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February 1, 2016

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Subject: EEA #15363, West Medway II
Final Environmental Impact Report

Dear Interested Party:

On behalf of the Proponent, we are pleased to provide the enclosed Final Environmental Impact Report (FEIR) for the proposed 200 MW West Medway II project in Medway, MA (the Project).

Since the Secretary of Energy and Environmental Affairs issued a Certificate on the Draft Environmental Impact Report (DEIR) for the Project on November 13, 2015, the Proponent has continued to advance the Project design and development effort. As summarized in Section 1.0 of the FEIR and detailed in the balance of the document, the Project has signed a Host Community Agreement with the Town of Medway and has reached agreement on a Payment In Lieu Of Taxes (PILOT) measure with the Medway Board of Selectmen.

Working under contract to the Town of Millis and the Proponent, the engineering and planning firm Kleinfelder has completed a study of the Millis water system with respect to providing supplemental water to the plant. The draft stormwater report has been issued and further work on the GHG analysis has been completed. A full update on water supply is provided in Section 8.0 of the FEIR; a more detailed GHG analysis is provided in Section 5.0 of the document.

If you wish to submit comments on the FEIR, they should be sent to:

Secretary, Matthew A. Beaton
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston MA 02114
Attn: Ms. Purvi P. Patel, EIT

Please reference EEA No. 15363. Comments on the FEIR will be due on Friday, March 11, 2016.

If you have any questions about the Project, please call one of us at (978) 897-7100.

Sincerely,

EPSILON ASSOCIATES, INC.

Theodore Barten, PE
Managing Principal

AJ Jablonowski, PE
Principal

Enclosure

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February 1, 2016

Secretary, Matthew A. Beaton
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston MA 02114

Subject: **West Medway II (EEA #15363)**
Final Environmental Impact Report

Dear Secretary Beaton:

On behalf of the Proponent, Exelon West Medway, LLC and Exelon West Medway II, LLC, we are pleased to submit the Final Environmental Impact Report (FEIR) for the proposed West Medway II Project located in Medway, Massachusetts.

As you know, the Project is a new, highly efficient, fast-starting 200 MW peaking plant. The new generating facility would operate during times of peak energy demand and would run primarily on natural gas, but could also run on ULSD fuel oil, ensuring fuel diversity and reliability. The Proposed Project will utilize two (2) simple-cycle General Electric LMS100 combustion turbine generators, the most efficient simple-cycle generator available on the market.

The Project will occupy a 13-acre site within a larger 94-acre Exelon-owned property on Route 126 in Medway; the property has been used for power generation and electrical infrastructure for more than 50 years. The Project will connect to the grid via an adjoining Eversource 115 kV switchyard. The natural gas connection will be to the Spectra/Algonquin interstate gas pipeline which runs along the western edge of the Exelon property.

The Project has successfully bid into ISO-NE's Forward Capacity Auction #9 and is scheduled to begin operation by June 2018. The Project will provide additional needed capacity to the Southeast Massachusetts – Rhode Island load zone in the ISO-New England electric grid while supporting the growth of renewable energy in Massachusetts by providing a quick-starting back-up for intermittent renewable energy sources such as solar and wind.

Importantly, Exelon's choice of the most efficient simple cycle turbine available will reduce overall cumulative CO2 emissions in the New England region by over 226,000 tons for the 2018-2030 time period by displacing older, less efficient electric generating plants. The $240 million capital costs of the Project will be an entirely private investment, with no government or ratepayer funding.

Since the September 30, 2015 submittal of the DEIR, the Project has continued to make good progress on a number of fronts. An independent group of attorneys, engineers and environmental scientists retained by the Town of Medway completed a thorough review of the Project and presented their findings at a well- attended public meeting. In mid-October, the project signed a Host Community Agreement with the Town of Medway. The Project and the Medway Selectmen also reached agreement on a PILOT agreement that will bring approximately $75 million to the Town over a twenty year period (pending Town Meeting approval).

Through the fall and early winter, the Project team completed a rigorous EFSB discovery process. Eleven days of evidentiary hearings were just concluded and the team is looking forward to moving into the briefing process. Local permit applications are being completed for submittal within a few months.

Please notice the FEIR in the Environmental Monitor to be published on February 10, 2016. We understand that the public comment period will extend through March 11, 2016, and the Certificate will issue on March 18, 2016.

Please feel free to contact us with any inquiries at (978) 897-7100.
Sincerely,

EPSILON ASSOCIATES, INC.

Theodore Barten, PE
Managing Principal

AJ Jablonowski, PE
Principal

Enclosure cc: circulation list

FINAL ENVIRONMENTAL IMPACT REPORT

Submitted Pursuant to the Massachusetts Environmental Policy Act

West Medway II (EEA #15363)

Submitted by:
Exelon West Medway LLC and Exelon West Medway II, LLC
300 Exelon Way
Kennett Square, PA 19348

Prepared by:
Epsilon Associates, Inc.
3 Clock Tower Place, Suite 250
Maynard, MA 01754

In Association with:
Rubin and Rudman LLP
Beals + Thomas
HDR, Inc.
The Analysis Group, Inc.

FEBRUARY 1, 2016

Epsilon
ASSOCIATES INC.

FINAL ENVIRONMENTAL IMPACT REPORT

WEST MEDWAY II

EEA No. 15363

Submitted to:
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Submitted by:
Exelon West Medway LLC and
Exelon West Medway II, LLC
300 Exelon Way
Kennett Square, Pennsylvania 19348

Prepared by:
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February 1, 2016

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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AGT	Algonquin Gas Transmission
ANRAD	Abbreviated Notice of Resource Area Determination
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ATR	Automatic Traffic Recorder
BACT	Best Available Control Technology
BANCT	Best Available Noise Control Technology
BBRS	Board of Building Regulations and Standards
BELD	Braintree Electric Lighting Department
BLSF	Bordering Land Subject to Flooding
BMP	Best Management Practice
BVW	Bordering Vegetated Wetlands
CAIR	Clean Air Interstate Rule
CAMD	Clean Air Markets Division
CBECS	Commercial Buildings Energy Consumption Survey
CEMS	Continuous Emissions Monitoring System
CFS	Cubic Feet per Second
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide Equivalent
COATS	CO_2 Allowance Tracking System
CPA	Comprehensive Plan Approval Application
CRPD	Charles River Pollution District
CSAPR	Cross-State Air Pollution Rule
CTG	Combustion Turbine Generators
DAQC	Division of Air Quality Control
dB	Decibel
DC	Direct Current
DEIR	Draft Environmental Impact Report
DEG	Diesel Engine Generator
DOER	Department of Energy Resources
EFSB	Energy Facilities Siting Board
EIA	Energy Information Administration
EIR	Environmental Impact Report
EJ	Environmental Justice
EMF	Electric and Magnetic Field
ENF	Environmental Notification Form
EOEA	Executive Office of Environmental Affairs
EOEEA	Executive Office of Energy and Environmental Affairs
EPA	U.S. Environmental Protection Agency
ERC	Emission Reduction Credit
ERP	Environmental Results Program
EUI	Energy Use Index
FAA	Federal Aviation Administration
FEIR	Final Environmental Impact Report

List of Acronyms (Continued)

GE	General Electric
GHG	Greenhouse Gas
GPD	Gallons per Day
GPH	Gallons per Hour
GPM	Gallons per Minute
GPS	Global Positioning System
GSHP	Ground-Source Heat Pump
GSU	Generator Step-Up
GUI	Graphical User Interface
GWSA	Global Warming Solutions Act
H_2O	Water
H_2SO_4	Sulfur Acid
HAP	Hazardous Air Pollutant
HCM	Highway Capacity Manual
HHV	Higher Heating Value
HRSG	Heat Recovery Steam Generator
Hz	Hertz
I/I	Inflow and Infiltration
IECC	International Energy Conservation Code
ILSF	Isolated Land Subject to Flooding
ISD	Intersection Sight Distance
ISO	International Standards Organization
ISO-NE	Independent System Operator – New England
IVW	Isolated Vegetated Wetlands
kV	Kilovolt
LAER	Lowest Achievable Emission Rate
LDC	Local Distribution Company
LHV	Lower Heating Value
LID	Low Impact Development
LNG	Liquefied Natural Gas
LOS	Level of Service
LUW	Land Under Water Bodies and Waterways
MAAQS	Massachusetts Ambient Air Quality Standards
MADFS	Massachusetts Department of Fire Services
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MassGIS	Massachusetts Office of Geographic Information
MCPA	Major Comprehensive Plan Approval
MEPA	Massachusetts Environmental Policy Act
MG	Million Gallons
MSGP	Multi-Sector General Permit
MS4	Municipal Separate Storm Water System
MUTCD	Manual on Uniform Traffic Control Devices
MW	Megawatt
N_2	Nitrogen gas

List of Acronyms (Continued)

NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NEMA	ISO-New England Northeastern Massachusetts
NESHAP	National Emission Standards for Hazardous Air Pollutants
NH_3	Ammonia
NOI	Notice of Intent
NOx	Oxides of Nitrogen
NPDES	National Pollutant Discharge Elimination System
NREL	National Renewable Energy Laboratory
NSPS	New Source Performance Standards
NSR	New Source Review
NWI	National Wetlands Inventory
O_2	Oxygen
O_3	Ozone
OSHA	Occupational Safety and Health Administration
Pb	Lead
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter with aerodynamic diameter of 2.5 micrometers or less
PM_{10}	Particulate Matter with aerodynamic diameter of 10 micrometers or less
POI	Point of Interconnection
PPM	Parts per Million
PPMVD	Parts per Million Volumetric Dry
PRIME	Plume Rise Model Enhancements
PSD	Prevention of Significant Deterioration
PV	Photovoltaic
PVMRM	Plume Volume Molar Ratio Method
RFA	Riverfront Area
RGGI	Regional Greenhouse Gas Initiative
RI	Rhode Island
ROW	Right-of-Way
SCR	Selective Catalytic Reduction
SEMA	Southeast Massachusetts
SF_6	Sulfur Hexafluoride
SO_2	Sulfur Dioxide
SO_3	Sulfur Trioxide
SSD	Stopping Sight Distance
SU/SD	Startup/Shutdown
TMDL	Total Maximum Daily Load
TPY	Tons per Year
TSS	Total Suspended Solids
ULSD	Ultra Low Sulfur Distillate
USGS	U.S. Geological Survey
VBV	Variable Bleed Valve
VOC	Volatile Organic Compounds
VPD	Vehicles per Day

List of Acronyms (Continued)

VPH	Vehicles per Hour
WMA	Water Management Act
WPA	Wetlands Protection Act

Section 1.0

Project Description and Permitting

1.0 PROJECT DESCRIPTION AND PERMITTING

This Final Environmental Impact Report is submitted in accordance with the Massachusetts Environmental Policy Act, G.L. c. 30, §§ 61 – 62I (MEPA) and accompanying regulations (301 CMR 11.00), and the "Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form" dated November 13, 2015. An annotated copy of the Secretary's Certificate and comment letters is provided in Section 12.0, Response to Comments.

1.1 Project Description

Project Name: West Medway II

Project Location: Summer Street, Medway, Massachusetts

EEA File Number: 15363

Project Proponent: Exelon West Medway, LLC and Exelon West Medway II, LLC

1.1.1 Summary

Exelon West Medway, LLC and Exelon West Medway II, LLC (collectively referred to hereinafter as "Exelon" or the "Proponent") propose to construct a new highly efficient, fast starting electric power peaking generation plant, and associated structures and infrastructure (the "Proposed Project" or the "Project"), on a portion of the existing +/- 94-acre West Medway Generating Station property located in Medway, Massachusetts (the "Property") (see Figure 1-1). The new generating facility would operate during times of peak energy demand and would run primarily on natural gas, but could also run on ULSD fuel oil, ensuring fuel diversity and reliability. Use of ULSD will be limited to an equivalent of 30 days/720 hours per year; the Proponent expects the Proposed Project will operate on average 10 days per year on ULSD.

The Proposed Project would be located on an approximately 13-acre site (the "Project Site") within the larger 94-acre Exelon owned site on Summer Street (Route 126) in Medway (the "Property" or the "Summer Street Site". Exelon's existing 135 MW West Medway, LLC power plant is located on the northeastern portion of the Summer Street site. The western half of the Summer Street site is occupied by two Eversource switchyards (one 345 kV, one 115 kV) and associated transmission rights of way.

Figure 1-1 locates the Project Site in the context of the Town of Medway and Interstate 495. The Project Site is in the south central portion of the Town of Medway, a community of approximately 13,000 residents. The Towns of Bellingham and Franklin are located to the south of the Town of Medway. The Project Site is approximately 1.6 miles east of Interstate-495 (I-495) and approximately 10.5 miles south of Interstate-90 (I-90); the Project Site is readily accessed via Route 109 (Exit 19 on I-495) and via Route 126 (Exit 18 on I-495).

Figure 1-2 provides a locus map of the more immediate Project area on a United States Geological Survey ("USGS") base. Figure 1-3 provides the same area coverage but on a more recent aerial photo base. Both of these maps locate the 94-acre Exelon Property and the Project Site, as well as the proposed natural gas pipeline and 115 kV transmission line interconnections.

As shown in more detail on Figure 1-4, the 115 kV transmission connection is entirely within the 94-acre Exelon Property. The natural gas pipeline interconnection extends a short distance to the north of the Exelon Property, running along an existing transmission right of way to reach an existing Spectra/Algonquin gate station just off Route 109.

The Proposed Project will be equipped with state-of-the-art clean air technologies, closed-cycle cooling to reduce water demand[1], and significant noise attenuation. The Proposed Project will include the following major components and structures (shown on Figures 1-5 and 1-6):

- Two (2) simple-cycle GE LMS100 combustion turbine generators ("CTGs");
- Pollution control equipment including Selective Catalytic Reduction ("SCR") and carbon monoxide (CO) oxidation catalysts in modules downstream of each CTG;
- Two (2) 160-foot-tall exhaust stacks;
- Natural gas compressors;
- Aboveground storage tanks for ULSD, service water, demineralized water and aqueous ammonia, including unloading areas;
- Transformers and electrical interconnection facilities;
- Combined ~15,700 square foot building[2] for control room, administrative and facility services, maintenance and warehouse area, water treatment area, and associated systems;
- 450 kilowatt ("kW") emergency diesel generator;
- 147 kW emergency diesel fire pump engine;
- Gas pipeline interconnection (3,080 feet); and
- Multi-basin stormwater management system.

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[1] Air cooling system for turbine intercooler as well as air cooling for lube oil system.

[2] Conditioned space is limited to 6,400 sf., or approximately 40% of the building footprint.

Natural gas for the Proposed Project will be delivered via an interconnection to the existing Algonquin Gas Transmission Company ("AGT") pipeline located to the northwest of the Project Site. A new approximately 3,080-foot-long, 12-inch diameter interconnection pipeline will be permitted and constructed by Exelon. Refer to Section 2.8 for a discussion of the pipeline route and minimization of impacts.

ULSD fuel oil will be transported to the Project Site from a Providence, Rhode Island terminal, following the same truck-based delivery practices as used for the existing ULSD-fired station on the Property. ULSD will be stored in a welded steel tank which will be located within full secondary containment. The Project proposes to use ULSD fuel for a maximum of 30 equivalent full load days per year. While this will provide an important measure of reliability during a very cold winter, it is anticipated that ULSD will be used for approximately 10 equivalent full load days in a typical year.

The Proposed Project will connect to an existing 115 kV switchyard located on the Property, and owned and operated by NSTAR d/b/a Eversource Energy ("Eversource").

1.1.2 Purpose and Need

The Proposed Project is intended to provide additional needed capacity to the Southeast Massachusetts – Rhode Island ("SEMA/RI") load zone in the ISO New England electric grid, to help meet energy demand during peak times. The Proposed Project will also enhance the region's overall electric system and support the growth of renewable energy in Massachusetts by providing a quick-starting back-up for intermittent renewable energy sources such as solar and wind. [3]

One of the markets that ISO-NE operates is the Forward Capacity Market ("FCM"). The Forward Capacity Market is a long-term wholesale market that assures resource adequacy, locally and system-wide. The market is designed to promote economic investment in supply. Critically, in exchange for capacity payments, a generating resource has an obligation to be ready to run and produce power when called upon. Long-term capacity markets such as the FCM provide economic incentives to attract investment in new and existing resources to achieve power system reliability requirements. In the FCM, ISO-NE holds an annual auction in which suppliers compete for the opportunity to meet New England's projected electricity demand three years out. Suppliers with the lowest price offers "clear" the auction and will receive capacity payments, which resources rely on for a stable revenue stream to maintain their viability.[4]

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3 *The Importance of a Performance-Based Capacity Market to Ensure Reliability.* ISO New England Inc. October 2015.

4 ISO-NE 2015 Regional Energy Outlook ("REO"), at pg.36.

In the 2018-2019 forward capacity auction that occurred in February of 2015 (FCA # 9), ISO-NE introduced a modification to help to ensure a more reliable and more flexible fleet of power supply resources. The principal change made to the FCM is called "Pay-for-Performance". ISO-NE determined that the market was not providing sufficient incentives for resource performance (i.e., availability) during the winter when natural gas delivery is constrained. This resulted in resources that sometimes failed to produce energy when it was needed most by the region, which posed a serious threat to the electricity grid's reliability[5].

Pay-for-Performance creates a stronger financial incentive for capacity suppliers to perform when called on during periods of system stress. If a resource underperforms or does not produce power, it may be required to pay back a portion of, or more than its entire capacity payment, through performance penalty payments. This penalty will likely have a serious detrimental effect on a resource's economic viability. The penalty was adopted expressly for the purpose of creating financial incentives to generators to find economical ways to "firm up" their winter fuel supply.

1.1.3 Project Operation

Exelon participated in the ISO-NE's FCA # 9 on February 2, 2015 with a bid for a 195 MW peaking project to sell power to the SEMA/RI load zone. The bid "cleared" which means that the Proposed Project holds a supply obligation in the ISO-NE capacity market. This means that beginning in June, 2018, if ISO-NE calls upon the Proposed Project to run and produce power, the Proposed Project must do so or it may be required to pay back a portion or more than its entire capacity payments through performance penalty payments.

Moreover, if the Proposed Project is unable to run and produce power, the reliability of the electric power system in the SEMA/RI load zone could also be in jeopardy. Accordingly, the Proposed Project must have the ability to produce power if required to do so by ISO-NE. In order to do so in the winter months, Exelon must overcome the challenge of the projected scarce supply of natural gas so that it is has fuel to run when called upon. The only reliable cost-effective way to ensure that the Proposed Project has a supply of fuel to run when called upon during cold weather is for the Proposed Project to be capable of also running on ULSD distillate oil and having the fuel stored on site. The Proposed Project's ability to use oil will be important in meeting the region's need for electricity during the winter peak months in a cost effective manner. The Project proposes to use ULSD fuel for a

5 ISO-NE 2015 REO, at pg.37.

maximum of 30 equivalent full load days per year. While this will provide an important measure of reliability during a very cold winter, it is anticipated that ULSD will be used for approximately 10 equivalent full load days in a typical year.[6]

The Proposed Project will utilize the most efficient simple-cycle generator available on the market, the General Electric LMS100. This simple-cycle unit has a significantly lower heat rate than current peaking plants operating today. It also has a lower heat rate than some of the very old steam cycle fossil units still operating. The very low heat rate (i.e., high efficiency) of this unit means that it will likely be dispatched by NE-ISO more often than traditional peaking units.

Under certain operating circumstances, it is possible that the Proposed Project could be dispatched up to 60% in a given year. However, in accordance with recently updated New Source Performance Standards ("NSPS") at 40 CFR 60, Subpart TTTT, the three-year rolling average capacity factor of each turbine will be limited to 43%. Accordingly, if the Project operates at 60% capacity factor for its first full year of service, operations over the next two years would be limited to an average capacity factor of 34.5% (yielding a three year rolling average of 43%).

1.2 Design Changes/Improvements

1.2.1 Site Area

As was described in the DEIR, a series of design and layout refinements resulted in a change to the original site area noted in the ENF. As reported in the DEIR, the permanent Project facilities, as well as elements of the construction laydown and construction parking areas, were located in an approximately 13-acre fenced area (see DEIR Figure 1-6 and 1-7, repeated as FEIR Figures 1-5 and 1-6). Since that time, the Project fence line has been adjusted to include some previously unfenced temporary laydown areas; the fenced area is now approximately 15 acres. The area occupied by permanent plant and stormwater facilities has not changed.

1.2.2 Impervious Surfaces

As was reported in the DEIR (Section 1.3, page 1-11), ongoing engineering and design work resulted in a reduction in planned impervious surface. The conservatively estimated seven (7) acres of impervious surface noted in the ENF was reduced to 4.3 acres. This was largely

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6 A recently released draft version of ISO New England's 2015 Regional System Plan indicates that energy efficiency programs are expected to drive a reduction in the 10 year gross winter peak demand growth from 0.75 to a net annual value of -0.1%. The draft report also discusses the need for additional transmission, generation and gas pipeline capacity and notes that a reliability program aimed at ensuring that generators stock sufficient fuel for use during extreme cold will be kept in place until at least 2018.

a result of finishing the main plant yard area (i.e., the area enclosed by the proposed sound wall) in pervious crushed stone as opposed to impervious paving. The reduced impervious area is the basis for the stormwater calculations discussed in Section 7.0.

1.2.3 Pipeline Route

As was reported in the DEIR, the proposed route of the pipeline that will carry natural gas to the Proposed Project from a Spectra/AGT meter station northwest of the Summer Street Site near Route 109 was refined to minimize wetlands impacts. Temporary impacts to Bordering Vegetated Wetlands (BVW) and Isolated Vegetated Wetlands (IVW) from construction of the approximately 3,080-linear-foot gas pipeline will occur in two discrete locations along the pipeline route. These construction impacts total approximately 1,241 square feet of temporary BVW impact and 734 square feet of temporary IVW impact (see Figure 1-7). These BVW/IVW impacts are conservatively based on an approximately 50-foot wide construction workspace corridor centered over the pipeline.

As shown on Figure 1-7, the pipeline itself crosses only one BVW area, that being a very narrow portion of a wetland area to the north of the Exelon 94-acre parcel. By locating the necessary crossing at the narrowest part of the wetland, the actual length of the crossing is limited to approximately 10 feet. The computed temporary impact area of approximately 880 square feet is based on an assumed 50-foot wide construction area. Given the very limited length of the crossing, it may be possible to reduce this impact area by staging equipment on either side of the wetland itself. This will be examined in further detail as the Notice of Intent filing is prepared for submittal to the Medway Conservation Commission. The use of Horizontal Directional Drilling (HDD) or other trenchless crossing techniques, is not, in the opinion of the Project, warranted to avoid such limited temporary BVW impacts. Moreover, use of HDD or jack and bore in this area would be very difficult because of the close proximity of the existing Spectra/AGT high pressure interstate gas line. As shown on Figure 1-8, the high pressure gas line is less than 100 feet to the west of the very short wetlands crossing.

The balance of the noted BVW/IVW impacts arise from the assumed 50 feet work area for the pipeline as it passes between two mapped wetlands areas just to the northwest of the existing Exelon 135 MW power station (see Figure 1-9). As shown on the figure, the pipeline itself has been routed to avoid the small mapped BVW to the south of the pipeline and the small IVW on the north side of the pipeline route. The estimated temporary impacts associated with the assumed 50 foot wide construction area are 285 sf. of BVW and 734 sf. of IVW. [7]

---

[7] As discussed in Section 7.1.1, the 115 kV electrical interconnection will impact ~206 sf. of BVW next to the Eversource switchyard. A ~500 sf. replacement wetlands is being proposed as mitigation for this unavoidable permanent impact.

As with the short wetland crossing discussed above, it may be possible to reduce these impact areas by limiting work to the approximately 25-foot wide area between the two mapped wetlands and/or by staging equipment on either side of the mapped wetlands thus reducing the assumed 50 foot wide construction area. This will be examined in further detail as the Notice of Intent filing is prepared for submittal to the Medway Conservation Commission. Given the very limited temporary impacts, the use of HDD or other trenchless crossing techniques, is not warranted in this area. Moreover, the pipeline has a bend in this immediate area, thus complicating any trenchless crossing. Further, the south side of any trenchless crossing would require work in the immediate proximity of the existing 135 MW generation facility and its electric connection to the adjoining switchyard. As shown on Figure 1-9, these facilities are located less than 50 feet from the pipeline as it passes between the small BVW and small IVW. There are construction worker safety and plant reliability issues associated with attempting a trenchless crossing in such close proximity to the existing power plant and its electrical interconnection.

1.2.4 Efficiency Measures

1.2.4.1 GE LMS100 Heat Rate

Over the past year, GE has made several improvements to the LMS100. The GE LMS100 was, and remains, the world's most efficient simple-cycle gas turbine engine. The LMS100PA+, the current engine from GE, can deliver 116 MW with 44% thermal efficiency (a heat rate of 7,776 BTU/kW-hr, Lower Heating Value (LHV)[8] at standard ISO conditions (60 F, sea level). This is approximately a 0.6% improvement in heat rate at ISO conditions. GE achieved this efficiency improvement by optimizing the power turbine flow function that allowed:

- Optimized high-pressure compressor inlet temperature
- Increased compressor discharge pressure
- Increase/open the booster (low-pressure compressor) inlet guide vane angle

These changes allowed GE to improve the engine heat rate from 7,822 BTU/kW-hr (LMS100PA) to 7,776 BTU/kW-hr (LMS100PA+) (Lower Heating Value/LHV). The Project will be using the LMS 100PA + design.

1.2.4.2 Transformer Efficiency

As discussed in Section 5.0 the Project will be using a very high efficiency transformer. Generator Step-up Unit (GSU) transformers elevate the voltage of electric power from the individual electric generators to a level compatible with the interfacing high voltage

8 The corresponding heat rate based on the Higher Heating Value (HHV) is 8,624 BTU/kWh

transmission voltage. For this Project, the "base case" would be individual two-winding 13.8kV to 115 kV GSU transformers for each generator. The more energy efficient proposed case involves the use of a single three-winding 13.8kV to 115 kV transformer to elevate voltage of power from each generator at a separate low voltage winding to a single outbound 115 kV circuit. This more efficient arrangement provides an approximately 50 kW reduction in energy loss as compared to the base case involving multiple transformers.

1.2.5 Renewable Measures

As discussed in Section 5.0, there is very little available space within Exelon's 94-acre parcel which might be safely used for a ground mounted PV array. However, the Project's 15,700 sf. control/admin/maintenance building will have a PV ready roof.

A HCA agreement with the Town of Medway includes a $20,000 per year energy awareness fund. Exelon will discuss the use of this fund with appropriate Medway officials and encourage Town officials to use a portion of the annual funding to examine and encourage the use of PV on municipal lands and buildings. Exelon will also provide business contacts with the solar/renewables side of Exelon's business in order to provide business and technical information/resources to the Town.

1.3 Project Development Progress

Since the submittal of the DEIR in September of 2015, the Project has continued to pursue development, design, licensing and permitting on several fronts. A summary of the significant progress made in the past 5 months is provided below.

1.3.1 Town of Medway

Exelon has continued to have productive discussions with Medway officials. During the spring of 2015, the Town of Medway retained a team of experienced attorneys, engineers and environmental consultants to conduct an independent review of the Proposed Project. The team completed their review and reported their findings at a well-attended public forum on October 21, 2015. The forum included an opportunity for residents to ask questions which were then addressed by the Town's review team. A copy of the presentation made by the Town's independent consultants is provided as Technical Appendix A.

In parallel with this review, Exelon had discussions with the Medway Board of Selectmen and Town officials regarding a Payment In Lieu Of Taxes (PILOT) Agreement as well as a Host Community Agreement (HCA).

1.3.1.1 PILOT Agreement

Exelon and the Board of Selectmen came to agreement on a draft PILOT agreement in October, 2015. The agreement, a copy of which is provided as Technical Appendix B, provides for a 20-year stream of tax and Community Preservation Act (CPA) payments beginning in the year that the Project enters commercial operation. The PILOT Agreement calls for the payment of $73,076,003 over the 20-year period plus an additional $2,192,280 in CPA payments. The total of $75,268,283 is an average of more than $3,750,000 per year.

The draft PILOT agreement will be brought before the citizens of Medway for discussion and a vote at the Annual Town Meeting in April 2016. The agreement covers the Proposed Project; Exelon will continue to make tax payments on the existing 135 MW power generation facility and the balance of its property in Medway.

1.3.1.2 HCA

The Host Community Agreement between Exelon and the Town of Medway was finalized in October of 2015, as well. A copy of the final HCA is provided as Technical Appendix C. The lengthy document stipulates a number of annual and one time payments to be made by Exelon to the Town. The document also spells out design, operations, monitoring, maintenance and decommissioning commitments made by Exelon.

The financial aspects of the HCA include:

- An annual payment of $15,000 to be used for fire, emergency management services, police and first responder training with respect to responses to the Facility and adjoining parcels;
- The sum of $650,000 for the purchase and equipping of a foam and structural fire fighting vehicle, together with training fire department personnel in the use of the equipment;
- The sum of $100,000 for the purchase of a dry chemical fire fighting vehicle;
- The sum of $100,000 for the Town's independent legal and technical of the Project and associated permit applications;
- The sum of $28,000 for a water analysis (the Town also explicitly recognized Exelon's earlier $40,000 payment for a water system leak detection study;
- Funding for a Property Value Security Fund. The Fund will provide compensation to any residential property owner within 300 feet of the Project who experiences a documented and material reduction in the value of their home attributable to the Project. The specifics are described on page 4 of the HCA (Technical Appendix C);

- An annual payment of $20,000 for an Energy Conservation Awareness Fund. Among other uses, this fund can be used to support Medway's activities as a "Green Community" as designated by MA DOER;

- A $2,000,000 parental guarantee (from Exelon Generation Company, LLC) with respect to future decommissioning and removal of the Project.

The extensive design, operations, monitoring, maintenance and decommissioning commitments made by Exelon are detailed on pages 6 through 11 of the HCA. The Health and Safety subsection includes an innovative agreement with respect to the Town's desire to see Exelon minimize the use of ULSD at the Project. Under certain circumstances, Exelon agrees to the pay the Town a "penalty" of $5 per megawatt hour for power generated using ULSD. For perspective, a qualifying 12-hour full load run on ULSD would result in an approximately $12,000 payment to the Town. On an annual basis, 10 days (full load equivalent) of qualifying ULSD operation would result in a payments totaling approximately $240,000 to the Town of Medway.

The Town has agreed to use any such payments for open space, recreation, conservation and general municipal purposes. As discussed in Section 8.0, the Project will have a discussion with Town officials to encourage that a portion of the ULSD operation payments be used for water conservation, specifically for the purpose of future leak detection and leak repair on the Town's water supply system.

1.3.1.3 Zoning Exemption

In late November, in response to a question from the EFSB staff, Medway Selectmen indicated their support for Exelon's requested Zoning Bylaw exemptions. Medway Selectmen also stated that the proposed Project was compatible with the Town's 2009 Master Plan.

1.3.2 Water Supply

Water supply for the Project is expected to come from primarily from an on-site well, supplemented as needed from the Town of Millis municipal system. Since the September 30, 2015 submittal of the DEIR, discussions with the Town of Millis regarding a supplemental water supply agreement have continued. This process has included an analysis by Kleinfelder, an engineering firm working under contract to the Town of Medway and the Project proponent, Exelon West Medway II, LLC.

On December 15, 2015, Kleinfelder issued Revision 1, of their report entitled "*Draft Water Supply and Demand Assessment In Relation To Exelon Power West Medway II Project*". The report was prepared for the Town of Millis by a team of engineers, hydro-geologists and planners from Kleinfelder's Cambridge, MA office.

A summary of the Kleinfelder Report findings are provided in Section 8.0 of the FEIR. A copy of the Draft Kleinfelder Report is provided as Technical Appendix E.

As described in the Kleinfelder Report, water purchased from Millis would be transported to the site via an existing connection between the Millis and Medway systems and a length of the Medway system. As described in the DEIR and repeated in this document, no process water will be supplied from the Medway water supply.[9] The Project Proponent expects to continue to work with Millis representatives to formulate a mutually agreeable supply arrangement for process water over and above the volumes which can be provided by the on-site well.

As discussed in Section 8.2.3, the Project has also initiated discussions with two firms for the purpose of providing supplemental water supplies via truck if needed.

1.3.3 Massachusetts Department of Environmental Protection

The Project submitted its Major Comprehensive Air Plan Application and PSD permit application on August 24, 2015. Copies of the applications were provided as Attachment D to the September 30, 2015 DEIR.

An administrative completeness determination was issued by DEP on September 10, 2015.

As noted in their November 13, 2015 comments on the DEIR (page 3), DEP has been conducting its detailed technical review of the applications.

On January 26, 2016, the Project requested an approximately 60 day extension of the Technical Review Period, to March 31, 2016. On January 26, 2016, the Project received the first set of technical review comments from DEP. The Project expects to receive additional DEP comments during the extended technical review period.

1.3.4 Energy Facility Siting Board

As described in Section 1.6 of the DEIR, the EFSB Petition for the Project was filed on March 13, 2015. The associated petition for Certain Exemptions from the Zoning Bylaw of the Town of Medway was filed with the DPU on March 19, 2015. This Zoning Petition was subsequently amended via filings made on May 1, 2015 and September 18, 2015. As is typically done, the primary EFSB Petition and the Zoning Petition were consolidated for purposes of review/hearings before the EFSB.

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[9] The Town of Medway will supply small volumes of potable water (~120 gpd) for use at the new Project and will continue to provide potable water to the existing plant.

A Public Statement Hearing was conducted by EFSB in Medway on June 11, 2015. The Public Statement Hearing was followed by an Administrative Conference. Several parties requested and were granted Intervenor status (Town of Medway, NSTAR Electric/Eversource, CLF, CRWA); these parties have participated at varying levels in subsequent discovery and adjudicatory hearings.

Discovery was conducted during the summer and fall of 2015; adjudicatory hearings began on December 8, 2015. A total of eleven days of hearings have been held through January 28, 2016. The next step in the EFSB process will be submittal of briefs by the parties. The EFSB review is expected to be completed in the summer of 2016.

1.4 Communications and Outreach Update

Since the submittal of the DEIR on September 30, 2015, the Project has continued its communications and outreach efforts, including enhanced public outreach to EJ populations in Milford and Franklin. In addition to the Monitor, a notice on the filing of the DEIR was published in the Milford Daily News (including Spanish and Portuguese translations). Notices were also provided for posting at two Milford churches with Portuguese and Spanish speaking congregants.

Copies of the DEIR were provided to Town Offices and to public libraries in Medway, Millis, Bellingham, Milford and Franklin. In addition to the initial distribution list, copies of the DEIR (paper or electronic) were provided upon request during the comment period. The Project has continued to update its website (http://www.medwayenergy.com/) and has provided additional updates of interest via social media, including Facebook (https://www.facebook.com/Medway-Clean-Energy-Expansion-1627579820839604/?fref=nf) and Twitter (https://twitter.com/ExelonGen?lang=en).

Project representatives have attended a number of open Selectmen and other Town Board meetings in Medway and Millis during the fall and early winter of 2015.

In addition to Notice in the Monitor, a notice on the filing of the FEIR is being published in Milford Daily News. This FEIR is being provided to Town Offices and public libraries in Medway, Millis, Bellingham, Milford and Franklin. In addition to the initial distribution list, copies of the FEIR (paper or electronic) will be provided upon request during the comment period.

Project communications efforts have been complemented by outreach and communications programs conducted by the Town of Medway. As noted in Section 1.3.1, the Town of Medway retained a team of experienced attorneys, engineers and environmental consultants to conduct an independent review of the Proposed Project. The team completed its review and reported their findings at a well-attended public forum on

October 21, 2015. The forum included an opportunity for residents to ask questions which were then addressed by the Town's review team. A copy of the presentation made by the Town's independent consultants is provided as Technical Appendix A.

Lastly, the Town of Medway website also contains a section devoted to the Exelon Project (http://www.townofmedway.org/Pages/MedwayMA_Bcomm/BOS/exelonbulletin).

1.5 Summary of Permit Requirements and Status

Permits, reviews, and approvals required for the Project and the status and anticipated application dates thereof, are identified in Table 1-1.

Table 1-1 Required Permits and Approvals

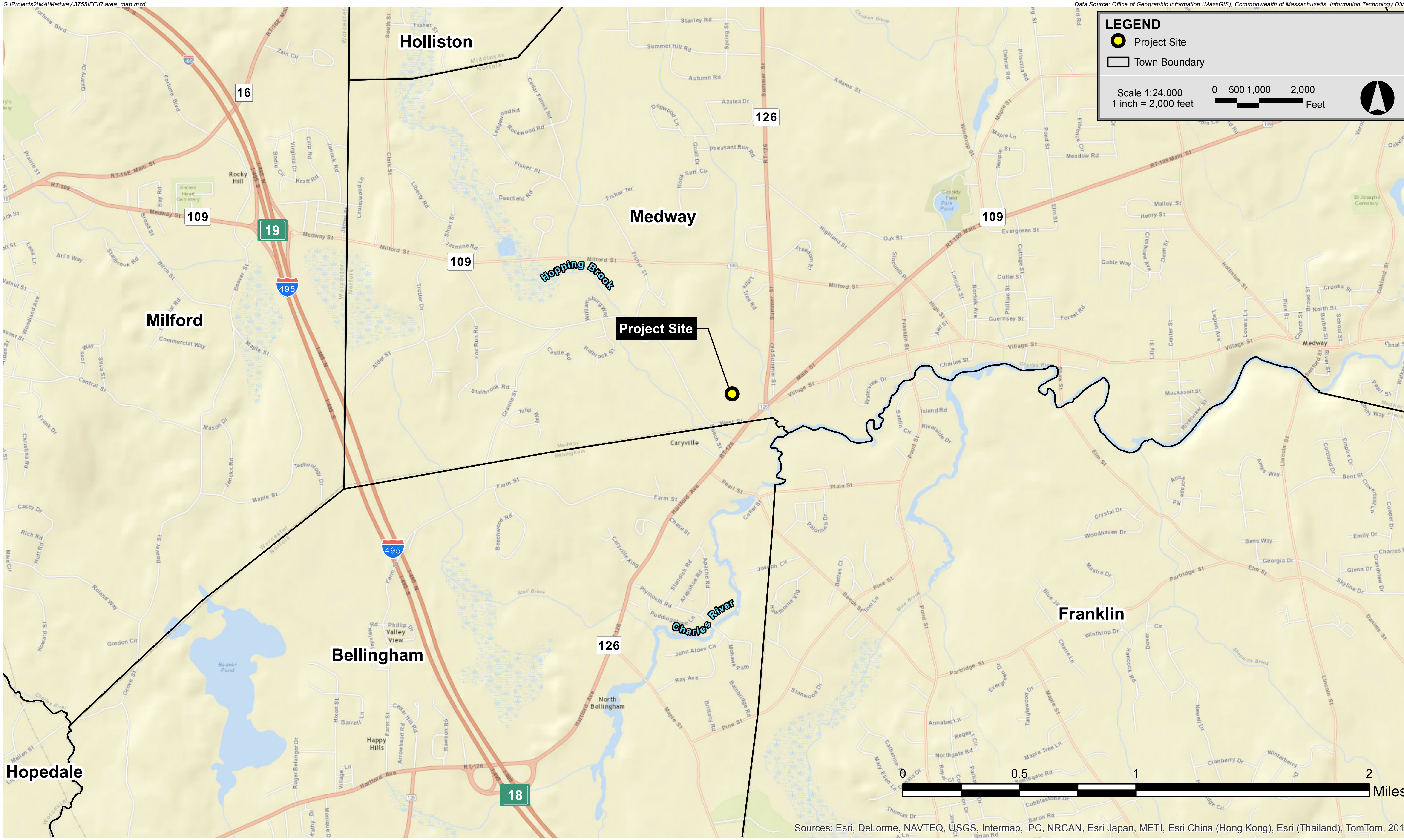
Issuing Authority	*Permit/Review/Approval Status*
FEDERAL	
Environmental Protection Agency	National Pollutant Discharge Elimination System ("NPDES") General Permit for Discharges from Construction Activities
Department of the Army	Section 404 General Permit, filing anticipated in Q2, 2016
Federal Aviation Administration	FAA Form 7560-1 Notice of Proposed Construction or Alteration for Construction Cranes
STATE	
Energy Facilities Siting Board	Approval of Petition to Construct; filed March 13, 2015, hearings occurred December 8, 2015 through January 28, 2016
Department of Public Utilities	Petition for Certain Exemptions from the Zoning Bylaw of the Town of Medway, filed March 19, 2015 Consolidated April 16, 2015 Amended Petition for Certain Exemptions from the Zoning Bylaw of the Town of Medway, filed May 1, 2015 Second Amended Petition for Certain Exemptions from the Zoning Bylaw of the Town of Medway, filed September 18, 2015 Hearings occurred December 8, 2015, through January 28, 2016
Massachusetts Department of Environmental Protection (MassDEP)	Major Comprehensive Air Plan Approval (BWP AQ03) filed August 24, 2015 Federal Prevention of Significant Deterioration ("PSD") Permit application filed August 24, 2015 Administrative completeness determination issued September 10, 2015 On Jan 26, 2016, Project requested an extension of Technical Review Period (to March 31, 2016)Initial DEP technical comments were received on Jan 26, 2016; additional comments expected Title V Air Operating Permit (BWP AQ14)
Department of Public Safety – State Fire Marshal	Construction and Use Permits (tanks > 10,000 gal.)

Table 1-1 Required Permits and Approvals (Continued)

Issuing Authority	*Permit/Review/Approval Status*
LOCAL	
Medway Planning and Economic Development Board	Site Plan Review, anticipated to be filed late Q1, 2016
Medway Conservation Commission	Abbreviated Notice of Resource Area Determination ("ANRAD") filed May 5, 2015, amended July 1, 2015, Order of Resource Area Delineation received September 10, 2015 (see Attachment J of DEIR) Wetlands Protection Act Order of Conditions, Notice of Intent anticipated to be filed 2nd Quarter, 2016.
Medway Inspectional Services Department	Building Permit(s), septic system removal permit
Medway Water Department/Department of Public Services	Water Service Permit
Medway Board of Health/Sewer Department	Application for Sewer Service
Medway Fire Department	Storage Tank Permit Flammable/Combustible Storage Permit
Medway Board of Selectmen or designee	Street Opening Permit for water and sewer line connections
Medway and Millis Boards of Selectmen or designee	Millis-to-Medway water conveyance agreement

G:\Projects2\MA\Medway\3755\FEIR\area_map.mxd

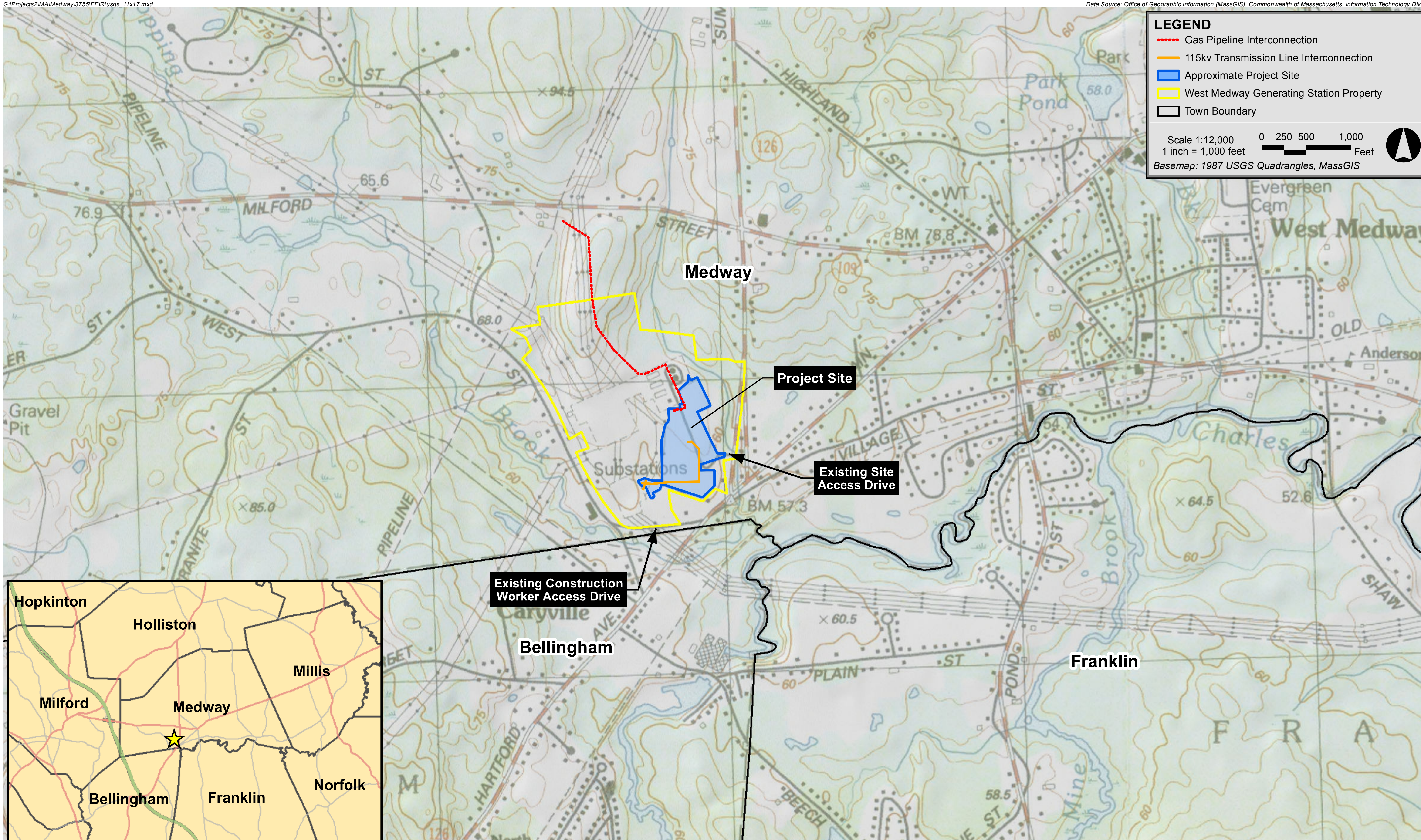
Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



West Medway II **Medway, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 1-1
Area Map

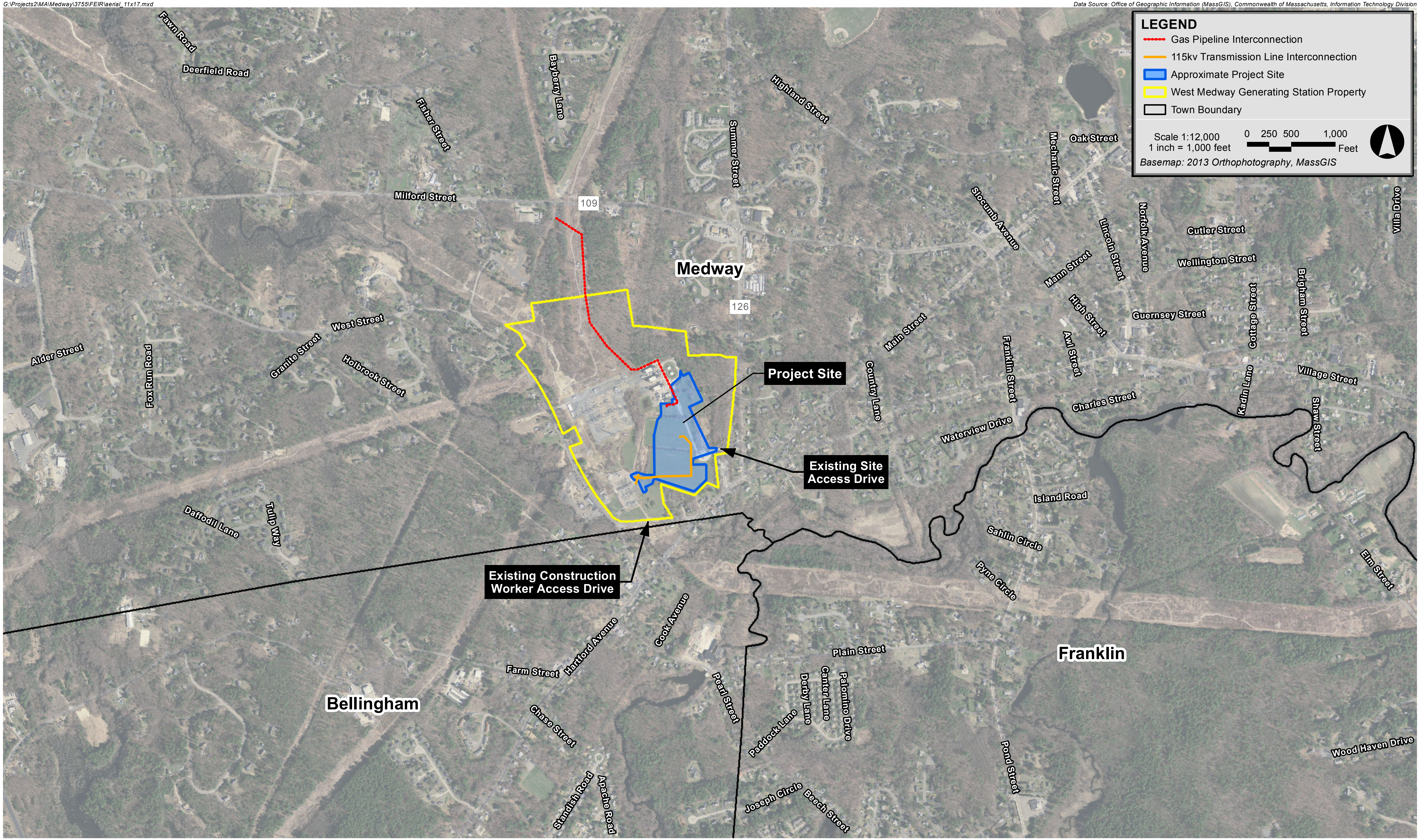


West Medway II Medway, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1-2
USGS Map

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

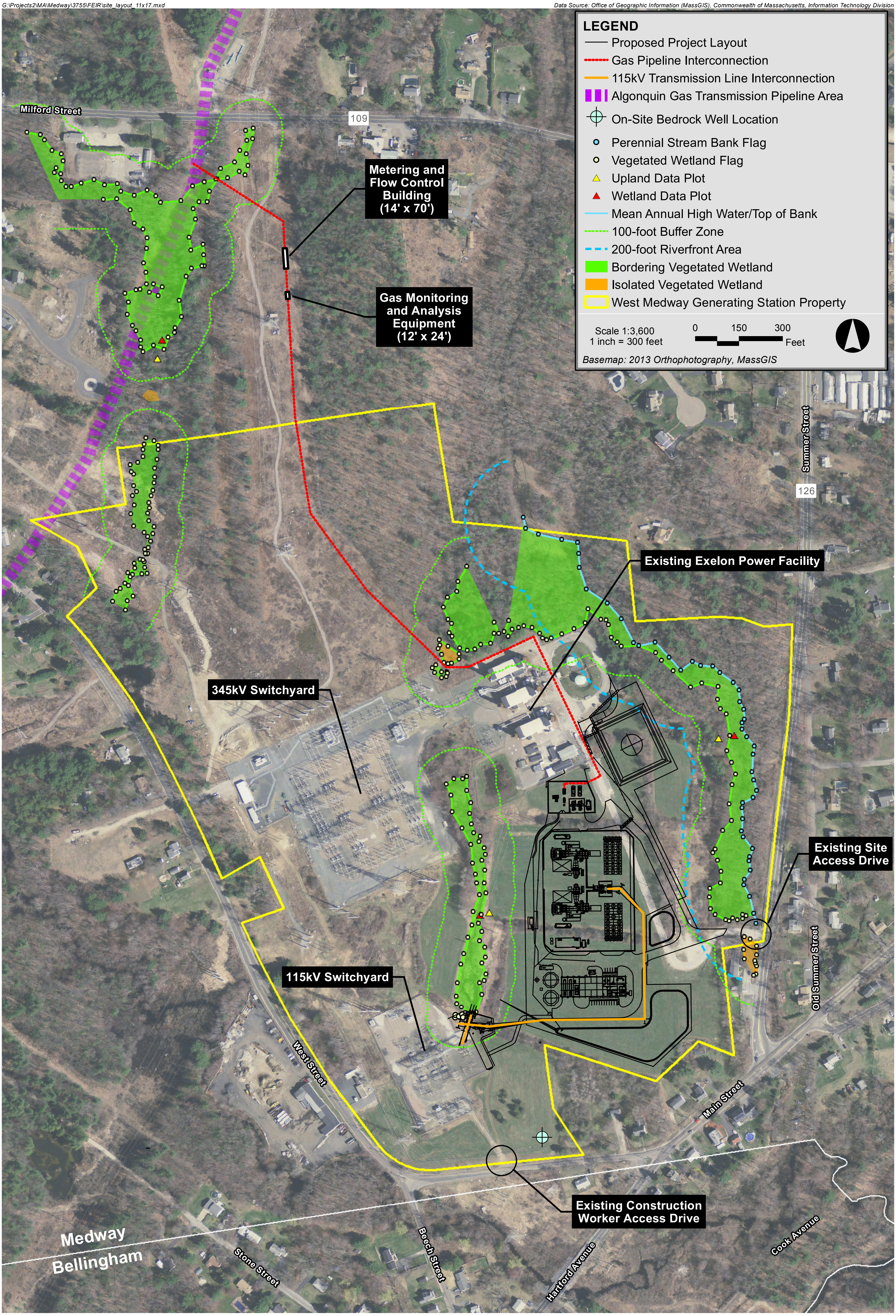


West Medway II Medway, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1-3

Aerial Map

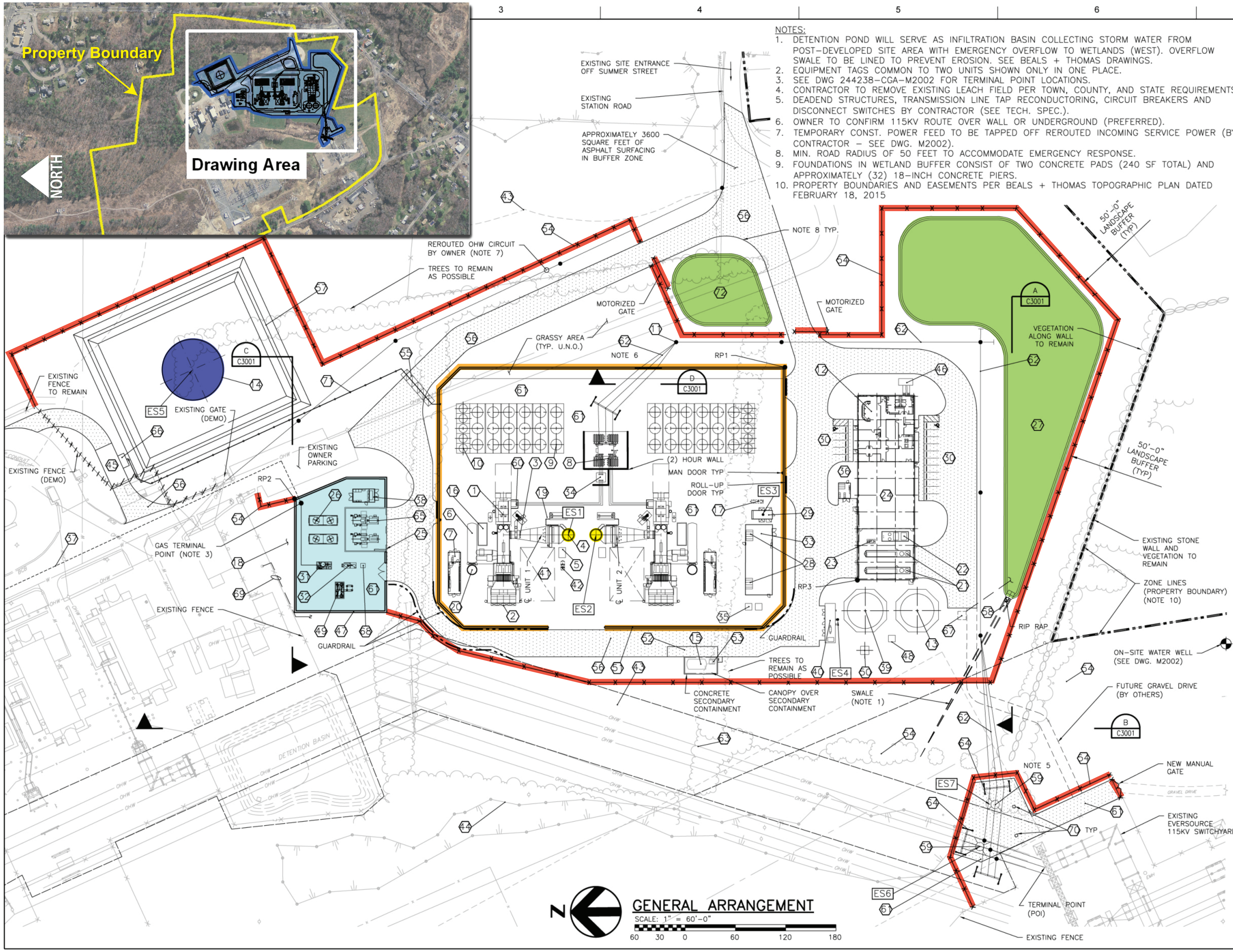


West Medway II Medway, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1-4
Site Layout

NOTES:
1. DETENTION POND WILL SERVE AS INFILTRATION BASIN COLLECTING STORM WATER FROM POST-DEVELOPED SITE AREA WITH EMERGENCY OVERFLOW TO WETLANDS (WEST). OVERFLOW SWALE TO BE LINED TO PREVENT EROSION. SEE BEALS + THOMAS DRAWINGS.
2. EQUIPMENT TAGS COMMON TO TWO UNITS SHOWN ONLY IN ONE PLACE.
3. SEE DWG 244238-CGA-M2002 FOR TERMINAL POINT LOCATIONS.
4. CONTRACTOR TO REMOVE EXISTING LEACH FIELD PER TOWN, COUNTY, AND STATE REQUIREMENTS.
5. DEADEND STRUCTURES, TRANSMISSION LINE TAP RECONDUCTORING, CIRCUIT BREAKERS AND DISCONNECT SWITCHES BY CONTRACTOR (SEE TECH. SPEC.).
6. OWNER TO CONFIRM 115KV ROUTE OVER WALL OR UNDERGROUND (PREFERRED).
7. TEMPORARY CONST. POWER FEED TO BE TAPPED OFF REROUTED INCOMING SERVICE POWER (BY CONTRACTOR – SEE DWG. M2002).
8. MIN. ROAD RADIUS OF 50 FEET TO ACCOMMODATE EMERGENCY RESPONSE.
9. FOUNDATIONS IN WETLAND BUFFER CONSIST OF TWO CONCRETE PADS (240 SF TOTAL) AND APPROXIMATELY (32) 18-INCH CONCRETE PIERS.
10. PROPERTY BOUNDARIES AND EASEMENTS PER BEALS + THOMAS TOPOGRAPHIC PLAN DATED FEBRUARY 18, 2015



ITEM	EQUIPMENT LEGEND DESCRIPTION
1	LMS 100 COMBUSTION TURBINE (GE)
2	INLET AIR FILTER (GE) (FRONT FACING)
3	SCR/CO MODULE (GE)
4	EXHAUST STACK (GE)
5	CEMS ENCLOSURE
6	INTERCOOLER (GE)
7	CTG POWER CONTROL MODULE (GE)
8	GENERATOR STEP-UP TRANSFORMER (THREE WINDING)
9	AIR COOLED HEAT EXCHANGER
10	LUBE OIL FIN-FAN COOLER (2 SYSTEMS)
11	TRANSMISSION POLE
12	66'X 218' CONTROL/ADMIN & FACILITY SERVICES BLDG.
13	46'-0" DIA DEMIN WATER STORAGE TANK (450,000 GAL)
14	75'-0" DIA FUEL OIL STORAGE TANK (1,000,000 GAL)
15	19% AQUEOUS AMMONIA STORAGE TANK UNDER CANOPY
16	COOLING PUMP SKID (GE)
17	OIL/WATER SEPARATOR #1 (UNDERGROUND)
18	EXISTING SEPTIC SYSTEM LEACHING AREA (NOTE 4)
19	AMMONIA BLOWER SKID (GE)
20	VENT STACK WITH SILENCER (VBV) (GE)
21	BAYS FOR (2) PORTABLE DEMIN TRAILERS
22	AIR COMPRESSOR SKID
23	MAINTENANCE AIR COMPRESSOR & DRYER
24	MAINTENANCE & WAREHOUSE AREA
25	FUEL GAS COMPRESSOR SOUND ENCLOSURE
26	COMPRESSOR FIN-FAN COOLER
27	STORM WATER DETENTION POND (INFILTRATION BASIN) – NOTE 1
28	4.16KV SWITCHGEAR (INSIDE PDC ITEM 33)
29	DIESEL GENERATOR (EDG)
30	PARKING (ASPHALT)
31	FUEL GAS SUCTION SCRUBBER SKID
32	FUEL GAS COALESCING FILTER/SEPARATOR SKID
33	POWER DISTRIBUTION CENTER NO. 1
34	UNIT AUXILIARY TRANSFORMER
35	STATION SERVICE TRANSFORMERS
36	POWER DISTRIBUTION CENTER NO. 2
37	U/G NATURAL GAS PIPING (BY OTHERS) – SEE DWG. C1003
38	POWER DISTRIBUTION CENTER NO. 3
39	48'-0" DIA SERVICE/FIRE WTR STOR TNK (500,000 GAL)
40	FIRE WATER PUMP ENCLOSURE
41	CRANE PARKING FOR TURBINE MAINTENANCE
42	WATER WASH DRAINS TANK (UNDERGROUND – COMMON)
43	100' WETLAND BUFFER ZONE
44	BORDERING VEGETATED WETLAND (STAKED BY EPSILON)
45	FUEL OIL UNLOADING TRUCK STATION (ULSD)
46	HVAC UNIT
47	FUEL GAS YARD (PERIMETER NOISE WALL)
48	SANITARY LIFT STATION
49	FUEL GAS DEW POINT HEATER (ELECTRIC – SEE TECH. SPEC.)
50	WASTE WATER COLLECTION SUMP
51	NOISE WALL
52	AMMONIA DELIVERY PAD (CONCRETE)
53	AMMONIA PUMP SKID UNDER CANOPY
54	FENCES AND GATES
55	PIPE RACK
56	NEW ROADWAY (ASPHALT)
57	SECONDARY CONTAINMENT BERM
58	EMERGENCY OVERFLOW SWALE TO ONSITE WETLANDS
59	115kv CIRCUIT BREAKER WITH MOTORIZED DISCONNECTS (NOTE 9)
60	LINE SIDE CUBICLE (GE) AND CIRCUIT BREAKER
61	AGGREGATE SURFACING
62	OVERHEAD 115KV CIRCUIT
63	OVERHEAD 115KV CIRCUIT (EXISTING; FROM J-3)
64	NEW DEAD END STRUCTURE (NOTES 5 & 9)
65	GAS COMPRESSOR
66	ULSD UNLOADING/FORWARDING PUMP SKIDS
67	OIL/GRIT SEPARATOR (UNDERGROUND – STORMCEPTOR)
68	HYDROCARBON DRAINS TANK (ABOVE GROUND)
69	SANITARY SEWER (EXISTING PLANT TO SANITARY LIFT STATION – 48)
70	CONCRETE PAD (NOTE 9)
71	ABOVE GROUND FUEL OIL PIPING (ON SLEEPERS)
72	BIORETENTION BASIN

HDR

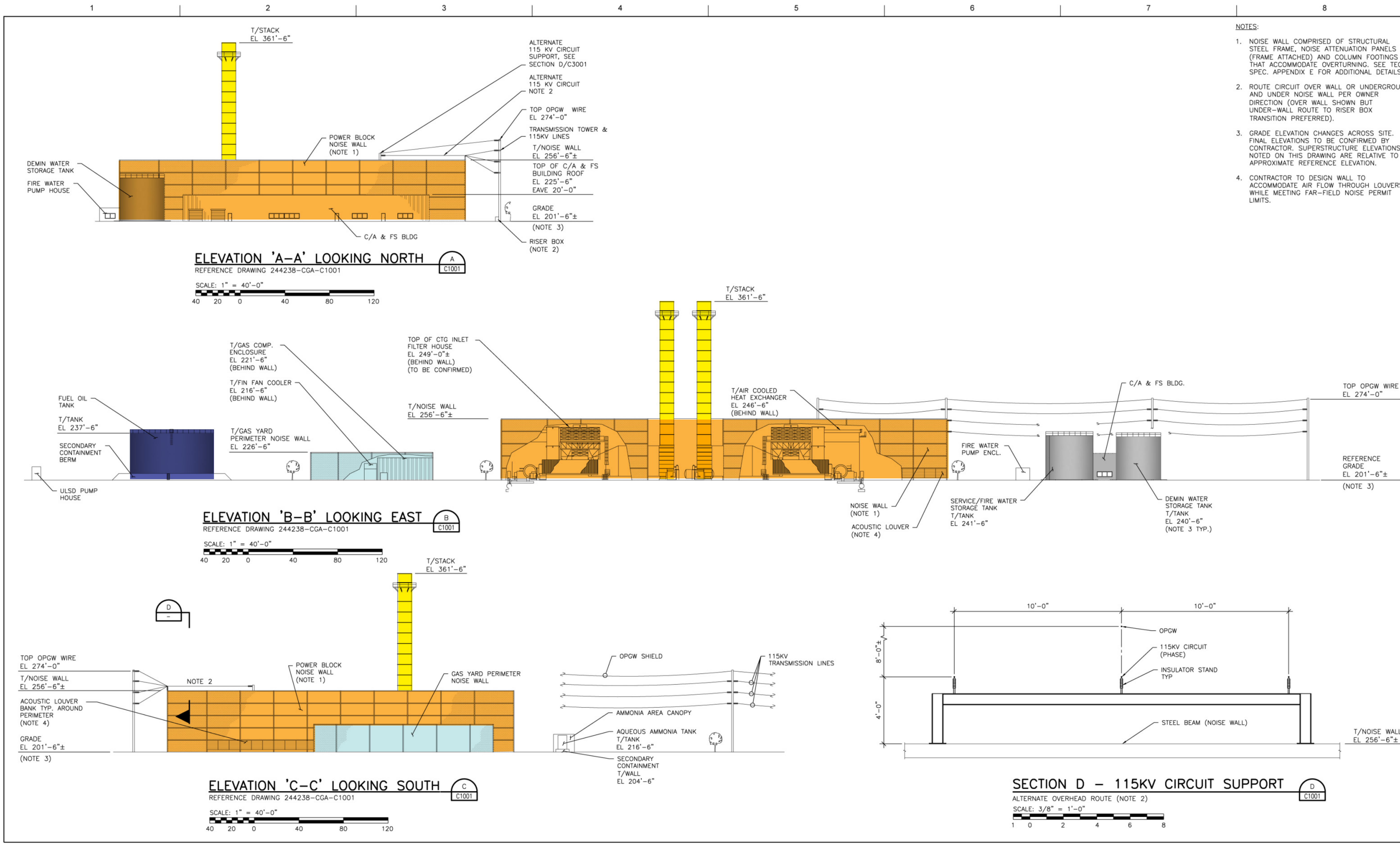
ISSUE	DATE	DESCRIPTION	DRAWN	ENGINEER	CHECKED	APPROVED
L	07/08/15	GENERAL UPDATE – CONTRACT	PVJ	CJH	CJH	CJH
K	06/17/15	GENERAL UPDATE	PVJ	CJH	CJH	CJH
J	05/12/15	GENERAL UPDATE	EDC	CJH	CJH	CJH
H	05/01/15	GENERAL UPDATE	PVJ	CJH	CJH	CJH
G	04/28/15	ADJUSTMENTS FOR SCR MODULE	PVJ	CJH	CJH	CJH
F	04/20/15	CONTINUED ALIGNMENT	PVJ	CJH	CJH	CJH
E	04/03/15	FOR EPC CONTRACT, SPA	PVJ	CJH	CJH	CJH
D	03/16/15	FOR EPC CONTRACT	EDC	CJH	CJH	CJH
C	03/06/15	UPDATED ARRANGEMENT	ELT		CJH	CJH

PRELIMINARY
NOT FOR CONSTRUCTION

Exelon.

EXELON WEST MEDWAY FACILITY
GENERAL ARRANGEMENT
SITE PLAN
2X0 LMS100 SIMPLE CYCLE

FILENAME C1001-0CGA-244238.dwg
SCALE AS INDICATED
SHEET **244238-CGA-C1001**



HDR

ISSUE	DATE	DESCRIPTION	DRAWN	ENGINEER	CHECKED	APPROVED
B	05/12/15	UPDATED FOR EPC CONTRACT	PVJ	CJH	CJH	CJH
A	03/16/15	FOR EPC CONTRACT	EDC	CJH	CJH	CJH

PRELIMINARY
NOT FOR CONSTRUCTION

Exelon

EXELON WEST MEDWAY FACILITY
ELEVATIONS
2X0 LMS100 SIMPLE CYCLE

FILENAME C3000-0CGA-244238.dwg
SCALE AS INDICATED
SHEET **244238-CGA-C3001**

Figure 1-6
Elevation View of Facility

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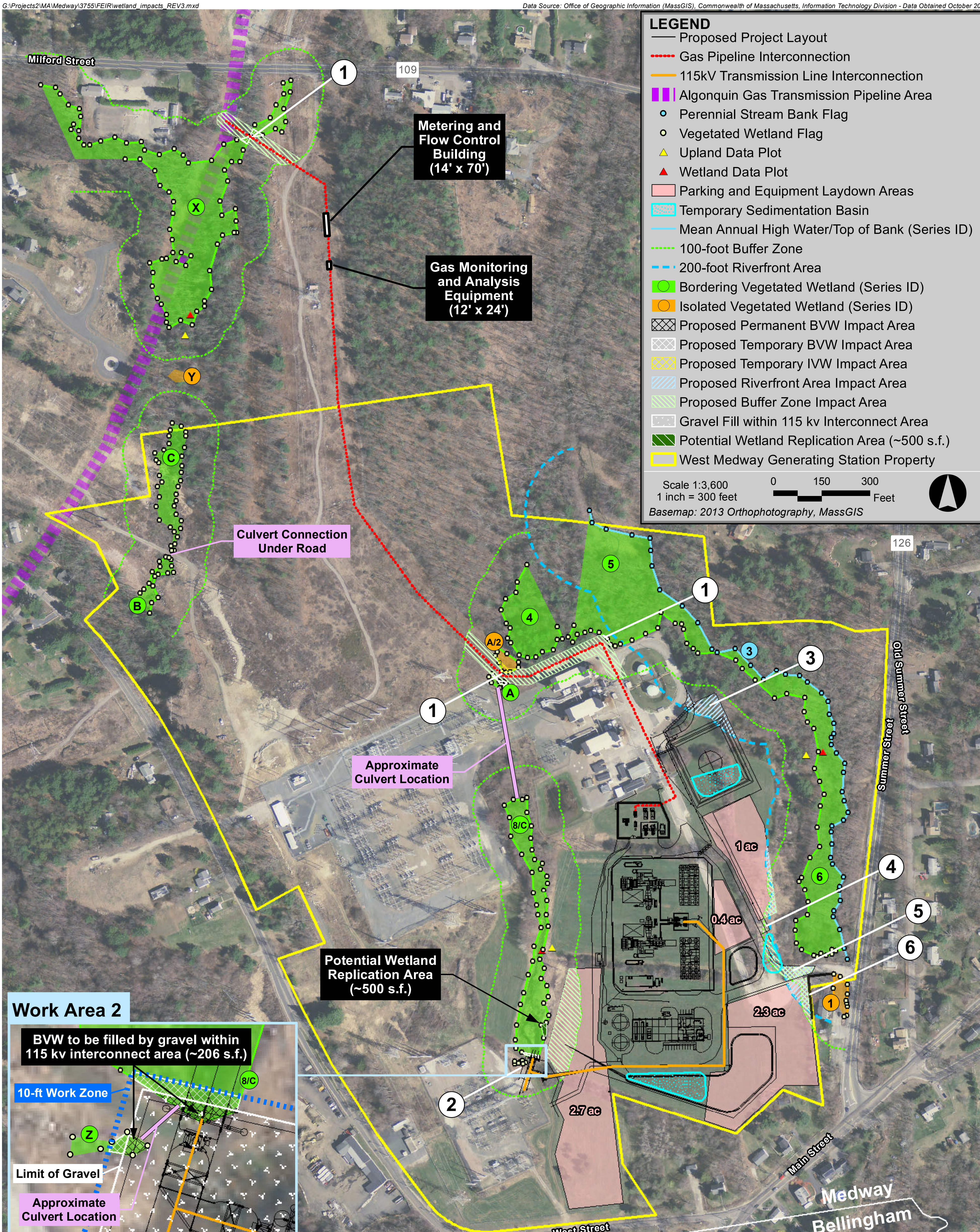
Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014



Proposed Work	Temporary IVW Impact Area (square feet)	Temporary BVW Impact Area (square feet)	Permanent BVW Impact Area (fill) (square feet)	Buffer Zone Impact Area (square feet)	Riverfront Area Impact Area (square feet)
1 Gas Pipeline Interconnection	734	1,241	0	41,530	0
2 115 kV Transmission Line Interconnect, Parking	0	323	206	20,643	0
3 New Roadway (Asphalt), Containment Berm, Fence	0	0	0	0	7,964
4 New Roadway (Asphalt), Fence, Parking	0	0	0	2,981	1,920
5 New Roadway (Asphalt), Equipment Laydown, Temp Basin	0	0	0	8,931	6,867
6 20' L-Shaped Sound Wall	0	0	0	4,377	3,811
TOTAL	734	1,564	206	78,462	20,562

West Medway II **Medway, Massachusetts**

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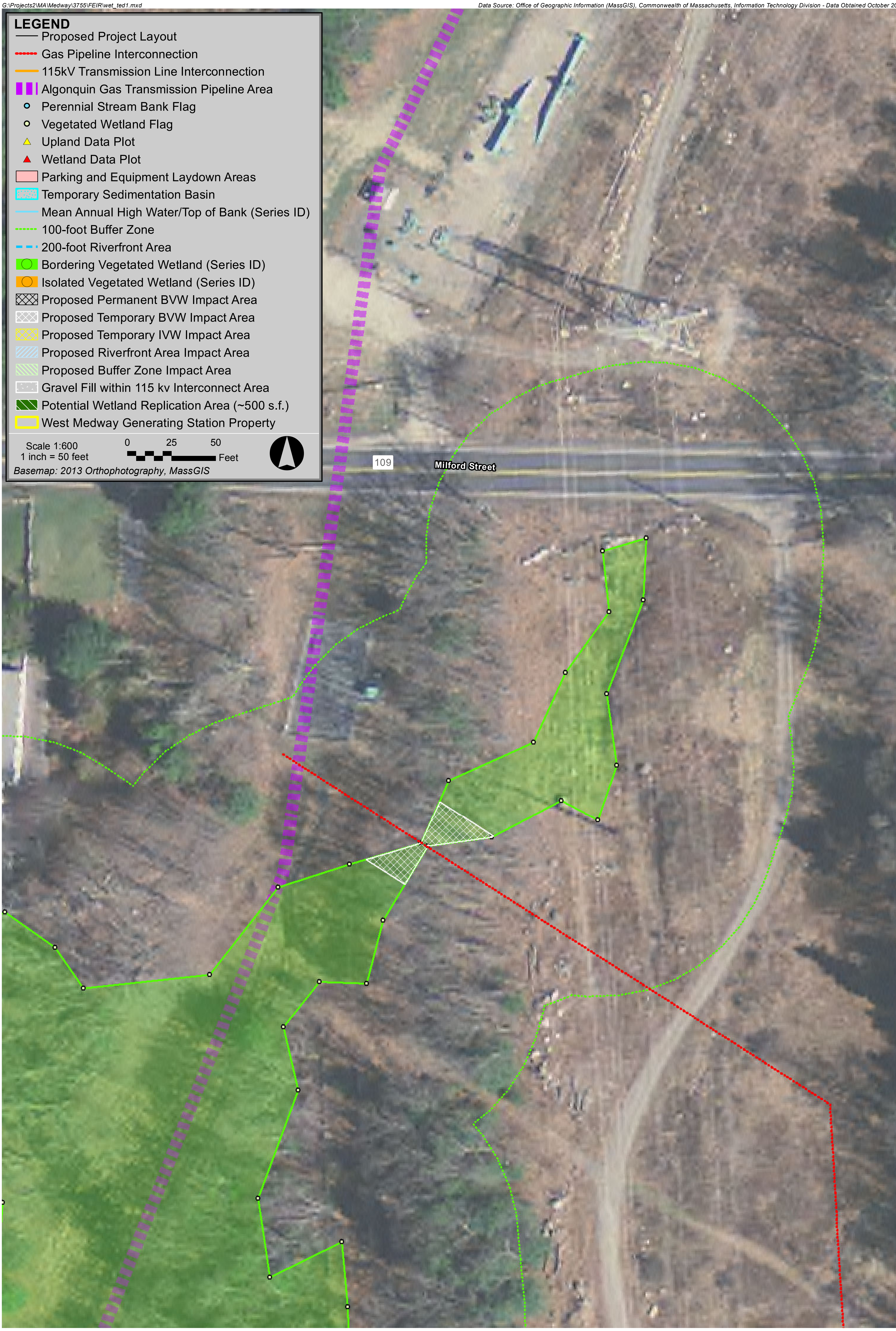
Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014

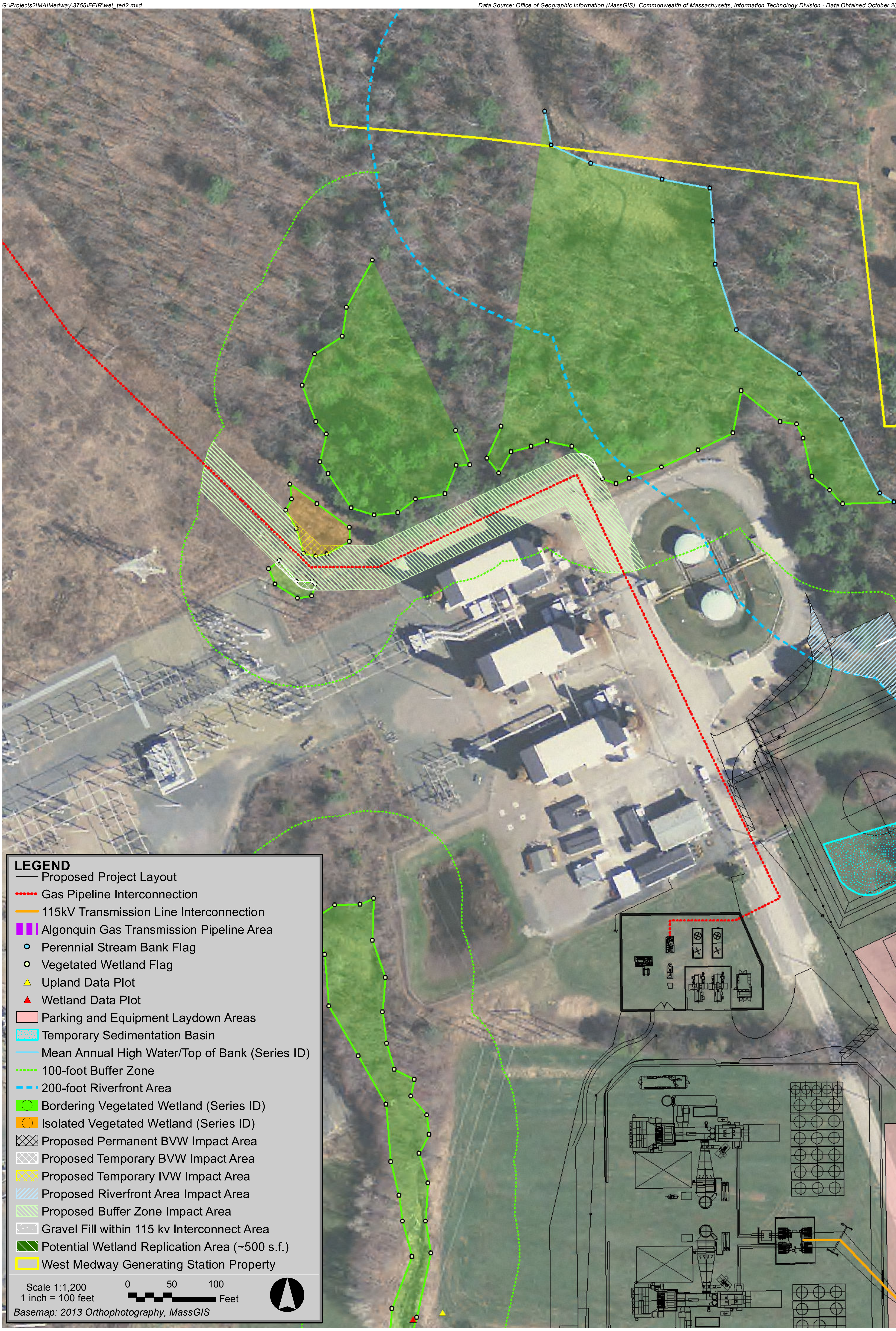


West Medway II Medway, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1-8

Pipeline BVW Crossing Close-Up



West Medway II Medway, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1-9
Pipeline BVW/IVW Avoidance Close-Up

Section 2.0

Project Alternatives

2.0 PROJECT ALTERNATIVES

In accordance with the Secretary's November 13, 2015 Certificate, Section 2.0 of this FEIR provides a further comparison of the No Build scenario, the Proposed Project at Medway and a theoretical 200 MW simple-cycle project at Exelon's Mystic Station in Everett, MA. Baseline site characteristics are repeated from the DEIR as a starting point as is baseline design data for the 200 MW GE LMS100 simple-cycle project.

Section 2.0 also provides a more in depth analysis of the selected simple-cycle combustion turbine technology in comparison to a combined-cycle combustion turbine project. The latter draws on record request information provided to the EFSB.

2.1 Project Concept

As was discussed in the DEIR, Exelon proposes to construct a new, highly efficient, fast-starting 200 MW generating facility. The new generating facility would operate during times of peak energy demand and would run primarily on natural gas, but could also run on ULSD fuel oil, ensuring fuel diversity and reliability. The Project will have a maximum capacity factor of 43% on a three year rolling average, but with the ability to operate up to 60% in any single year. The Project will need to produce electricity when called upon by ISO-NE, and under certain operating circumstances, it is possible that the Proposed Project could be dispatched up to 60% in a given year. However, in accordance with New Source Performance Standards ("NSPS") at 40 CFR 60, Subpart TTTT, the rolling three-year average capacity factor of each turbine will be limited to 43%. Accordingly, if the Project operates at 60% capacity factor for its first full year of service, operations over the next two (2) years would be limited to an average capacity factor of 34.5% (yielding a three-year rolling average of 43%). Use of ULSD will be limited to an equivalent of 30 days/720 hours per year. The Proponent expects the Project will operate on average 10 days per year on ULSD.

The Proposed Project will include the following major components and structures:

- Two (2) simple-cycle GE LMS100 CTGs;
- Pollution control equipment including SCR and carbon monoxide ("CO") oxidation catalyst in modules downstream of each CTG;
- Two (2) exhaust stacks;
- Natural gas compressors;
- Aboveground storage tanks for ULSD, service water, demineralized water and aqueous ammonia, including unloading areas;
- An in-ground wastewater sump (for clean wastewater monitoring and periodic discharge);

- Transformers and 115 kV electrical interconnection facilities;
- Combined building (15,000 square feet) for control room, administrative and facility services, maintenance and warehouse area, water treatment area, and associated systems;
- 450 kW emergency diesel generator;
- 147 kW emergency diesel fire pump engine; and
- Stormwater detention/infiltration pond or other necessary stormwater facilities.

Exelon has selected the GE LMS100 combustion turbine, which is the most efficient simple-cycle technology available, burning less fuel per megawatt hour than any peaking turbine in its size range currently on the market. The GE LMS100 is an intercooled CTG developed from the GE's frame and aeroderivative turbine technologies. The GE LMS100 is based on a combination of proven technologies, derived from the CF6-80E and CF6-80C2 aircraft engines, the predominant engines for the Boeing 747 and 767 wide-body aircraft, and from the frame 6FA combustion turbine. GE CF6-80 engines have more than 100 million operating hours in airline service and GE F technology units have more than eight million operating hours in power generation service. The GE LMS100 can produce up to 109.5 net MW at an ambient temperature of 12 degrees Fahrenheit. The efficient CTG has a gross nominal heat rate of 8,624 BTU/kWh (Higher Heating Value, "HHV") on natural gas at ISO conditions, and can achieve full power within ten (10) minutes from a cold start on either fuel. The GE LMS100 is a "quick-start" machine. The machine can be started and brought to full power (maximum of 109.5 MW net output at an ambient temperature of 12 degrees Fahrenheit) in slightly less than ten (10) minutes. This response time is very useful to the transmission grid owner (Eversource) and operator (ISO-NE). The GE LMS100 can run efficiently and in emissions compliance as low as 25% of its full rated power.

Each GE LMS100 CTG has its associated inlet air filter, intercooler, vent stack for intercooler, air-cooled heat exchangers for the intercooler and lube oil, Selective Catalytic Reduction (SCR) modules complete with ammonia injection skid, oxidation catalyst, and exhaust stack, as well as three-winding main generator step-up transformer, auxiliary transformer, and electrical switchgear. An introductory GE brochure on the LMS100 CTG was provided as Attachment B to the DEIR.

As listed previously, the Project also includes a number of systems and components: a single building housing the control room, a maintenance and warehouse area; a trailer-mounted demineralizer system; an enclosed gas compressor station with adjacent gas yard;

a 1,000,000-gallon aboveground fuel oil (ULSD) tank; a 500,000-gallon service water tank; a 450,000-gallon demineralized water storage tank; 12,000-gallon fully diked and covered aqueous ammonia storage tank; and a perimeter access road.

As proposed in Medway, the Project will provide additional needed capacity to the SEMA/RI load zone in the ISO New England electric grid, to help meet energy demand during peak times. In addition, the Project will enhance the region's overall electric system and support the future of renewable energy in Massachusetts by providing a fast-starting back-up for intermittent renewable energy sources such as solar and wind.

2.2 Medway Site/Property Description

The approximately 13-acre Project Site is located within Exelon's existing 94-acre Property at 9 Summer Street in the Town of Medway. The Project Site is currently vegetated, primarily with grass, with an existing access road extending along the northeastern side of the Project Site. The Project Site is located entirely within the Town's Industrial II zoning district.

The 94-acre Property is located in the West Medway section of the Town of Medway, to the east of Interstate 495 and to the north of the Town of Bellingham. The majority of the 94-acre Exelon Property is also located in the Industrial II zoning district. An unimproved, wooded area on the northeast corner of the Property (to the north of the existing station) is located in the Town's Agriculture/Residential II zoning district. No work is proposed in or near this wooded area.

The Property and existing on-site electrical infrastructure is generally bordered on the north by land abutting Route 109 (Milford Street), on the east by Route 126 (Summer Street), and on the south and west by West Street. Adjacent properties consist predominantly of forest, residential uses, and limited commercial uses. A children's daycare facility is located southeast of and abutting the Property. Several private residences (on West Street and Main Street) directly abut the southern boundary of the Proposed Project, and others (on Summer Street) are situated to the northeast of the existing station, with the nearest residence approximately 400 feet from the existing station's fence line. The Property has been used for power generation since 1970. Prior to 1970, the Property was either used as farmland or was undeveloped.

The existing 135 MW West Medway Generating station is located on approximately five acres of the Property, to the north of the Project Site. The main access road from Summer Street passes through the northeastern portion of the Project Site. The existing station is fully fenced and mostly surfaced with impervious pavement. Major components associated with the existing power generation operations on the Property include: three turbine buildings (each housing a 45 MW electric generator, two combustion turbine sets and two 65-foot tall square-to-round stacks), two 157,000-gallon above-ground fuel oil tanks, a two-story building housing the control room, and a stormwater detention pond.

The existing station is served by town water for potable and fire protection purposes. Sanitary water is discharged via an on-site private septic system and leach field. Outdoor runoff from impervious portions of the 135 MW plant site is channeled to an oil-water separator system and then to the stormwater detention pond. No process water is used by the existing combustion equipment.

Eversource holds an easement on approximately 54 acres of the 94 acre Property, on which it owns and operates transmission and switchyard facilities.[1] The Eversource facilities are located to the southwest and west of the Project Site. The Eversource facilities are designated as Station #446 (containing 345 kV and 230 kV transmission switchyards) and Station #65 (containing a 115 kV switchyard). Station #446 is a component of ISO-New England's Northeastern Massachusetts ("NEMA") load zone, while 115 kV Station #65 serves the SEMA/RI load zone. Each switchyard includes transformers, switchgear, transmission lines/towers and other associated infrastructure dispersed throughout the Eversource easement.

2.2.1 Surficial Geology

The surficial geology of the Project Site has been mapped by the U.S. Geological Survey (USGS) as including glacial till deposits and glacial outwash deposits (see Figure 2-1). Glacial till deposits are generally composed of a random, non-stratified mix of sediments deposited beneath the advancing glacial ice sheet. As a result, they tend to be highly compacted. In contrast, glacial outwash deposits consist of sediment deposited by melt-water running of the retreating or stagnating ice sheet. Such deposits are generally composed of stratified sediments and are often found in valleys and other low areas into which melt water ran. Such "valley fill" deposits are one of the principal sources of groundwater supplies throughout New England. Due to their order of deposition, it is not unusual to find glacial till underlying glacial outwash deposits.

The northern, more upland portion of the Project Site is mapped as glacial till at the surface, while southern portion of the Project Site is mapped as outwash deposits associated with the valley defined by the Charles River and Hopping Brook, south and west of the site, respectively.

Test boring conducted on the Project Site confirmed these surficial geology mappings, with outwash deposits ranging in thickness from 0 to 18 feet from the northern end of the site, to the south end of the Property near West Street. These deposits included both graded sand and silts, as well as rounded pebble to cobble-sized material. Glacial till was encountered

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1 In May 1998, Sithe Energies, Exelon's predecessor, purchased the West Medway Generating Station from Boston Edison Company ("BECo"). At the time of the transfer, BECo reserved an easement on approximately 54 acres of the Property for the ownership, operation, and maintenance of its existing electric transmission infrastructure. BECo's transmission and distribution operations subsequently merged with Commonwealth Electric and Cambridge Electric to form NSTAR Electric in 1999.

at the surface in the northernmost borings, and till or weathered bedrock was encountered beneath all borings. The glacial till was encountered at the surface (below the soil horizon) or below the glacial outwash deposits. The top of the glacial till was encountered at depths ranging from 6 inches to about 18 feet below the ground surface, while bedrock was encountered at depths ranging from 8 to 24 feet below the ground surface.

2.2.2 Bedrock Geology

The glacial outwash and till deposits of the Project Site are underlain by the Milford Granite, a medium to coarse-grained granite (see Figure 2-2).[2] The bedrock outcrops at the surface at the northern end of the Property and is generally found within 10 to 20 feet of the surface within the footprint of the Project Site. There is a relict (inactive) fault located north of the Property, and units of a biotite-hornblende schist are mapped to the north and southeast of the Property, but no such mapped features are identified on or proximate to the site.

2.2.3 Soils

The General Soil Map Units mapped by the U.S. Department of Agriculture Natural Resources Conservation Service ("USDA-NRCS") within the Study Area and the characteristics of the predominant soil associations located within Property are summarized in Table 2-1. The predominant soil association within the footprint of the Project is the Merrimac soil series (see Figure 2-3).

As per Table 2-1, Merrimac soils tend to be deeply developed, somewhat excessively drained soils located on gently sloping or terraced lands. Typically, the underling parent material consists of sands associated with outwash deposits. Of note, Merrimac soils are identified by the USDA as "prime farmland" soils, which are soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and that could be used as cropland, pastureland, or forest land.

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2 US Geological Survey, 1977, Bedrock Geologic Map of the Holliston and Medfield Quadrangles, Middlesex, Norfolk, and Worcester Counties, Massachusetts, R.P. Volckmann, Map I-1053.

Table 2-1 Facility Site Soil Descriptions

Map Unit and No.	Map Unit Name	General Soil Description
Sb (10)	Scarboro and Birdsall Soils	Deep, nearly level, very poorly drained soils in low, flat areas and in depressions on glacial outwash plains and terraces.
WhA (73A)	Whitman fine sandy loam, 0 to 5 % slopes, extremely stony	Extremely stony, very deep, nearly level and gently sloping, very poorly drained soil along drainageways, in depressions, and in low areas or uplands.
ChC (103C)	Charlton-Hollis-Rock outcrop complex, 8 to 15 % slopes	Strongly sloping soils on uplands where the underlying bedrock is near the surface; very deep, well drained Charlton soil is in low pockets. The shallow, somewhat excessively drained Hollis soil is on the tops of hills and ridges near rock outcrops.
MmB (254B)	Merrimac fine sandy loam 3 to 8 % slopes	Very deep, gently sloping, somewhat excessively drained soil in broad areas on plains and on terraces that commonly follow major stream valleys.
CbB/CbC)(422 B/C)	Canton fine sandy loam, 3 to 8 % slopes/8 to 15 % slopes, extremely stony	Very deep, gently sloping, well-drained soil on the sides of upland hills and ridges near plains and terraces
Ua (653)	Udorthents, sandy	Nearly level to steep areas where the original soils have been removed for use as road fill, concrete aggregate, or landfill. The original soils were typically excessively drained to well drained and on glacial outwash plains, terraces, kames and eskers.

2.2.4 Surface Water and Wetlands

The Project Site is located on the hydrologic divide between two tributary streams in the upper reaches of the Charles River watershed. These streams include an unnamed brook that flows southward along the eastern border of the Property, and Hopping Brook located off-site to the south and east. The unnamed stream joins Hopping Brook at a point approximately 400 feet southeast of the southern end of the Property, and approximately 500 feet northwest of the point where Hopping Brook enters the main stem of the Charles River.

The unnamed tributary has a drainage area of approximately 0.65 square miles, while the drainage basin of Hopping Brook at the point of confluence with the unnamed stream is approximately 10.3 square miles. Meanwhile the drainage basin of the Charles River immediately above the point where Hopping Brook discharges to the Charles River is approximately 25.4 square miles.

Flow data for the unnamed stream, Hopping Brook, and the Charles River at the above-referenced points has been obtained for the USGS StreamStats program[3] and/or interpolated from the USGS Water Resource Data Report for Massachusetts and Rhode Island (Water Year 2013).[4] Anticipated stream flow for the referenced stream segments is presented in Table 2-2.

Table 2-2 Estimated Stream Flows (cubic feet per second – cfs)

Waterway	Drainage Area (sq. mi.)	Mean Annual Flow (cfs)	D50[(1)] (cfs)	D99[(1)] (cfs)	7Q10[(2)] (cfs)
Unnamed Stream	0.65	1.1	0.6	>0.01	>.01
Hopping Brook	10.3	17.1	10.3	0.45	0.41
Charles River	25.4	42.2	25.9	1.20	1.09

(1) Flow at or exceeded 50/99 % of time.
(2) 7-day low flow with 10 year recurrence interval.

There are a number of wetland resource areas to the east, north and west of the Project Site. These include Riverfront Area, Bordering Vegetated Wetlands (BVW), Isolated Vegetated Wetlands (IVW), Inland Bank, Land Under Water, and the 100-foot buffer zone thereto. On September 8, 2015, the Medway Conservation Commission issued an Order of Resource Area Delineation ("ORAD") (MassDEP File No.216-0849) confirming the extent of state and locally-regulated wetland resource areas.

Subsequent to the issuance of the ORAD the Medway Conservation Commission Agent identified an additional pocket wetland (~183 sf. ±) located in the vicinity of the previously delineated linear shaped Bordering Vegetated Wetland (BVW) (Flag Series 8/C, "BVW-8/C") situated to the west of the proposed Facility within Eversource's transmission line right-of-way. As requested by the Commission's Agent, this additional BVW was field delineated, surveyed and incorporated onto the current drawing set (see Figure 1-7).

The proposed Medway Project and its ancillary facilities have largely avoided any permanent impacts to these resource areas. An updated wetlands discussion and mapping are provided in Section 7.0 of the FEIR.

3 http://water.usgs.gov/osw/streamstats/massachusetts.html

4 USGS, 2014, Water-resources data for the United States, Water Year 2013, USGS Water-Data Report WDR-US-2013, Sites 01103500 and 01103280.

2.2.5 Ground Water

Depths to groundwater vary throughout the Property, and are dictated by both topography and geology. Test borings completed within the anticipated footprint of the Project Site encountered groundwater at depths of approximately nine feet. Meanwhile, the wetlands and the unnamed stream located within the Property indicate areas where groundwater is at or near the surface.

Groundwater flow in overburden can generally be presumed to mimic the topography. As discussed above, the site straddles a local drainage divide between the unmanned stream to the immediate east, and Hopping Brook to the west and south. Given these conditions, groundwater in the overburden of the Project Site can generally be anticipated to flow in a southerly direction, with a slightly southwesterly orientation on the west side of the Property, and a southeasterly component on the east side of the Property.

The rate of groundwater flow in the overburden of the Project Site is likely variably, reflecting the change in overburden material from glacial till in the northern portion of the Property, to glacial outwash in the southern portion of the Project Site. Generally, groundwater movement is less rapid in the denser, non-stratified glacial tills than the more loosely deposited stratified glacial outwash deposits. It is this ability to both store and transmit water more readily that results in these outwash deposits being one of the primary sources of water supply in New England.

The outwash of the southern portion of the Project Site is associated with a more extensive deposit that extends to the northwest following the Hopping Brook, and to the east following the Charles River. However, due to the relatively shallow depth of the associated outwash deposits, it is not identified as prime aquifer. The closest aquifer mapped by MassGIS currently utilized as a public water supply is located west of the Property in Bellingham.

2.2.6 Land Uses in Vicinity of the Medway Site

As previously noted, the Exelon Property covers approximately 94 acres and is located in the West Medway section of the Town of Medway, to the east of Interstate 495 and to the north of the Town of Bellingham. The Property is generally bordered on the north by land abutting Route 109 (Milford Street), on the east by Route 126 (Summer Street), and on the south and west by West Street. Adjacent properties consist predominantly of forest, residential uses, and limited commercial uses. A children's daycare facility is located southeast of and abutting the property. Several private residences (on West Street and Main Street) directly abut the southern boundary of the Project, and others (on Summer Street) are situated to the northeast of the existing power plant, with the nearest residence approximately 400 feet from the existing plant's fence line.

2.2.7 Historic and Archaeological Resources

The Massachusetts Historical Commission ("MHC") consults with other Commonwealth agencies to take into consideration the effects projects the fund, license, or permit may have on significant historic and archaeological resources. A review of the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory) and the State and National Registers of Historic Places identified no historic or archaeological resources within the Project Site. The Project Site is located in the vicinity of the Caryville/West Medway Area, an area included in the Inventory. In 1998, the MHC reviewed the Environmental Notification Form submitted by Sithe West Medway Development LLC to construct a 540 MW simple-cycle gas fired generation facility on the current Project Site (approved by the EFSB in 2000 but never constructed) and had no comment on that project. The Proposed Project will result in no substantive changes since the 1998 ENF filing that would affect historic and archaeological resources. Therefore, the Project is unlikely to have an impact on historical and archaeological resources.

2.2.8 Rare Species

The Project Site is not located within areas mapped as Priority Habitat of Rare Species and/or Estimated Habitat of Rare Wildlife by the Natural Heritage and Endangered Species Program (NHESP) under the Massachusetts Endangered Species Act and the Massachusetts Wetlands Protection Act, respectively (Natural Heritage Atlas, 2008). There are no mapped potential vernal pools or certified vernal pools within or in the immediate vicinity of the Project Site.

2.3 Mystic Site/Property Description

In this section, the approximately 58-acre area that comprises Exelon's Mystic Station site will be referred to as the Mystic Site, whereas the approximately 4.3-acre footprint that is discussed as an alternative location for the 200 MW Project will be referred to as the Project Site. Distances to off-site locations described as "from the Mystic Site" are measured from the nearest edge of the overall Mystic Site boundary, and "from Project Site" are measured from the approximate center of the Project area, unless otherwise noted.

The Mystic Site, located regionally on Figure 2-4, is located along the north bank of the Mystic River on the southern edge of the City of Everett, MA. The residential areas of the City of Everett are located to the north, with the City of Chelsea to the east/northeast, the City of Somerville to the west and the City of Cambridge to the southwest. The Charlestown neighborhood of the City of Boston is located to the south, just across the Mystic River, with downtown Boston approximately 2 miles to the south.

The Mystic Site has been used for power generation for many decades. Steam electric generating units 1-3 were built in the early 1900s and retired some time ago. The stacks were dismantled but the structures themselves are still in place. Steam electric generating units 4-6, totaling 468 MW, were built in the 1950s and retired in place in 2003. Mystic 7, a 575 MW dual fuel (natural gas, oil) steam electric unit was built in 1975 and remains in operation. Mystic Units 8 and 9 are large combustion turbine combined-cycle units which entered commercial operation in 2003. An essential component of the electrical power supply for the Greater Boston area, Units 8 and 9 are fired primarily with natural gas (via Distrigas) but can also fire ULSD. The Units have a combined capacity of approximately 1,500 MW and are air-cooled. As shown of Figure 2-5, Mystic 8 and 9 occupy the eastern half of the 58 acre site.

As also shown on Figure 2-5, Mystic Unit 7 and ancillary equipment are located in the center of the 58 acre site. Cooling water intake and discharge structures for Unit 7 are located along the Mystic River on the southern border of the site. For perspective, the boiler house for Mystic 7 is on the order of 200 ft. tall and would be the "controlling structure" with respect to a GEP stack height analysis for the new 200 MW project. This would likely result in stacks for the new plant on the order of 250-300 ft in height (as compared to 160 ft for the same plant at Medway).

The northwest corner of the site as well as a strip on land on the western side of the 58 acre site is occupied by active Eversource 345 kV and 115 kV substation/switchyard equipment. Lastly, retired Units 1-6 are located in the southwest quadrant of the 58 acre site. The area occupied by Units 1-6 is approximately 4 and ½ acres and is outlined in red on Figure 2-5. This is the only part of the 58-acre site which is available for a 200 MW simple-cycle generation project. Use of this area would obviously require demolition and removal of Units 1-6 and selected foundations, underground piping and wiring and other ancillary facilities.

Figure 2-6 provides a conceptual layout of a 200 MW simple-cycle Project on the parcel currently occupied by retire Units 1-6. The approximately 4.3-acre footprint is south of operating Unit 7 and just north of the riverbank intake structure. This footprint was developed by CH2M-Hill at an earlier point in the overall Project. As such, some of the supporting structures (ULSD tank, finished water tank) are considerably smaller than those currently included in the Medway site layout. While this layout shows a completed 200 MW plant it does not show areas that would be required for construction parking and laydown. There is very little available/unused space on the 58-acre site, thus construction logistics for a new 200 MW plant would be very challenging.

Again, the Figure 2-6 layout assumes that Units 1-6 are demolished and removed prior to development of the Project. Demolition of these robust masonry structures is a considerable undertaking. For additional perspective, a photo of the Mystic Station is provided as Figure 2-7. Units 1-6, including the three stacks for Units 4-6, are visible on the left (west) side of the photo.

The 58 acre Mystic Site, including the 4.3 acre Project site, is located in an "Industrial District" pursuant to the City of Everett Zoning Map. The site elevation is approximately 10-15 ft. above North American Vertical Datum (NAVD) 88. To the east of the Mystic site is a scrap metal recycling facility, to the north are Rover and Dexter St., and to the west Rte. 99/Alford St. There are also residential areas north of the site, the closest being at the corner of Betty and Robin St., about 350 ft. from the northern property boundary and 1,500 ft. from the center of the Project site. The closest residential area to the south is across the Mystic River in Charlestown on Medford Street, about 2,200 ft. south the center of the Project site. Residents to the east and north are at further distances in Chelsea and Admiral's Hill in Charlestown.

2.4 200 MW Simple-Cycle Peaking Project at Medway

2.4.1 Power Plant

The Proposed Project was fully described in Section 1.0 and 2.0 of the DEIR. Relevant general arrangement, elevation, and construction workspace drawings are repeated in this FEIR for ease of reference (please see Figures 1-5, 1-6, and 3-1).

2.4.2 Electric Transmission System

To interconnect with Eversource, Exelon will construct one (1) approximately 1,200-foot, three-phase 115 kV overhead circuit from a circuit breaker at a GSU transformer to be connected to Eversource's 115 kV SEMA/RI switchyard (Station # 65) to the southeast of the Project. Figure 1-4 shows the location of this interconnection.

Eversource will distribute electric power generated by the Proposed Project through Eversource's existing yard and into its bulk transmission system. At present, it is Exelon's understanding that no off-site changes or upgrades need to be made to the Eversource transmission system to accommodate the Proposed Project.

2.4.3 Schedule and Project Phasing

Construction of the Proposed Project is scheduled to begin in approximately fall of 2016 and continue for a period of 17 months. The Project is required to commence commercial operation no later than June 2018.

2.5 200 MW Simple-Cycle Peaking Project at Mystic (Everett)

2.5.1 Power Plant

The Project will be a simple-cycle power plant utilizing two combustion turbine-generators (CTGs), and ancillary equipment for a nominal total output of approximately 200 MW. The units will burn primarily pipeline natural gas with ultra-low sulfur distillate (ULSD) oil as a back-up fuel supply for up to 30 days/year. The facility could operate at up to a 60% capacity factor (5256 full load hours per year) in a single year, with a three year rolling average capacity factor limit of 43%.

A general layout of the major components is provided on Figure 2-6, which is based on two GE LMS100 turbines as extracted from an earlier CH2M-Hill study. The CTG, SCR housing and stacks will be outdoors. The control room, and office, warehouse and maintenance facilities would be enclosed in a building. As shown on this initial plan, exterior tankage would include a new 300,000 gallon oil storage tank, a 250,000 gallon water tank and an aqueous ammonia tank[5]. A ULSD-fired generator would also be installed for emergency standby purposes.

The primary process design includes use of City of Everett water supply to operate a water injection system for NOx control. The City of Everett is part of the MWRA system. Wastewater would be discharged to the City of Everett sewer system.

Good Engineering Practice (GEP) stack height for the new units would be approximately 500 ft (based on the adjacent Mystic 7 boiler building), but stack height will be determined by atmospheric dispersion modeling balanced with visual impact. It is likely that the stack heights would be on the order of 250 ft, possibly as high as 300 ft. A stack of less than GEP height has been approved by the EFSB and the DEP in several other simple-cycle projects. For example, the approved BELD stack is 100 ft compared to a GEP height of 202 ft for that location.

Water will be obtained from the City of Everett which in turn is supplied by the Massachusetts Water Resources Authority (MWRA) which originates at the Quabbin and Wachusett Reservoirs to the west. Wastewater will be conveyed to the City of Everett sewers which ultimately discharge to the MWRA sewage treatment plant on Deer Island in Boston Harbor to the east.

The Project site currently is served by a number of leaching catch basins, dry wells and trench drains in Drainage Areas designated 2 and 3 in the SWPPP. These are all registered as Underground Injection Control (UIC) Class V wells with the MassDEP Drinking Water Program (DWP). Depending on the extent of demolition activities, the Project would continue to be served by the same stormwater system and/or by discharge to the Mystic River via an update to the Notice of Intent to be covered by the EPA Multi-Sector General Permit for industrial stormwater.

5 Note: Tank sizes would likely be increased per the Medway design

2.5.2 Interconnections

The Project would connect to the existing on site 115 kV or 345 kV switchyard; these switchyards serve the Greater Boston area. The need for related off site transmission and/or station work has not been specifically studied but it is likely to be required. The need for such work would be studied by ISO-NE in concert with connecting transmission owners (Eversource, National Grid). To the extent that jurisdictional work was necessary, an EFBS review would ensue; this review has the potential to impact the overall project schedule. A new 200 MW plant at Mystic would sell into NEMA.

The project would presumably "piggyback" on the existing gas supply for Mystic 7. This would likely require some offsite gas line work as well.

2.5.3 Mystic Permitting Considerations

The area available for construction of a 200 MW plant at Mystic is subject to Chapter 91 jurisdiction and will require a Waterways License. Based on recent precedents (Footprint), it is possible that MassDEP would not agree that the project is water-dependent, thus complicating the licensing process (Chapter 91 variance).

2.5.4 Project Schedule

The need to demolish and remove Units 1-6 is a major work element which would need to be factored into the project construction schedule as would the need to study, design and license any necessary offsite transmission and gas line work.

The construction schedule could also be lengthened by the need to work on a congested operating power plant site.

2.6 No Build Alternative

Under the No-Build Alternative, the proposed 200 MW generating facility would not be constructed and none of its benefits would be realized. The SEMA/RI area would not have power supply which ISO NE has determined to be necessary for acceptable reliability. The region would not have the benefit of 200 MW of fast start, flexible capacity as a complement to a growing supply of intermittent renewable capacity. The Town of Medway would not have the benefit of $75,000,000 in PILOT and HCA revenues over the next twenty years.

Conversely, without the Project, none of the potential impacts as were detailed in Sections 4.0 through 10.0 of the DEIR, and elaborated upon in elements of the FEIR, would be realized. It should be emphasized that the Projects air emissions and noise levels are well within applicable standards; a reflection of the use of clean burning fuels, highly effective air pollution control systems and effective noise mitigation. The Plant location and design is generally consistent with local zoning bylaws, while the wetlands impacts are small and largely temporary.

More specifically, ISO-NE has determined that this new capacity provided by the Proposed Project is necessary to provide needed capacity and ensure electricity reliability in southeast Massachusetts. Medway was selected in the Forward Capacity Auction to meet this reliability need. Without the Proposed Project, that reliability will be in question. If the Proposed Project were not available, ISO-NE could enter into RMR agreements with an existing steam cycle plant such as Canal to provide the necessary capacity. However, use of aging steam electric plants such as Canal or Brayton Point, can be an inefficient and expensive solution to a reliability challenge.

The highly efficient, fast-start, dual fuel generating facility is designed to respond to the electricity supply challenges currently facing New England. As described by Dr. Susan Tierney and Mr. Pavel Darling of The Analysis Group in testimony prepared for the Energy Facilities Siting Board[6], two challenges are particularly relevant to the Proposed Project: (1) assuring the ability of the system to meet electric reliability requirements during winter months; and (2) ensuring that the system includes resources with operational flexibility and responsiveness to support a growing reliance on intermittent and variable energy resources (i.e., wind energy, photo voltaic).

The winter peak reliability challenge arises from the region's relatively high dependence on generating capacity that burns only natural gas. "Gas only" plants represent approximately 30% of 2014/15 (winter capability); the availability of this capacity to generate electricity during winter peak periods depends on having access to delivered gas in any hour when the plants might be needed for operations. The gas delivery system into the region (pipelines and LNG) faces constraints during the winter when pipelines are fully loaded with shipments of gas for firm customers who use it primarily for heating purposes. By virtue of having dual fuel capability (natural gas and ULSD), the Proposed Project will be able to operate when called upon, even on days when the gas supply system stretched to its limit.

With respect to generating resources with the necessary flexibility and responsiveness to support a growing reliance on intermittent and variable resources, the proposed Medway station is exactly the type of new capacity needed on the system. As described in ISO-NE's 2014 Regional Electricity Outlook: "Over the next few years, more than 2,000 MW of renewable energy resources have been proposed to join the New England fleet, helping to fulfill many public policy goals." More wind and solar power creates a need for fast

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6 See Exelon March 2015 EFSB Petition submittal, Appendix F, Pages 17-26

starting, flexible resources that can take up the slack when the wind stops or clouds roll in.[7] The proposed 200 MW Medway generating facility is an ideal and necessary complement to the continued growth of renewables.[8]

As stated above, the "No Build" alternative means that the Proposed Project is not built and thus cannot contribute to solving the important electricity supply challenges described in Dr. Tierney and Mr. Darling's analysis. Furthermore, under the No Build alternative, the Project benefit of reducing overall cumulative CO2 emissions in the New England region by over 226,000 tons for the 2018-2030 time period by displacing older, less efficient electric generating plants would not be realized.

2.7 Comparison: No Build / 200 MW at Medway / 200 MW at Mystic

The DEIR, Section 3.0, presented a qualitative comparison of a 200 MW project at the Medway and Mystic sites based on a series of locational, environmental and community criteria. For the FEIR, this tabular comparison has been expanded to include the "No Build" alternative as well as some land alteration and schedule comparisons. For context, the DEIR Medway versus Mystic discussion is repeated below, with supplements as appropriate.

2.7.1 Locational Criteria

While both the Mystic and West Medway sites are large (West Medway at 94 acres and Everett at 58 acres) and offer sufficient available acreage for development of a new facility. However, a significant demolition effort would be required at Mystic would be required in order to free up space for the new project. In addition, Exelon Generation determined that demolition of portions of Mystic Station potentially may need to be followed by costly remediation efforts. While demolition of Units 1-6 at Mystic would free up enough space for a new 200 MW simple-cycle plant, construction laydown and parking would be a significant challenge. Laydown and construction parking would likely be located off site at a suitable vacant industrial or commercial site. Moving equipment and workers from these location(s) would add to area traffic and increase construction costs.

Both sites are located in Industrial zoning districts, but the areas and uses surrounding the Mystic site are more industrial than those in West Medway. There are more residences located near the West Medway Property than in proximity to the Mystic site.

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[7] For perspective, a typical annual capacity factor for a commercial scale PV installation in New England is approximately 13% {Black, J. (2014). ISO New England PV Energy Forecast Update Distributed Generation Forecast Working Group [PowerPoint slides]. Retrieved from http://www.iso-ne.com/static-assets/documents/2014/09/pv_energy_frcst_update_09152014.pdf}; the corollary figure for monthly median wind capacity in New England is approximately 24% {http://www.eia.gov/todayinenergy/detail.cfm?id=20112}.

[8] From a cold start, the aero derivative GE LMS100 can achieve full power in 10 minutes.

West Medway was viewed as superior to the Mystic site in Everett with respect to transmission. Exelon Generation would be able to sell into both the NEMA and SEMA/RI load zones from West Medway, but could only sell into NEMA from Mystic. As previously noted, it is likely that offsite transmission and/or station upgrades would be needed for the Mystic project; this has schedule and project cost implications.

West Medway also was deemed to be preferable to Mystic with respect to gas supply. At West Medway, Exelon's Proposed Project would be able to be directly interconnected to AGT mainline system. Specifically, AGT's 24-inch and 30-inch mainlines in West Medway offer superior reliability of both supply and pressure. By comparison, Mystic Station is located at the tail end of the interstate gas transmission behind the Eversource city gate. The Mystic location offers Exelon Generation more limited gas supply reliability and would require the sharing of gas infrastructure with the Mystic 7 unit. Expansion of the gas infrastructure in a highly urbanized area like Everett would be costly.

Mystic was considered to be preferable to West Medway with respect to availability of water. While City of Everett water is available at Mystic, at the time sites were being considered, there was some concern that a municipal water supply would not be available in West Medway. However, as described in Section 8.0 of the FEIR, an adequate water supply has since been identified utilizing an on-site well supplemented with water from the Town of Millis municipal system.

Exelon Generation viewed the West Medway and Mystic sites as comparable with respect to "ease of permitting", but the West Medway Project Site was slightly preferred with respect to this particular consideration because a Chapter 91 license would not be necessary.

In sum, while Mystic was preferable to West Medway with respect to water supply, and comparable in terms of other locational criteria, West Medway was considered far superior to Mystic relative to gas supply and reliability, availability and ease of transmission interconnection, and the ability to sell into both the NEMA and SEMA/RI load zones.

Moreover, Medway does not have the demolition and remediation requirements of a project at Mystic. Lastly, Medway has the necessary laydown and construction parking areas immediately adjacent; a project at Mystic would need to use offsite laydown and parking areas.

2.7.2 Environmental Criteria

While the West Medway and Mystic sites were considered comparable for most environmental criteria, West Medway was preferable to Everett with respect to waterways impacts (no Chapter 91 license necessary) and traffic.

2.7.3 Community Criteria

The West Medway Project Site also was considered preferable to the Mystic site with respect to community criteria. While the City of Everett has a significant industrial tax base, West Medway has a very limited number of industrial properties and is seeking to expand its industrial tax base. The Town of Medway Master Plan specifically encourages the development of additional power generation at the Medway site.

While the West Medway and Mystic sites were comparable with respect to support from residents and the importance of project-related jobs to the community, because of Medway's interest in expanding its industrial tax base through development of a generation facility, Exelon determined that the West Medway Project Site was slightly preferable to the Mystic site with respect community criteria.

In sum, both the West Medway Project Site and the Mystic site satisfied Exelon's overall site selection objectives, as well as most, if not all, of its locational, environmental and community criteria. However, based on application of specific locational, environmental and community criteria, the West Medway Project Site was deemed preferable to the Mystic site.

Further, development of a 200 MW project at Mystic is likely to have a significant longer schedule owing to the need for extensive pre-construction demolition, potential Chapter 91 licensing issues and the possible need for offsite transmission and gas pipeline work.

Similarly, the cost of a 200 MW project at Mystic would be significantly higher than West Medway, owing to these factors and the need for offsite laydown and construction parking. The Company preliminarily estimates a cost difference of approximately $30-million more for Mystic site development, which includes higher gas and electrical interconnections cost, labor costs, and demolition of existing structures.

Table 2-3 Alternatives Comparison: No Build, 200 MW at Mystic, 200 MW at Medway

Site Attribute	*"No Build"*	*Everett (Mystic)*	*West Medway*
Meets Project Purpose, FCA #9, 195 MW into SEMA/RI	No	No	Yes
Project can be completed and in commercial operation by June 2018	NA	No	Yes
Property Size	NA	58 acres	94 acres
Exelon Site Control	NA	Yes	Yes

Table 2-3 Alternatives Comparison: No Build, 200 MW at Mystic, 200 MW at Medway (Continued)

Site Attribute	*"No Build"*	*Everett (Mystic)*	*West Medway*
Area available for new plant, and for construction facilities	NA	Less than 5 acres, all of which will be required for permanent plant and access. No adjoining space for temporary construction facilities	15 acres plus; approximately 10 acres will be used for permanent structures, access roads and stormwater detention/recharge
Current use of plant site	NA	Major power plant infrastructure, retired in place	Primarily open field, some hedge rows, access to existing facilities
Massachusetts Land Use Designations and/or Protections	NA	Designated Port Area (DPA); Tidelands (Chapter 91 Jurisdiction): coastal wetlands resource area	Inland wetlands resource areas
Local Zoning	NA	Industrial, surrounding area a mix of residential and industrial	Industrial II, surrounding area mostly residential
Extent of Demolition and available site area	NA	The construction of a new generating facility at the Mystic site would require demolition of Mystic Units 1 through 6 and associated infrastructure. This is a significant demolition effort (cost, time, potential remediation issues)	No demolition required, ample site area available
Potential Site Remediation Issues	NA	Given historic industrial use of property for electric generation, potential site contamination issues were identified as a concern. (The Everett site is listed as a "disposal site" by MassDEP)	No site contamination issues in construction area
Interconnections	NA	Potential gas limitations, 115 and 345 kV electric transmission onsite, offsite improvements TBD	On interstate gas mainline, reliable supply and pressure, two electric transmission switchyards onsite (115 and 345 kV), no offsite work required

Table 2-3 Alternatives Comparison: No Build, 200 MW at Mystic, 200 MW at Medway (Continued)

Site Attribute	*"No Build"*	*Everett (Mystic)*	*West Medway*
Selling Markets	NA	NEMA only	SEMA/RI and NEMA
Community Criteria	No project, hence no potential for community benefits	Everett has significant existing industrial tax base	Medway seeking to expand industrial tax base; project consistent with Master Plan
Air Quality	No direct project emissions, but no opportunity to supplant older less efficient plants	Cleanest possible fossil fuels, highly effective Air Pollution Control systems, 250 ft + stacks…similar plant ground level contributions to Medway	Cleanest possible fossil fuels, highly effective Air Pollution Control systems, 16o ft stacks
Demographics, Environmental Justice	NA	Extensive EJ population in plant area; ~1,100,000 people within 10 km radius	Limited EJ populations in plant area, ~128,000 people within 10 km radius
Water	No water use	Ample water from City of Everett via MWRA (surface water supplies in Central MA)	Concern with availability of water from Town of Medway at time of site selection
Noise	No project noise	Higher background, greater distances to nearest residences, likely less noise mitigation required	Comprehensive mitigation
Transportation	No project related traffic	Proximity to I-93 but in a congested urban area	Proximity to I-495, two state highways to site; traffic manageable
Licensing and Permitting	NA	Chapter 91 License required; possible need for Variance Potential need for separate EFSB review of off-site transmission and gas pipeline improvements	No Chapter 91 jurisdiction; standard licensing process

2.8 Pipeline Route Alternatives

The existing AGT main runs in a generally southwesterly to northeasterly direction, passing within a short distance from the northwest corner of Exelon's Medway Property. The ENF outlined potential gas pipeline interconnection options; the DEIR presented a preferred route and an alternative route for a pipeline interconnection with the Spectra/AGT interstate main.

2.8.1 Natural Gas Pipeline

Natural gas for the Project will be delivered via an interconnection to the Spectra/Algonquin Gas Transmission Company (AGT) pipeline. The remnants of a decommissioned natural gas feed line, originally maintained by Bay State / Columbia Gas, extend from the northwest fence line of the existing power plant to Route 109 and is abandoned. A new gas interconnection system will be designed, permitted and constructed by Exelon. A preferred route can be found on Figure 1-4.

The proposed gas interconnection route starts at the off-site Spectra/AGT meter station at an existing ROW northwest of the Summer Street Site near Route 109. This tap location was preferred by Spectra; the alternative route tap location further to the south was in proximity to residences. This proposed route generally travels southeast from the meter station for about 400 feet, then due south for about 1,000 feet, then turns southeast for about 750 feet, and turns east along the existing fence line/edge of pavement for about 300 feet before heading south along the existing site roadway to meet the new natural gas yard. The total length of the preferred route (300-750 psig, 12-inch diameter underground pipe) is approximately 3,080 feet.

The conceptual design of the gas pipeline interconnection includes the following components:

- Dual 6″ Ultrasonic Meter Runs in Meter Facility (with the ability to be expanded to 8″ Ultrasonic Meter Runs in the future);
- Gas Chromatograph located in Meter Facility Building;
- Separate, Single Room EGM Building to Spectra Standards;
- Dual Pipeline Hot Taps off of the AGT Main Line and L30B Pipelines; and
- 12-inch, 2,200-foot Pipeline Lateral from the Meter Facility to the Power Plant.

The maximum operating pressure of the lateral will be the same as the AGT main pipeline, approximately 750 psig. The typical operating pressure of the AGT main line ranges from 450 to 620 psi. The Proponent is proposing to tap into both AGT's main line and the 30-inch loop lines that are contained within the same right-of-way. The typical operating pressure of the 30-inch loop lines is 600-740 psi. Due to the tap into both the main and 30-inch loop lines, the Proponent would expect the normal operating pressure range of the proposed lateral to be 450-740 psi.

The Proponent anticipates that it will construct two buildings to support the gas interconnection. The first will be approximately 14 feet wide by 70 feet in length, and will contain flow control and metering equipment. The second, smaller building will be approximately 12 feet wide by 24 feet in length and will contain gas monitoring and analysis equipment including a gas chromatograph. The location of the proposed gas metering and monitoring buildings is approximately 500-600 feet from the closest residence. The Proponent is proposing passive flow control valves in the flow control and metering building, which will remain normally open. As such, there will be no pressure cut, which means that noise levels will be at or below ambient conditions.

As described further in Section 7.0, there will be approximately 1,975 square feet of temporary impacts to Bordering Vegetated Wetland (BVW) and Isolated Vegetated Wetland (IVW) associated with construction of the gas pipeline. These temporary BVW/IVW impacts are conservatively based on an approximately 50-foot-wide workspace corridor centered over the pipeline. The final BVW impacts will be refined through the Notice of Intent process.

The gas pipeline interconnection will be constructed in existing natural gas and transmission rights of way, and as such, limited vegetation removal will be required to support construction. Since the gas pipeline interconnection will be constructed in existing natural gas and transmission rights of way, the Proponent expects that restoration work post-construction will be minimal and consist mainly of replanting disturbed areas.

Since the submittal of the DEIR, the Project team has continued to evaluate and refine the potential interconnection route. The preferred route minimizes wetlands impacts while connecting at the location strongly preferred by Spectra, and it also avoids private landowners' property by utilizing existing utility rights-of-way. The total length of the preferred route (300-750 psig, 12-inch diameter underground pipe) is approximately 3,080 feet.

The Preferred Route was selected for the following reasons:

- It avoids private landowners' property by utilizing existing utility rights-of-way;
- It connects to the Spectra line at a location adjacent to the existing gate station, south of Route 109;
- It avoids/minimizes wetlands impacts; and
- It avoids existing infrastructure on-site where feasible (e.g., existing transmission lines, underground piping, fuel oil lines).

2.9 Technology Alternatives

The Secretary's November 13, 2015 Certificate indicted that the FEIR should discuss the selection of a simple-cycle turbine in comparison to a more efficient "flex" or combined-cycle turbine. In this context, "Flex" refers to a combined-cycle unit offered by Siemens.[9] As discussed in the DOER comment letter on the DEIR, this combined-cycle unit can operate in simple-cycle mode when necessary. A discussion of the proposed simple-cycle technology in comparison to combined-cycle technology was provided in Section 3.0 of the DEIR (see pages 3-15 and 3-16).

As was discussed in the DEIR, Exelon selected the GE LMS100, the most efficient simple-cycle combustion turbine available, for the Medway project. The GE LMS100 has the fast start, fast ramp, dual fuel capabilities necessary for this Project coupled with a strong operating track record. As of March 2015, there were 51 GE LMS100 units in commercial operation worldwide (35 in the US). While Exelon is confident that the GE LMS100 simple-cycle combustion turbine is the right technology for Medway, the Project team has developed a further discussion of the feasibility of installing a combined-cycle plant at Medway (see FEIR Section 5.0, as well).

The permanent land area required for a typical 2x1 dual-fuel, air-cooled, combined-cycle plant is approximately 2 to 6 acres greater than that for the proposed 2x0 West Medway facility. This land is necessary to locate additional equipment required for a combined-cycle power plant but also to meet access and setback requirements for long term operation and maintenance of the facility. The Company does not believe it would be possible to site the power block and ancillary equipment associated with either a 2x2x1 combined-cycle facility or two Siemens Flex 10 Plants on the existing West Medway site without additional impact to environmentally sensitive areas (such as wetlands or the riverfront area), without encroaching much closer to existing residential properties, or to enable far-field noise restrictions to be met. Figure 3-2 shows that there are, at most, two additional acres theoretically "available" to be developed in the area of the Proposed Project, two laydown areas of 0.7 and 1.3 acres on the east side of the site. However, these are closer to residential areas, and substitute laydown areas would need to be identified. For other laydown areas on-site, such as further to the north, wetland crossings would be needed for an access road. The 1.4-acre construction parking area to the south is not available for permanent site features as it is an easement to Eversource that does not allow for permanent features. In addition, the increase in land area described above does not take into account a larger stormwater infiltration basin that would be required, a larger operations and maintenance building that would be needed for a larger onsite staff, nor a warehouse building which would be required for the materials necessary for a more complex

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[9] As has been discussed with MEPA, DOER and DEP representatives, the Siemens Flex unit does not have sufficient US operating history for Exelon to realistically consider such a unit for a project which is receiving capacity payments and which must be available when called upon by ISO NE.

combined-cycle operation. When these additional factors are considered, it is clear that neither a 2x2x1 combined-cycle plant nor two Siemens Flex 10 Plants could be reasonably sited at Exelon's existing West Medway site with the land currently available for development.[10]

It is important to note that with respect to water usage for power generation, the rates of water usage are not well defined in publically available information and vary dramatically by site location, raw water source, and treatment requirements. As a result, a wet-cooled combined-cycle could require up to 2,000 to 3,000 gallons per minute of water in warmer weather on a sustained basis. Based on the Company's efforts to source water for the existing Project with a much smaller water demand (an average of 36 gpm based on expected operations, 124 gpm based on peak day, ULSD firing), such a large supply of water is not available. Accordingly, any combined-cycle installation would need to be air-cooled requiring the installation of a large air-cooled condensers (ACC). A dual fuel 2x1 air-cooled Siemens 5000F requires approximately 25 to 80 gallons per minute of water to support operations. This estimate does not take into account advanced water treatment, such as reverse osmosis, which is typically required for combined-cycle operations. If this technology were necessary, there is a fair amount of reject water generated that is not suitable for use in the steam cycle of the power plant which could further increase water consumption rates. Additionally, in typical summer conditions, the water demand for a 2x1 dual fuel air-cooled combined-cycle would be at the upper end of the range cited above. With respect to the Siemens Flex 10 power plant, the Company was unable to locate water usage information online for either a natural gas or a dual fuel installation and as such water consumption rates for this technology are not available.

With respect to noise, the Company believes that it is highly unlikely that either a 2x1 dual fuel air-cooled combined-cycle or two Siemens Flex 10 Plants could be sited and comply with MassDEP noise policy limiting increases of noise to 10 dB above background during both the day and night. This is due to the addition of large ACCs which require elevated fans contributing additional noise) that would be needed as a heat sink for the steam turbine, heat recovery steam generators, additional generator step up transformers, and the addition of the steam turbine itself. Further, the installation of a larger facility than is currently proposed would likely lead to a significant increase in the height of the noise wall surrounding the facility (or a much larger building) which would increase the height requirements of the stacks and increase visual impacts at neighboring properties and beyond, while still, even with these measures, unlikely to comply with MassDEP noise policy.

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10 As noted elsewhere, much of the 94 acre Exelon property is already in use, including 5 acres for the existing 135 MW power plant and 54 acres in Eversource easements (switchyards, transmission lines)

The GE LMS100 CTG is best suited for simple-cycle operation, but such unit(s) could be placed into a combined-cycle configuration (two international plants exist). Net output for 2x2x1 and 1x1x1 LMS100-based combined-cycles (two-pressure non-reheat) at ISO conditions are nominally 254 MW and 127 MW, respectively. Outputs with ULSD firing and air-cooling are somewhat lower. The ability to fit a 2x2x1 dual fuel air-cooled LMS100-based configuration on the West Medway site is not possible without increased impacts to environmentally sensitive receptors as described above for other 2x2x1 configurations and it is even less likely that a 2x2x1 dual fuel air-cooled GE LMS100 combined-cycle configuration could comply with MassDEP noise policy due to the installation of additional equipment.

Based on discussions with General Electric in 2015, there are only two LMS100 CTGs of fifty-one total units in commercial operation that were installed in a combined-cycle configuration (none are in the United States). The low exhaust gas temperature from the GE LMS100 compared to other CTGs results in improved simple-cycle efficiency and other LMS100 benefits. This low exhaust gas temperature does not lend itself very well to a combined-cycle configuration. The GE LMS100 unit itself is already a fast-starting and ramping CTG and is "flexible" in terms of meeting fast-start, peak power, and load-following (renewables integration) configurations.

With respect given to all configurations addressed above, none meet the stated Project objectives to provide:

- 200 MW of fast starting generation to ISO-NE,
- Provide the ability to ramp across a wide load range (25-100% load),
- Perform unlimited starts and stops with no maintenance penalties

Further, the ability of these configurations to achieve compliance with MassDEP noise policy and reduce water consumption compared to Exelon's current proposal is highly unlikely. As such, the Company believes that the GE LMS100 in a simple-cycle configuration is the appropriate technology to meet not only all stated Project objectives but to comply with all Massachusetts environmental regulations and policies, and to do so at the lowest possible cost.

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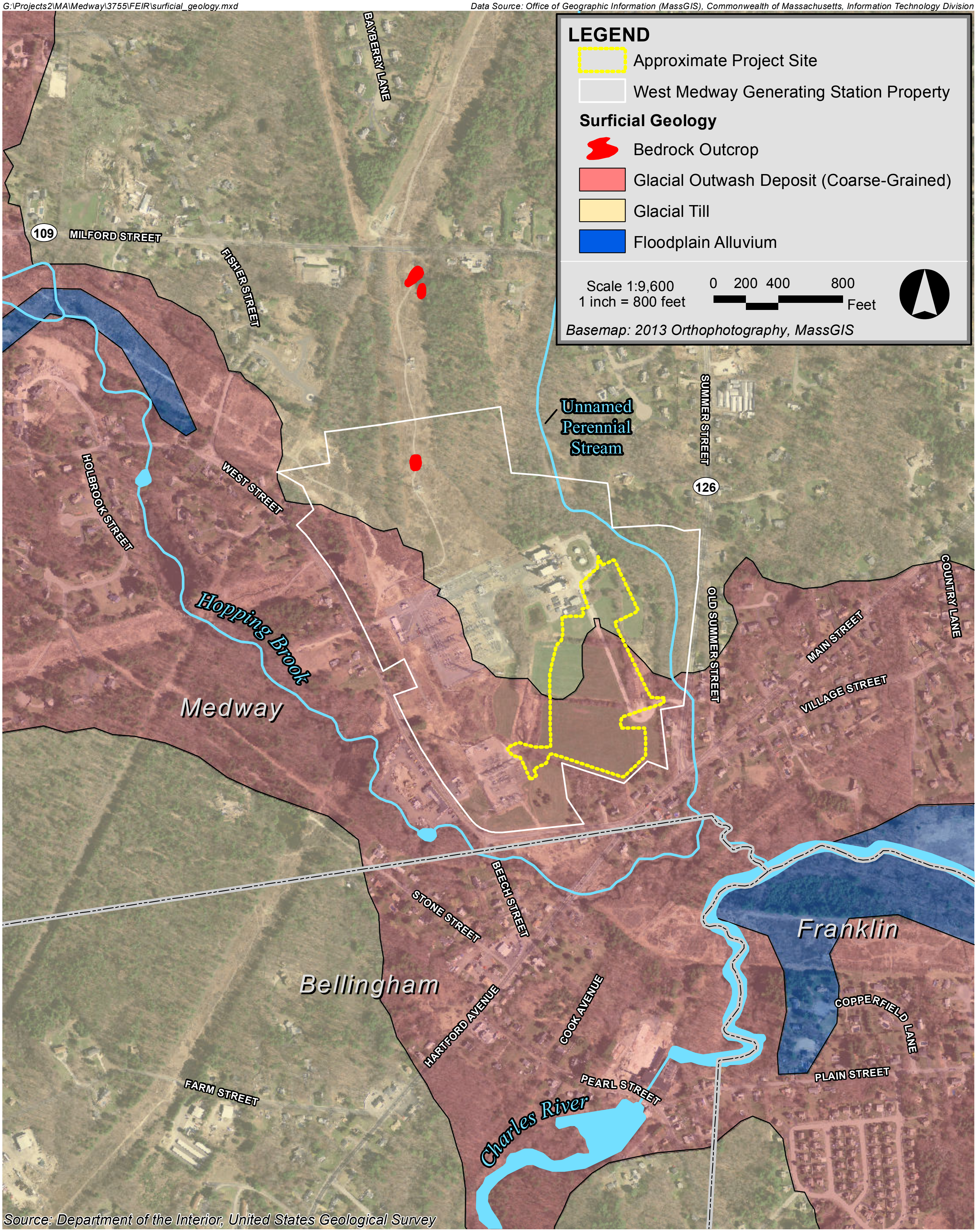
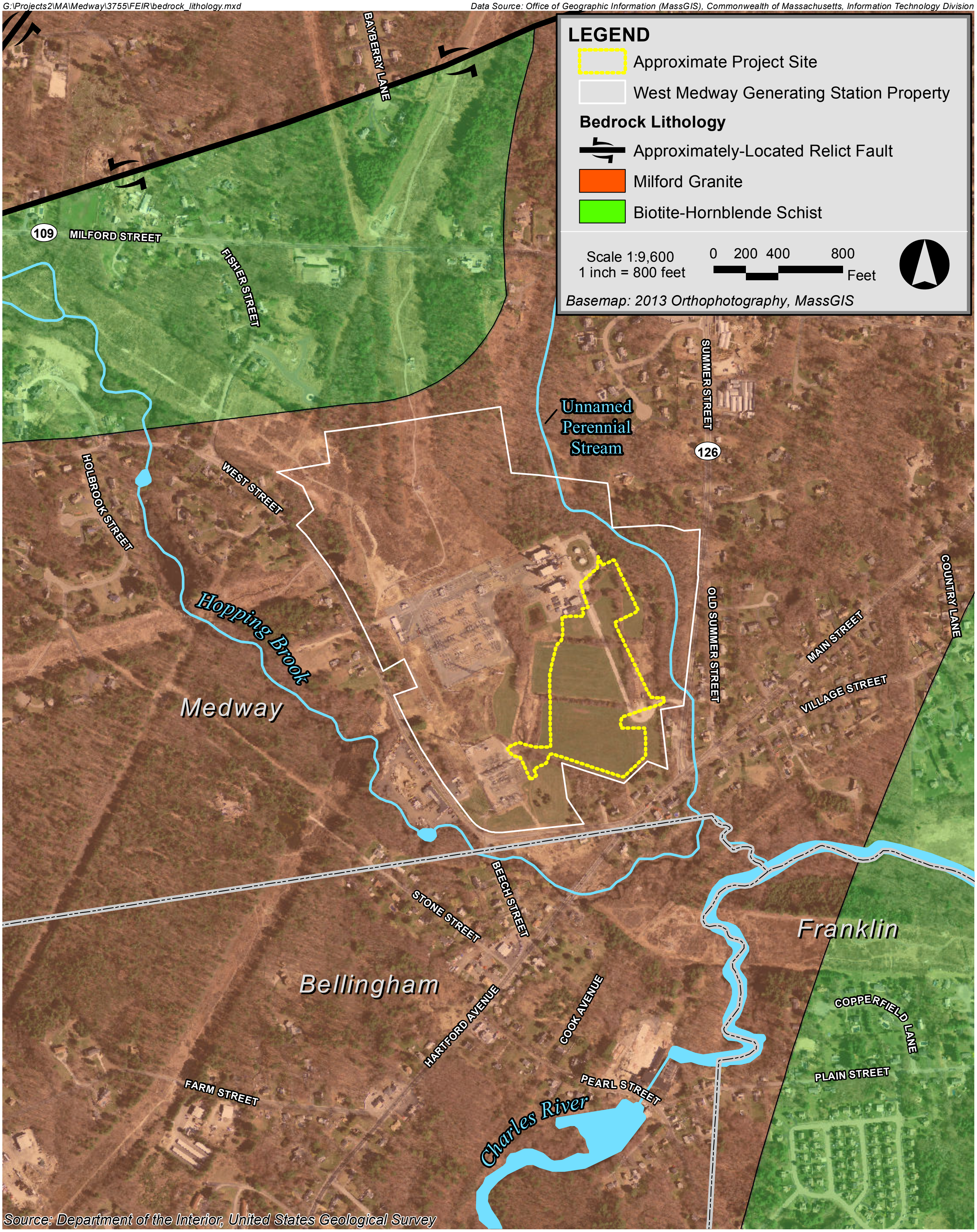
Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



West Medway II **Medway, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 2-1
Surficial Geology



West Medway II **Medway, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 2-2
Bedrock Lithology

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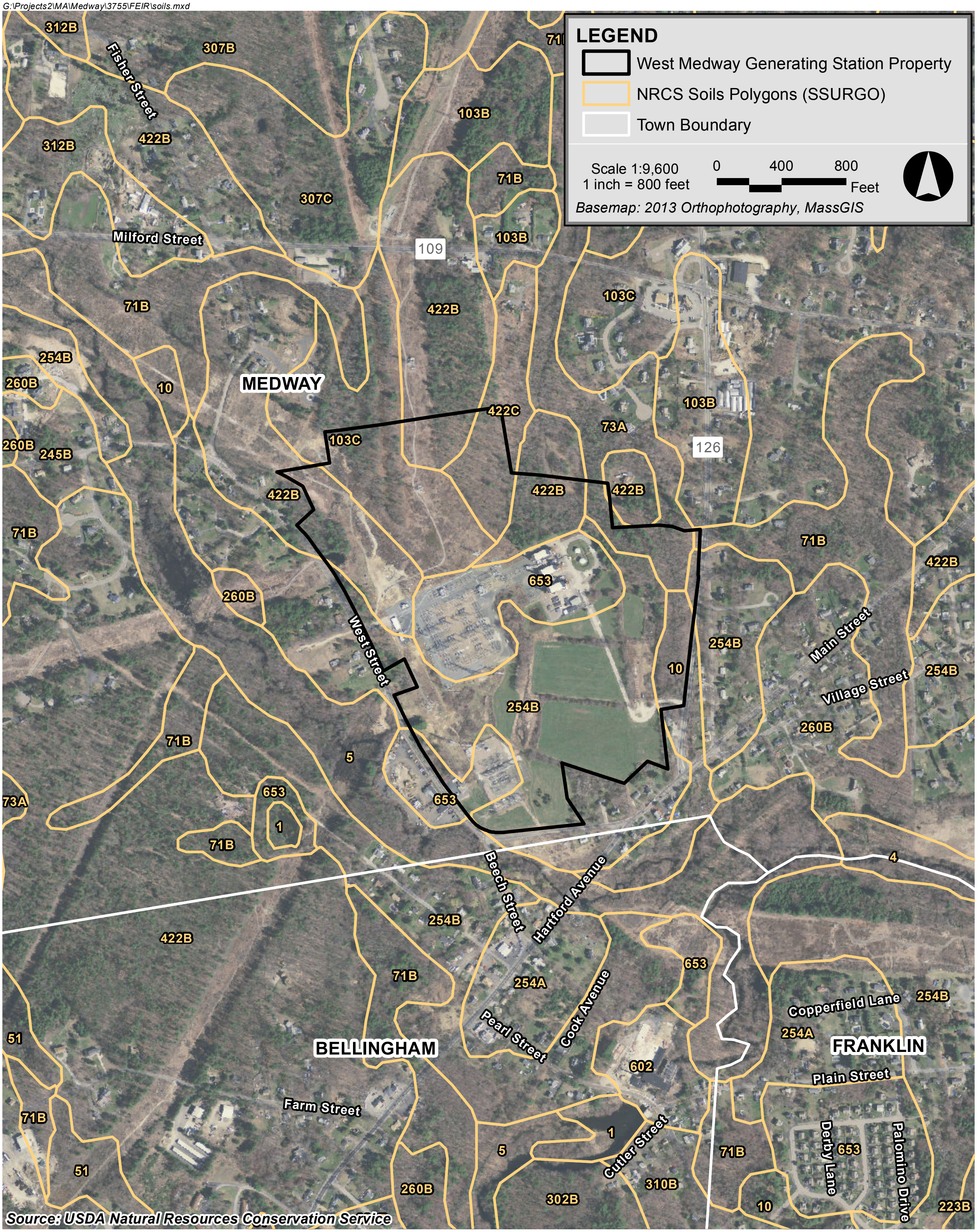

West Medway II **Medway, Massachusetts**

Epsilon
ASSOCIATES INC.

Figure 2-3
Soils Map

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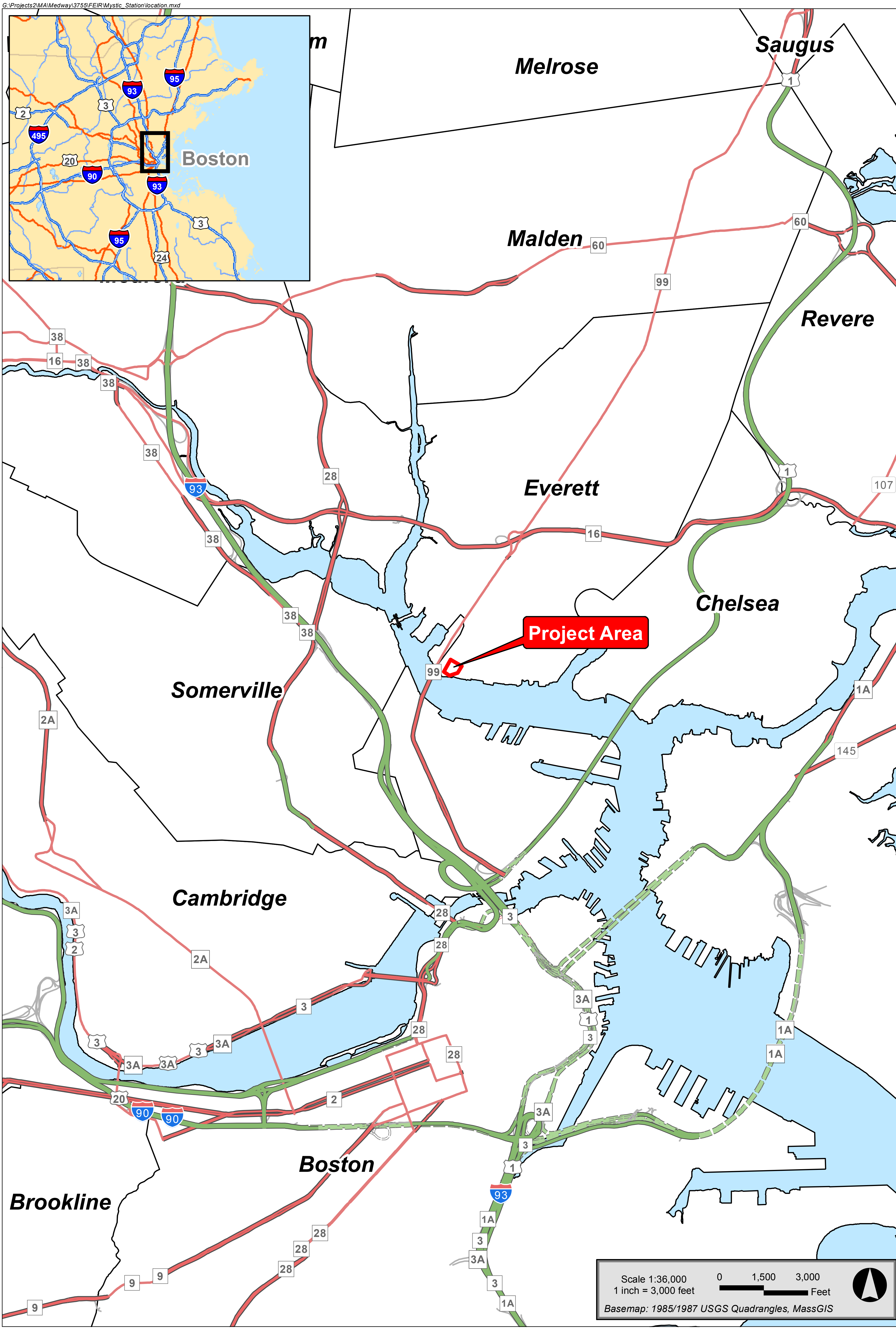

Figure 2-4
Mystic Site Location, Exelon NEMA 200 MW Peaking Plant – Mystic Station, Everett, MA

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Epsilon ASSOCIATES INC.

Figure 2-5

Mystic Site and Vicinity, Exelon NEMA 200 MW Peaking Plant – Mystic Station, Everett, MA

NO.	DATE	REVISION	BY	CHK
P1	04/17/13	ISSUED FOR INFORMATION	SR	TT

RESPONSIBLE ENGINEER

PE #

REVISION APPROVAL		REV P1	DATE 4/17/13
DISCIPLINE	REVIEWED	DISCIPLINE	REVIEWED
CIVIL		ELECTRICAL	
STRUCTURAL		INST & CNTRL	
MECHANICAL		ARCHITECTURAL	
PROCESS		PLANT LAYOUTS	
PIPING			

STATUS					
ISSUED	REV	DATE	DM	SDE	PEM
PRELIMINARY	P1	04/17/13			
FOR REVIEW AND APPROVAL					
APPROVED FOR CONSTRUCTION					
REVISED & APPROVED FOR CONSTRUCTION					

SCALE 1″= 40′-0″

EXELON POWER
MYSTIC GENERATING STATION
CHARLESTOWN, MASSACHUSETTS
PROJECT NO. 473357

CH2MHILL
CH2MHILL Engineers, Inc.

GENERAL ARRANGEMENT
LMS 100 SIMPLE CYCLE EQUIPMENT LAYOUT

DWG. NO. G-SK001 REV. P1

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1″

FILENAME: PLOT DATE:

Figure 2-6
Preliminary Mystic Site Layout, Exelon NEMA 200 MW Peaking Plant – Mystic Station, Everett, MA

Source: Energy Tariff Experts, LLC

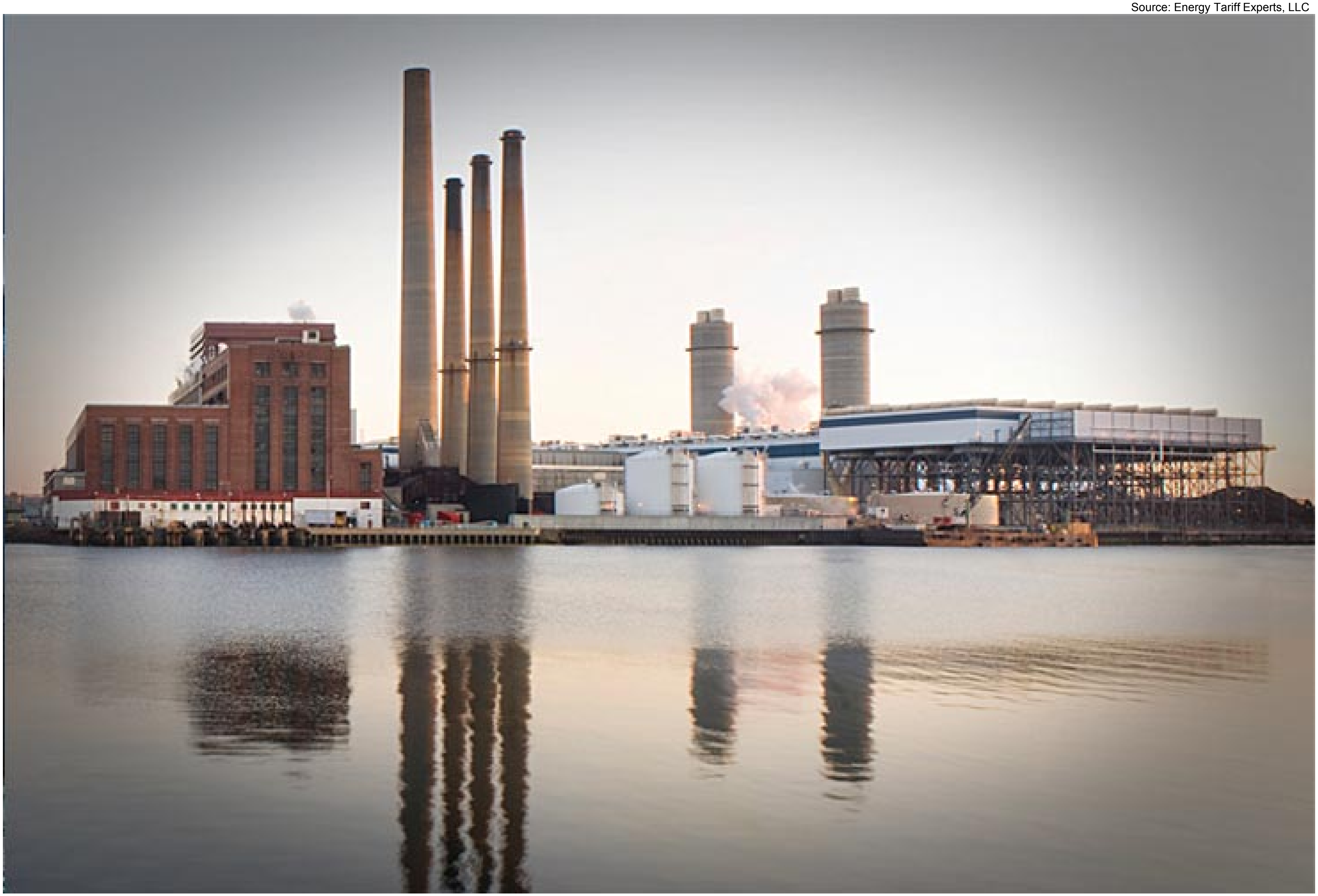


Figure 2-7

Existing Mystic Station, Exelon NEMA 200 MW Peaking Plant – Mystic Station, Everett, MA

Section 3.0

Land Alteration

3.0 LAND ALTERATION

3.1 Site Area and Land Alteration

As was described in the Section 1.3 of the DEIR, a series of design and layout refinements resulted in an increase in the 10-acre permanent site area noted in the ENF. The primary change was inclusion of the stormwater retention basins. As reported in the DEIR, the permanent Project facilities (including the stormwater system), as well as elements of the construction laydown and construction parking areas, were located within an approximately 13-acre fenced area (see DEIR Figure 1-5, fenced site area is shown with a blue line).

The DEIR also included Figure 11-2, Construction Laydown and Parking Areas. Using the Project General Arrangement drawing as a base, this figure located and sized four temporary construction laydown and construction parking areas. Portions of the 0.9-acre construction trailer/admin parking area, the 2.5-acre equipment laydown area and the primary 1.7-acre craft parking and laydown area were outside the fence line used to demarcate the 13-acre Project Site as shown in the DEIR. For ease of reference DEIR Figure 11-2 is reproduced as FEIR Figure 3-1.

As planning and design efforts for the Project have continued to progress, the fence line has been adjusted to fully incorporate the 0.9-acre construction stage office trailer/admin parking area on the east side of the site and the 2.5-acre equipment laydown area, also on the east side of the site. A few other minor fence line adjustments were made to avoid mapped Riverfront Area on the northeast corner of the oil tank dike and to maintain appropriate clearances around certain permanent facilities such as the gas compressor. As a result, the fenced site area has increased from approximately 13 acres to approximately 15 acres (see Figure 3-2). The 1.4-acre craft labor parking area on the south side of the site remains outside the fenced area.

Importantly, the area occupied by permanent plant and stormwater facilities has not changed, nor has the total area designated for temporary construction laydown and parking. In total, the permanent plant facilities, and the associated stormwater system occupy approximately 13 acres. The temporary construction laydown and parking areas beyond the permanent facilities/stormwater system account for an additional approximately 3.5 acres.

Once construction has been completed, the approximately 3.5 acres of temporary laydown and parking will be restored to grassed fields. The craft employee parking area on the south side of the site will have been surfaced with crushed stone. When construction is complete, the crushed stone will be removed and a grass field restored.

Once construction is finished, the 15-acre area inside the fenceline will be a mix of paved roadways and other impervious surfaces (buildings/enclosures, containment areas), yard areas finished with crushed stone, vegetated stormwater bioretention and detention areas, and a variety of perimeter spaces. The perimeter spaces are largely at the periphery of the fenced area and will generally be vegetated.

The acreages used in this discussion are GIS level takeoffs from current layout drawings.

3.2 Impervious Surfaces

As was reported in the DEIR, ongoing engineering and design work resulted in a reduction in planned impervious surface. The conservatively estimated seven (7) acres of impervious surface noted in the ENF has now been reduced to 4.3 acres. This is a result of a decision to finish the main plant yard area (i.e., the area enclosed by the proposed sound wall) in pervious crushed stone as opposed to the originally assumed impervious paving. As a result of this change, the Project no longer exceeds the impervious surface trigger for a mandatory EIR.

The current 4.3 acres of impervious surface includes the following:

- The footprint of principal equipment enclosures (the two GE LMS100 combustion turbines and associated air pollution control equipment, within the sound wall, the gas compressor enclosure, etc.);
- The footprint of the gas compressor enclosure;
- The footprint of the main step-up transformer and its underlying containment structure;
- Paved access and perimeter roadways, including turning/positioning areas for demineralizer trailers, ULSD tankers, aqueous ammonia tankers;
- The footprint of the ULSD storage tank and its surrounding impervious containment areas (~1 acre);
- The footprint of the ~15,700 sf. (0.36 acre) admin/control/maintenance building;
- Paved parking/access areas on either side of the admin/control/maintenance building (~0.24 acre);
- The footprint of several storage tanks (raw water, finished water);
- The footprint of the aqueous ammonia tank and its surrounding impervious containment area and enclosure;

The use of compact, space efficient equipment, coupled with a well thought out layout is an important starting point with respect to minimizing impervious surface. Further reductions in impervious surfaces stem from the selection of an "outdoor" installation with a 55-foot perimeter sound wall and crushed stone finished yard area (as opposed to sizeable buildings to enclose the power generation, air pollution control and ancillary equipment). The use of a single 15,700 sf. multipurpose building for admin, control, maintenance, storage, and water treatment provides some reduction in footprint and thus in impervious surface (as opposed to the use of multiple single purpose buildings).

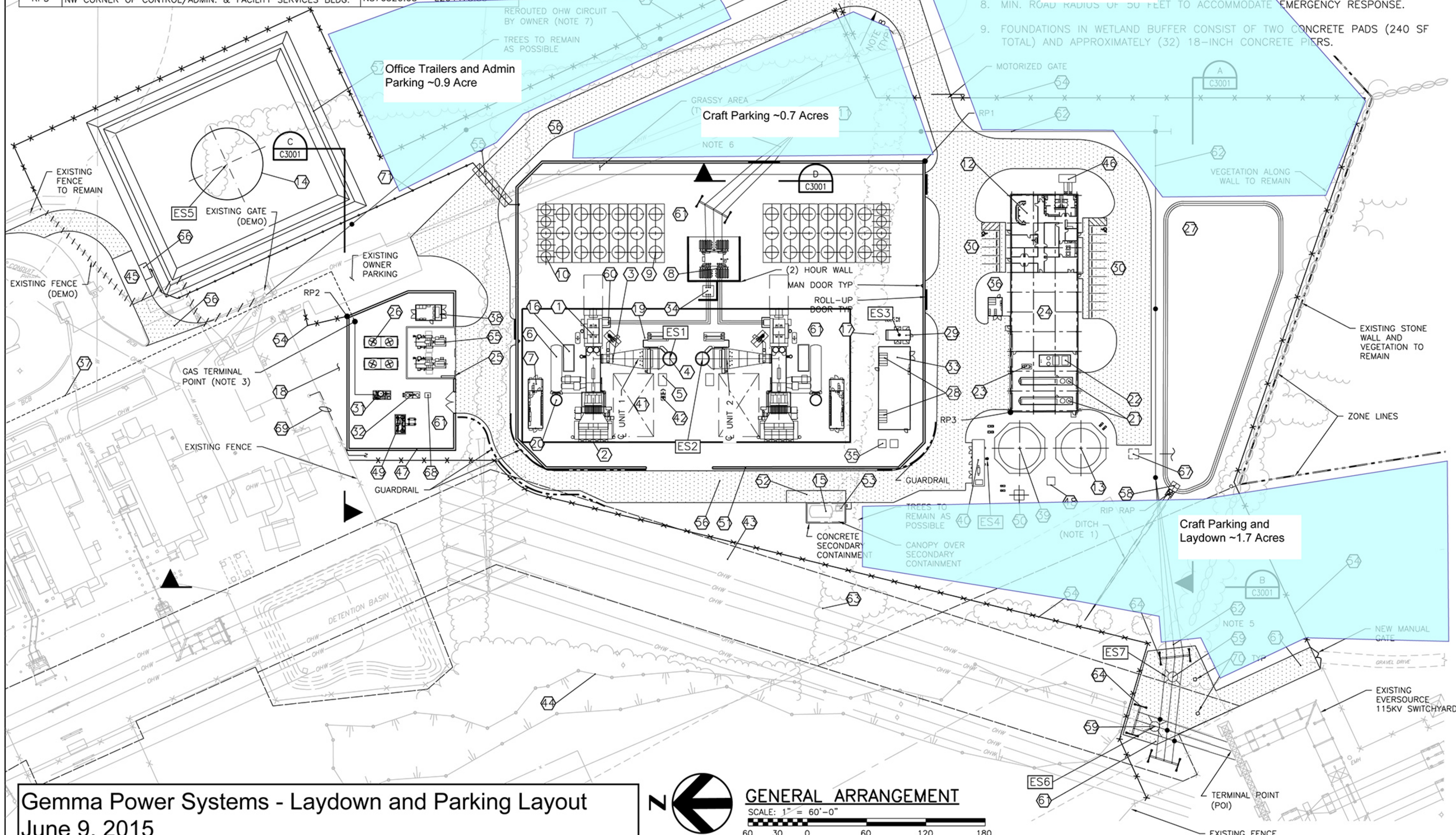
The use of a single paved access road, coupled with a perimeter road, allows for the necessary access and efficient circulation while helping to minimize paved surfaces. The access road and a portion of the perimeter road will also provide access to the existing 135 MW plant on the property. The access and perimeter roads must be wide enough for allow for two way truck traffic, access by fire apparatus and periodic access by heavy equipment as may be needed for major maintenance/overhauls. Parking areas have been minimized based on a small plant operating staff while complying with applicable code (handicapped spaces, etc.). At this point, impervious area has been minimized consistent with the necessary function of the Project, together with the need for routine and emergency access by large tractor trailers and other large vehicles.

The 4.3-acre impervious area is the basis for the stormwater calculations summarized in Section 7.0 of this FEIR.

EMISSION SOURCES		
NO.	SOURCE	STATE PLANE (METERS)
ES1	CTG EXHAUST STACK UNIT 1	N876425.35 E204488.57
ES2	CTG EXHAUST STACK UNIT 2	N876415.29 E204488.69
ES3	EDG EXHAUST STACK	N876354.99 E204496.71
ES4	DIESEL FIRE PUMP ENGINE EXHAUST STACK	N876329.65 E204455.25
ES5	FUEL OIL TANK VENT (TANK CENTER)	N876562.64 E204547.00
ES6	SF6 CIRCUIT BREAKER #1	N876274.37 E204376.92
ES7	SF6 CIRCUIT BREAKER #2	N876268.98 E204392.31

REFERENCE POINTS		
NO.	DESCRIPTION	STATE PLANE (METERS)
RP1	SE CORNER OF NOISE WALL	N876347.36 E204550.50
RP2	NE CORNER OF GAS YARD WALL	N876525.09 E204500.45
RP3	NW CORNER OF CONTROL/ADMIN. & FACILITY SERVICES BLDG.	N876320.05 E204473.35

NOTES:
1. DETENTION POND WILL SERVE AS INFILTRATION BASIN COLLECTING STORM WATER FROM POST-DEVELOPED SITE AREA WITH LARGE STORM EMERGENCY OVERFLOW TO WETLANDS (WEST). OVERFLOW DITCH TO BE LINED TO PREVENT EROSION.
2. EQUIPMENT TAGS COMMON TO TWO UNITS SHOWN ONLY IN ONE PLACE.
3. SEE DWG 244238-CGA-M2002 FOR TERMINAL POINT LOCATIONS.
4. CONTRACTOR TO REMOVE EXISTING LEACH FIELD PER TOWN, COUNTY, AND STATE REQUIREMENTS.
5. DEADEND STRUCTURES, TRANSMISSION LINE TAP RECONDUCTORING, CIRCUIT BREAKERS AND DISCONNECT SWITCHES BY CONTRACTOR (SEE TECH. SPEC.).
6. OWNER TO CONFIRM 115KV ROUTE OVER WALL OR UNDERGROUND (PREFERRED).
7. TEMPOR FEED TO BE TAPPED OFF REROUTED INCOMING SERVICE CTOR – SEE DWG. M2002).
8. MIN. ROAD RADIUS OF 50 FEET TO ACCOMMODATE EMERGENCY RESPONSE.
9. FOUNDATIONS IN WETLAND BUFFER CONSIST OF TWO CONCRETE PADS (240 SF TOTAL) AND APPROXIMATELY (32) 18-INCH CONCRETE PIERS.



Gemma Power Systems - Laydown and Parking Layout
June 9, 2015

EQUIPMENT LEGEND	
ITEM	DESCRIPTION
1	LMS 100 COMBUSTION TURBINE (GE)
2	INLET AIR FILTER (GE)
3	SCR/CO MODULE (GE)
4	EXHAUST STACK (GE)
5	CEMS ENCLOSURE
6	INTERCOOLER (GE)
7	CTG POWER CONTROL MODULE (GE)
8	GENERATOR STEP-UP TRANSFORMER (THREE WINDING)
9	AIR COOLED HEAT EXCHANGER
10	LUBE OIL AIR COOLED HEAT EXCHANGER
11	TRANSMISSION POLE
12	66'X 218' CONTROL/ADMIN & FACILITY SERVICES BLDG.
13	46'-0" DIA DEMIN WATER STORAGE TANK (450,000 GAL)
14	75'-0" DIA FUEL OIL STORAGE TANK (1,000,000 GAL)
15	19% AQUEOUS AMMONIA STORAGE TANK UNDER CANOPY
16	COOLING PUMP SKID (GE)
17	OIL/WATER SEPARATOR #1 (UNDERGROUND)
18	EXISTING SEPTIC SYSTEM LEACHING AREA (NOTE 4)
19	AMMONIA BLOWER SKID (GE)
20	VENT STACK WITH SILENCER (VBV) (GE)
21	BAYS FOR (2) PORTABLE DEMIN TRAILERS
22	AIR COMPRESSOR SKID
23	MAINTENANCE AIR COMPRESSOR & DRYER
24	MAINTENANCE & WAREHOUSE AREA
25	FUEL GAS COMPRESSOR SOUND ENCLOSURE
26	FIN-FAN COOLER
27	STORM WATER DETENTION POND (NOTE 1)
28	4.16KV SWITCHGEAR (INSIDE PDC ITEM 33)
29	DIESEL GENERATOR (EDG)
30	PARKING (ASPHALT)
31	FUEL GAS SUCTION SCRUBBER SKID
32	FUEL GAS COALESCING FILTER/SEPARATOR SKID
33	POWER DISTRIBUTION CENTER NO. 1
34	AUXILIARY TRANSFORMER
35	STATION SERVICE TRANSFORMERS
36	POWER DISTRIBUTION CENTER NO. 2
37	U/G NATURAL GAS PIPING (BY OTHERS) – SEE DWG. C1003
38	POWER DISTRIBUTION CENTER NO. 3
39	48'-0" DIA SERVICE/FIRE WTR STOR TNK (500,000 GAL)
40	FIRE WATER PUMP ENCLOSURE
41	CRANE PARKING FOR TURBINE MAINTENANCE
42	WATER WASH DRAINS TANK (UNDERGROUND)
43	100' WETLAND BUFFER ZONE
44	BORDERING VEGETATED WETLAND (STAKED BY EPSILON)
45	FUEL OIL UNLOADING TRUCK STATION (ULSD)
46	HVAC UNIT
47	FUEL GAS YARD (PERIMETER NOISE WALL)
48	SANITARY LIFT STATION
49	FUEL GAS DEW POINT HEATER
50	WASTE WATER COLLECTION SUMP
51	NOISE WALL
52	AMMONIA DELIVERY PAD (CONCRETE)
53	AMMONIA PUMP SKID UNDER CANOPY
54	FENCES AND GATES
55	PIPE RACK
56	NEW ROADWAY (ASPHALT)
57	SECONDARY CONTAINMENT BERM
58	EMERGENCY OVERFLOW WEIR WITH DITCH TO WETLANDS
59	115kv CIRCUIT BREAKER WITH MOTORIZED DISCONNECTS (NOTE 9)
60	LINE SIDE CUBICLE (GE) AND CIRCUIT BREAKER
61	AGGREGATE SURFACING
62	OVERHEAD 115KV CIRCUIT
63	OVERHEAD 115KV CIRCUIT (EXISTING; FROM J-3)
64	NEW DEAD END STRUCTURE (NOTES 5 & 9)
65	GAS COMPRESSOR
66	ULSD UNLOADING/FORWARDING PUMP HOUSE
67	OIL/WATER SEPARATOR #2 (UNDERGROUND – STORMCEPTOR)
68	HYDROCARBON DRAINS TANK (ABOVE GROUND)
69	SANITARY SEWER (EXISTING PLANT TO SANITARY LIFT STATION)
70	CONCRETE PAD (NOTE 9)
71	ABOVE GROUND FUEL OIL PIPING (ON SLEEPERS)

HDR

ISSUE	DATE	DESCRIPTION	DRAWN	ENGINEER	CHECKED	APPROVED
J	05/12/15	GENERAL UPDATE	EDC	CJH	CJH	CJH
H	05/01/15	GENERAL UPDATE	PVJ	CJH	CJH	CJH
G	04/28/15	ADJUSTMENTS FOR SCR MODULE	PVJ	CJH	CJH	CJH
F	04/20/15	CONTINUED ALIGNMENT	PVJ	CJH	CJH	CJH
E	04/03/15	FOR EPC CONTRACT, SPA	PVJ	CJH	CJH	CJH
D	03/16/15	FOR EPC CONTRACT	EDC	CJH	CJH	CJH
C	03/06/15	UPDATED ARRANGEMENT	ELT		CJH	
B	1/20/15	UPDATED ARRANGEMENT	PVJ	.	ELT	.

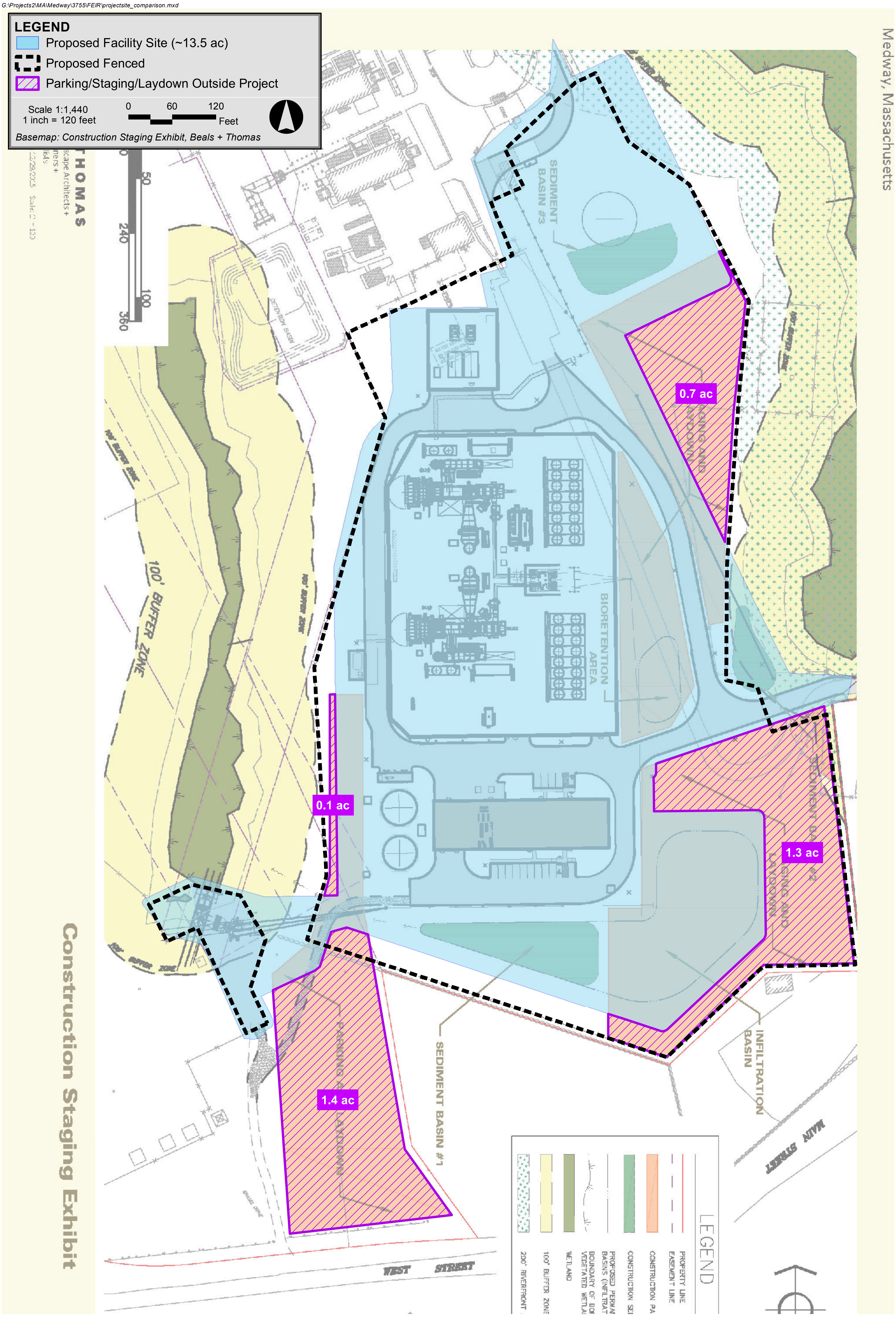
PRELIMINARY
NOT FOR CONSTRUCTION

Exelon

EXELON WEST MEDWAY FACILITY
GENERAL ARRANGEMENT
SITE PLAN
2X0 LMS100 SIMPLE CYCLE

FILENAME: C1001-0CGA-244238.dwg
SCALE: AS INDICATED
SHEET: **244238-CGA-C1001**

G:\Projects2\MA\Medway\3755\FEIR\projectsite_comparison.mxd



Section 4.0

Air Quality

4.0 AIR QUALITY

4.1 BACT

The Air Plan Application was submitted to MassDEP on August 24, 2015. Revisions were provided to MassDEP on September 30, 2015. In this latest version on the Air Plan Application provided with the DEIR, on p. 5-41, it states: "During ULSD firing, Exelon proposes to meet a BACT limit of 4.5 ppmvd." Thus, the proposed limit was reduced from 5.0 to 4.5 ppmvd in the most recent application.

The Air Plan Application, in Section 5.3.4.5, explains why carbon monoxide is proposed as BACT at 5.0 ppmvd rather than 4.0 ppmvd. All of the combustion turbines that have permit limits for CO of 4.0 ppmvd are single fuel burners using only natural gas. A single fuel burner is a fundamentally different application than a dual fuel burner. The single fuel burner uses a dry low NOx combustor with lower uncontrolled CO emissions and thus can achieve 4.0 ppm with lower control efficiency from the CO catalyst. Also, the Project proposes to meet 5.0 ppmvd down to 25% load where the uncontrolled concentration is 139 ppmdv, which requires a control efficiency of 96.4%, a very high control efficiency. Most other projects at 4.0 ppmdv are not designed for such low partial load. For example, the Great River Elk Station on p 5-33, only achieves 4 ppm down to 70% load. Finally, DEP's Top-Case BACT Guidance, in Table 5-1 (p. 5-2) is 5.0 ppmdv of CO for gas and oil-fired simple-cycle combustion turbines >10 MW.

4.2 LAER

The DEIR included comprehensive BACT and LAER analyses as part of the Major Comprehensive Air Plan Approval Application and the Prevention of Significant Deterioration Permit Applications (DEIR Attachment D). The proposed air pollution control systems were also described in Sections 2.3 and 4.4 of the DEIR.

With respect to DEP's DEIR comment, Section 4.4 of the air permit application simply contains a summary of the proposed LAER limits for NOx for the combustion turbines, emergency diesel generators and emergency fire pump engines. Section 4.1.1, Evaluation of Emission Limiting Techniques addressed the three categories of techniques: 1) change in raw materials, 2) process modifications and 3) add-on controls. This list of techniques was provided for information to show how LAER emission limits may be achieved in practice. The source of this information is from the BACT analysis. Beyond the discussion provided in the DEIR/permit application, there are no other methods of achieving the proposed LAER emission limits for NOx.

The Project expects to provide additional technical information in response to the DEP technical review comments provided on January 26, 2016.

4.3 LNG as a Backup Fuel Alternative

DEP's comments on the DEIR included a request that the Project elaborate on the discussion of LNG as a potential backup fuel (in lieu of ULSD). An analysis of alternative backup fuels was provided in Section 5.3.1.3 of the Major Comprehensive Plan Approval Application which was included as part of the DEIR submittal (Attachment D). The analysis stated that onsite storage of LNG would require space beyond that available. It also noted concerns with respect to the time required for EFSB review and the challenges of quickly refilling a depleted LNG storage tank.

In the course of the recently concluded EFSB evidentiary hearings, the Project was asked to respond to a Record Request on the subject of LNG as a potential alternative backup fuel. The Record Request response was developed by the Project team with the assistance of Northstar Industries, LLC. Northstar is a consulting engineering/EPC firm based in Methuen MA; the firm has considerable experience in the design of LNG and CNG (compressed natural gas) storage facilities. Northstar was the design engineer responsible for the only EFSB jurisdictional LNG storage facility licensed and constructed in Massachusetts (Berkshire Gas LNG Storage and Vaporization Facility, Whately MA, case EFSB 99-2).

For the Medway project, Northstar examined a postulated LNG storage facility based on a field erected, full containment, double cryogenic wall storage tank. Two possible tank sizes were examined; a three day supply (0.16 bcf or 1,900,000 gallons) and a five day supply (0.27 bcf or 3,200,000 gallons).[1] The postulated LNG facility also includes an LNG tanker unloading facility, a boil off gas compressor and return system, vaporizers with gas fired water/glycol heaters, and the necessary impoundments, monitoring and safety systems. The vaporization system is sized at 48,000 MCF per Day. The truck unloading system is rated at 330 gpm (30 minutes pumping per LNG trailer).

Intrastate LNG facilities over 25,000 gal are MA EFSB jurisdictional.[2] The Northstar conceptual design is in accordance with 980 CMR 10, Siting of Intrastate Liquefied Gas Storage, the Energy Facilities Siting Council Handbook, revised 2011, and NFPA-59A, Standard for Production, Storage and Handling of Liquefied Natural Gas.

The principal findings of the Northstar report are as follows:

- Vapor Hold up techniques are used to contain all vapor on site, thus the limiting factor on site size is the Thermal Exclusion Zone;

1 For perspective, initial fill of a five day tank (3,200,000 gallons) would require approximately 320 LNG tanker loads

2 Interstate LNG facilities are Federal Energy Regulatory Commission (FERC) jurisdictional.

- Conservatively using the 460 BTU/sf. per hour thermal exclusion zone criteria, a 52 acre sole purpose site would be required;

- The time line to design, permit and build the LNG facility is estimated to be 48 months;

- The LNG storage and vaporization facility would have an estimated construction cost of ~$60 million. For perspective, the estimated cost of the proposed 200 MW project with ULSD as a backup fuel is $240 million.

A copy of the January 27, 2016 Northstar conceptual report is provided at the end of this section. Figure 4-1 provides a perspective on the necessary thermal exclusion zone with respect to Exelon's Medway property.

Given the site size required (52 acres), the estimated four year implementation timeline and the approximately $60 million construction cost, use of LNG as a backup fuel for this Project is clearly not practical or feasible. This is particularly true in light of the Project's June 2018 FCA commitment.

4.4 Construction Equipment Engines

The Proponent will require that all heavy construction equipment be fitted with the best available after-engine emission control technology, such as diesel particulate filters (DPFs) or diesel oxidation catalysts (DOCs), in accordance with the Massachusetts Department of Environmental Protection (MassDEP) Clean Air Construction Initiative (CACI).

Construction contractor(s) for the Proposed Project will have their own fleets of construction equipment that will broadly vary in age whereas the life expectancy of such equipment is many years. Although the Environmental Protection Agency's (EPA's) Tier 4 emissions standards for all sizes of off-road vehicles are now in effect for all manufacturers of such equipment, contractors are not required, nor expected, to replace their existing fleet with equipment containing engines manufactured to Tier 4 emission standards. Use of contractor equipment meeting the requirements of Tier 4 standards, when available, will be encouraged.

Until a construction contractor(s) is hired for Project construction, a list of engines, their emission tiers, and any BACT installed on each piece of equipment cannot be provided.

MEMORANDUM

Date: January 27, 2016
From: Northstar Industries, LLC
To: Tammy Sanford, Exelon Power
Revision 3: Conceptual Design Basis, Cost/Schedule: LNG Storage/Vaporization West Medway, MA

1. BACKGROUND/EXECUTIVE SUMMARY

A request has been made for Northstar Industries, LLC (Northstar) to assist Exelon Power in providing a response to an interrogatory from the Energy Facility Siting Board of Massachusetts (EFSB): EFSB 15-1/D.P.U. 15-25 Exhibit CLF-2: Testimony of Christopher Stix. In order to meet this request, Northstar has provided conceptual definition, budgetary cost, and schedule for providing an LNG Facility in West Medway, Massachusetts as back up fuel for the Medway II, Natural Gas Fired Generation Project.

Two options for storage size have been requested. Three days and five day options for onsite LNG storage at 48 MMSCFD has been requested and defined in this report. It is further assumed that the LNG will be supplied via over the road LNG tanker trucks and vaporized at 48,000 MSCFD.

Northstar has long been an EPC provider of facilities for natural gas, LNG and CNG customers. Northstar designed and constructed the first and only LNG facility in Massachusetts which meets, and in some cases exceeds, the siting criteria established by the EFSB in 980 CMR 10.0. The design baseline for this conceptual facility is intended to do the same. For example: 980 CMR 10.0 was written to regulate the siting of new LNG facilities in MA. It provides minimum distances from impoundments as well as mapping requirements of various exclusion zones from 460 BTU/ft2.hr – 2000 BTU/ft2.hr.

- Northstar has assumed a conservative approach and conceptualized a site which encloses the largest exclusion area defined by 980 CMR 10.0 for 460 BTU/ft2.hr. This results in a site which is 52 Acres.

- For the purposes of this conceptual report, the LNG Plant site is assumed to be a separate, 52 acre, sole purpose site.

- Vapor Hold up techniques would be used to contain all the vapor on site: therefore the limiting factor on site size is the Thermal Exclusion Zone of 460 BTU/ft2.hr.

- This report concludes that temporary fuel using LNG would cost approximately US $60 MM at plus or minus 25% accuracy. It could take approximately 48 Months to implement dependent upon approvals.

2. REFERENCE CODES & STANDARDS

- 980 CMR 10.00: Siting of Intrastate Liquefied Gas Storage
- The Energy Facility Siting Council Handbook: Revised July, 2011
- National Fire Protection Association NFPA-59A Standard for Production, Storage and Handling of Liquefied Natural Gas (LNG)

3. DESIGN BASIS ASSUMPTIONS FOR CONCEPTUAL LNG FACILITY

ITEM	DEFINITION
LNG Working Volumes and 10% Tank Heel: Option 1 (3 Days)	160 MMSCF/1.9 MM US Gallons
LNG Working Volumes and 10% Tank Heel: Option 2 (5 Days)	265 MMSCFD/3.2 MM US Gallons
LNG Tank Secondary Containment Size	10,000 Square Feet
Protective Distance per 980 CMR 10: d = 3.6 Square root (A)	360 feet
LNG Tank Working Vapor Pressure	1 psig
LNG Tank Type	Full Containment with Double Cryogenic Wall
Truck Unload Sizing	330 US GPM for 30 Minute Unload
Vaporization Volume	48 MMSCFD
Vaporization Type	Shell and Tube Heat Exchanger /Remote Heat Source
LNG Boil off Design	.25% per day of LNG in Storage
LNG Boil Off Handling	Re-liquefaction and Insert into Storage
Site Size: Determined by 460 BTU/ft2.hr	52 Acres

4. EFSB JURISDICTION OVER LNG FACILTIES IN MA

The EFSB Handbook states that MGL.c.164 S 69G gives the EFSB jurisdiction over certain energy facilities. The handbook specifically identifies LNG facilities with greater than 25,000 US gallons of storage as jurisdictional for siting and licensing. Both options defined in this report are within the jurisdiction of the EFSB in Massachusetts.

The formal siting process involves a Procedural Phase, an Evidentiary Phase, and a Decision Phase. In general, the applicant must present a determination of need, a review of alternatives, a review of the proposed solution in terms of design, and a determination that the presented case represents the least cost, least environmental impact solution to the identified need. In this example, the applicant Exelon Power, would need to provide that the LNG Facility is the best alternative as back up fuel.

5. EFSB MAPPING & SITING REQUIREMENTS

980 CMR 10 requires the applicant to map certain Thermal Exclusion lines and vapor exclusion as follows:
-2,000 BTU/ft2.hr
-1,000 BTU/ft2.hr
-460 BTU/ft2.hr
-Vapor Dispersion Zone

Thermal Radiation printout attached for "***Phast" Version 7.11 for Thermal Exclusion Calculation.***

6. SITE SIZE USING MINIMUM PROTECTION DISTANCE VERSUS THERMAL EXCLUSION

980 CMR 10 defines a minimum protection distance as d (ft.) = 3.6 x Square root (Area Square Feet). In this conceptual, report the Minimum distance is assumed to be 360 feet from the outer secondary wall. 980 CMR 10.0 also requires Mapping and extensive research and description of areas encompassed by 460 BTU/ft2.hr-2,000 BTU/ft2.hr.

It is Northstar's experience that site control of all areas up to the most distant zone defined in 980 CMR 10.0 will greatly simplify the siting process, the public hearings, and final approvals for the project. For this conceptual design, it is assumed that the criteria for site size will be determined by the 460 BTU/ft2.hr Thermal Radiation Zone and that methods will be engineered to contain vapor on selected site: The LNG site size is therefore assumed to be a separate, sole use, 52 acre.

EXCLUSION ZONES DEFINED BY	ACREAGE FOR SQUARE SITE
Protective Distance at 360 feet	16 Acres
2,000 BTU/ft2.hr	15 Acres
1,000 BTU/ft2.hr	28 Acres
460 BTU/ft2.hr	52 Acres
Vapor Dispersion Zone	Vapor Containment Results in Zero Vapor outside property.

7. COST

	CASE 1	CASE 2
Liquefaction (MCFPD)	0	0
Storage (BCF)	0.16	0.27
Vaporization (MCFPD)	48,000	48,000
DESCRIPTION	COST	COST
Storage Tank (Field Erected)	$ 20,000,000	$ 25,000,000
Project Development Includes EFSB Filing	$ 3,500,000	$ 3,500,000
Balance of Plant	$ 7,500,000	$ 7,500,000
EPCM	$ 5,000,000	$ 5,000,000
LNG Truck Unloading Facilities	$ 4,000,000	$ 4,000,000
Land @ $50,000 / Acre	$ 2,600,000	$ 2,600,000
Vaporization	$ 7,500,000	$ 7,500,000
Subtotal	$ 50,100,000	$ 55,100,000
Contingency (15%)	$ 7,515,000	$ 8,265,000
TOTAL (+/- 25%)	**$ 57,615,000**	**$ 63,365,000**

8. CONCEPTUAL SCHEDULE

PRELIMINARY ENGINEERING: 3 Months
SITE SELECTION AND RATING: 3 Months
FINAL ENGINEERING AND PREPARATION OF EFSB FILING: 4 Months
ADJUDICATION, INTEROGATORIES, FINAL ORDER: 12 Months
PROCURE LONG LEADS/CONSTRUCT: 24 Months
COMMISSIONING/TRAINING/PROCEDURES/DATA BOOKS: 2 Months:
TOTAL SCHEDULE: 48 MONTHS

CONCLUSIONS:

A conceptual design, cost, and schedule has been provided by Northstar for an LNG Facility at the West Medway II Gas Fired Generating Plant as a back-up fuel supply. The conceptualized LNG facility is intended to meet the siting and design requirements of 980 CMR 10. There is only one facility in MA that currently meets this standard and this facility was provided by Northstar to Berkshire Gas. Northstar therefore feels that the overall approach presented in this report is reasonable at this conceptual stage. The West Medway II Conceptual LNG Facility is estimated at approximately US $60 MM, at plus or minus 25% accuracy, and would take approximately 48 months to implement.

LNG has been used extensively in the Northeast US where geological resources for underground storage do not exist. There are approximately 35 LNG plants in the Northeast US being used to avoid peak capacity pipeline charges. This has been proven to be an extremely cost effective use of LNG.

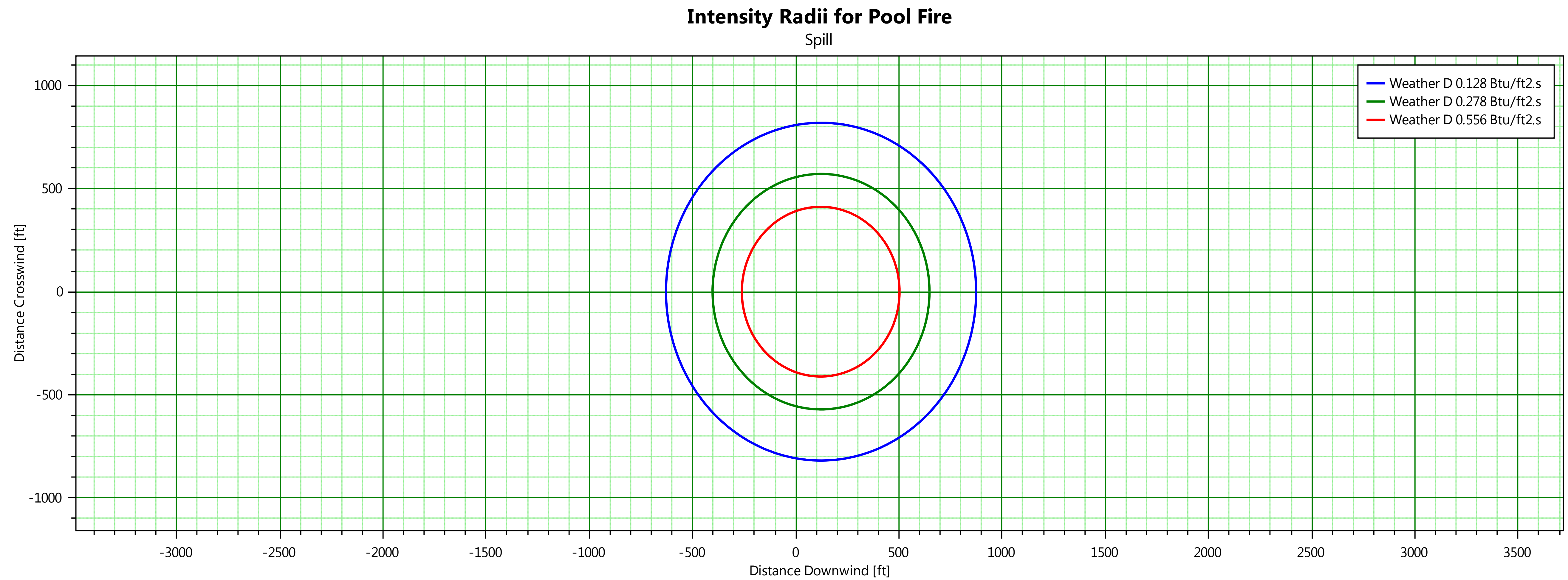
LNG as a back-up fuel for gas fired generation has not proven to be a cost effective solution. Northstar has provided numerous budgetary estimates and, to date, none have been built to provide LNG as a backup commodity fuel.

Northstar believes that it has provided a complete response to your request.

Please see attachments for reference:

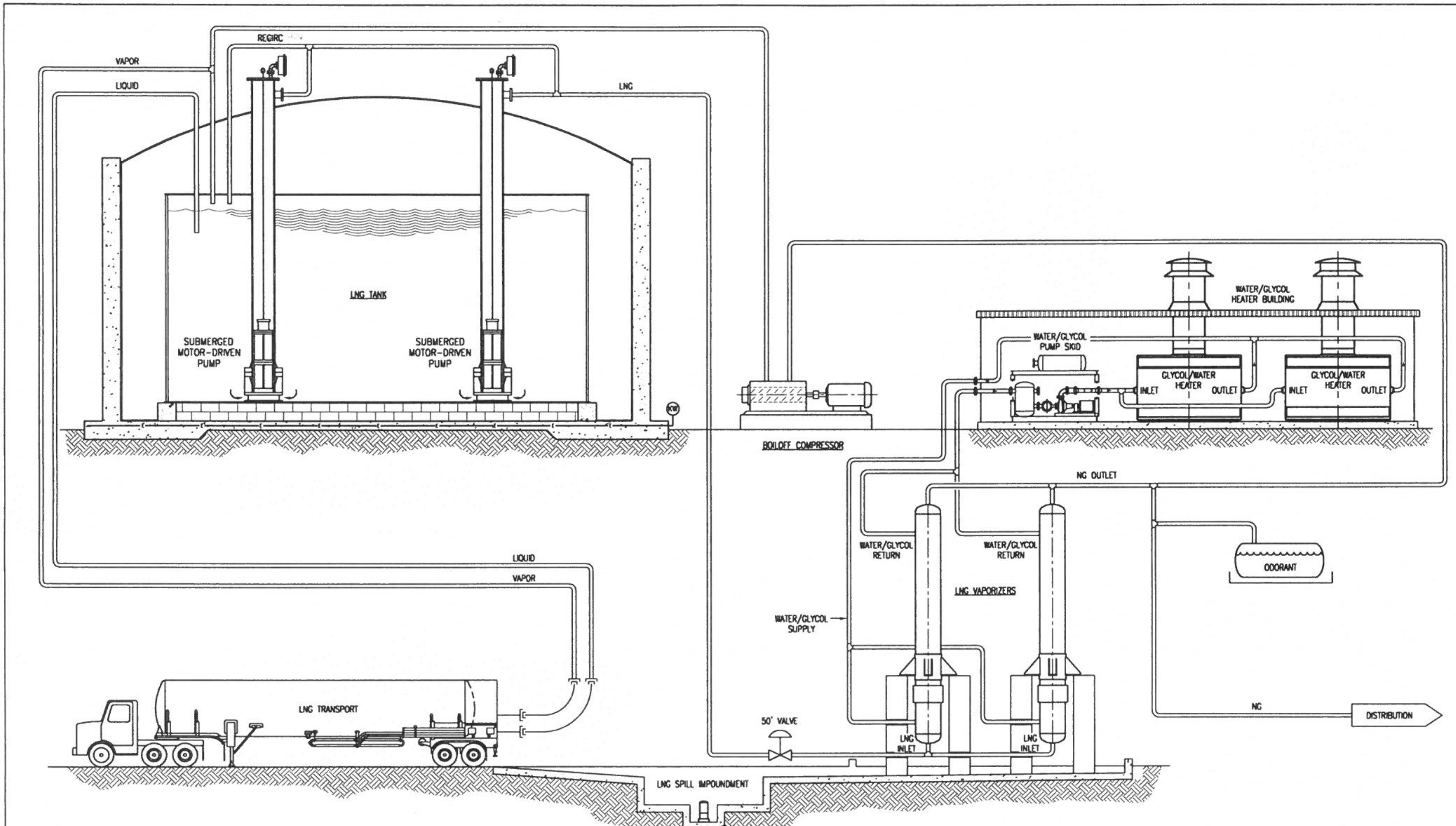
1. Exelon West Medway ***"Phast"*** Thermal Exclusion Calculations using PHAST Version 7.11
2. LNG Facility Elevations Schematic

Audit Number	6837
Equipment	Atmospheric storage tank
Material	METHANE
Program	Phast 7.11
Scenario	Spill
Workspace	Constellation 22Jan16



Distance | Intensity Radii

Dispersion | Early Pool Fire | Late Pool Fire | Explosions | Pool Vaporisation



PRELIMINARY FOR INFO ONLY

FILENAME: BGC961Y1.DWG LAST UPDATE: 11/8/96 TIME: 11:30a MGG

REVISIONS	REMARKS	DESIGN APPROVAL	REVISIONS	REMARKS	DESIGN APPROVAL	REVISIONS	REMARKS	DESIGN APPROVAL
BY / CHKD / DATE			BY / CHKD / DATE			BY / CHKD / DATE		
BY / CHKD / DATE			BY / CHKD / DATE			BY / CHKD / DATE		

CONCEPTUAL LNG PLANT ELEVATIONS

CONTRACT NO.

PROJECT NO. BGC-9601

BY MGG CHK'D J.STEERE DATE 11/8/96

ENGINEERING SUPERVISOR

NORTHSTAR ENERGY CORPORATION
184 PLEASANT VALLEY STREET
METHUEN, MA 01844

DWG NO. BGC-9601-Y1 REV. B

SCALE: NONE

West Medway II **Medway, Massachusetts**

Figure 4-1

Alternate LNG Layout

Section 5.0

Updated and Expanded Greenhouse Gas Analysis

5.0 UPDATED AND EXPANDED GREENHOUSE GAS ANALYSIS

5.1 Introduction

This revised Greenhouse Gas (GHG) analysis responds to comments and direction provided by MEPA in the FEIR Scope, and reflects the continuation of Project design with additional design details available. The overall conclusions of the DEIR are unchanged: the DEIR and this FEIR document the means by which damage to the environment can be avoided, minimized and mitigated to the maximum extent feasible, and the Project as-proposed uses all practicable means and measures to minimize damage to the environment.

Exelon consulted with MEPA, MassDEP and DOER staff regarding the GHG analysis on December 17, 2015 and this FEIR reflects feedback and guidance provided during that consultation.

Consistent with the DEIR, this section addresses GHG emissions from the Project and options that will reduce these emissions in accordance with the MEPA Greenhouse Gas Emissions Policy and Protocol (GHG Policy). The GHG Policy requires that subject projects identify a project baseline, estimate the preferred alternative's GHG emissions and commit to mitigation measures that will help reduce GHG emissions from the Project.

5.2 GHG Analysis with Revised Baseline

5.2.1 Use of Proposed Combustion Turbine as Baseline

As stated in the DEIR, turbine choice has by far the largest impact on GHG emissions of any Project design decision. The GE LMS100 turbine is the most efficient system available. As such, the GE LMS100 turbine system is a highly pre-engineered overall package system, and the vast majority of available mitigation is pre-engineered by GE into the system. More detail regarding how the pre-engineering of the GE LMS100 package maximizes efficiency and minimizes GHG emissions is provided in Section 5.4, below.

As requested in the FEIR Scope, this update of the GHG analysis reflects a Base Case corresponding to the Project proposed in the ENF (GE LMS100 CTGs). This update was prepared with information already included in the DEIR (that is, by changing the top-left value in DEIR Table 5-5 to match the top-right value). The FEIR uses this revised baseline in the emission summary in Section 5.10.2.

5.2.2 Description of Expected Actual Operation

MEPA reviews in general, and GHG reviews in particular, focus on expected actual impacts. Accordingly, the Project's Baseline GHG emissions reflect GHG emissions from the Project's expected actual operating scenario of a 33% capacity factor with 10 days of ULSD firing per year. (Note that this contrasts with the MassDEP air permitting process which focuses on maximum potential emissions. For example, a hotel being reviewed per the MEPA GHG Policy and Protocol would calculate only the expected actual emissions from its HVAC units, even though it would be allowed to operate those units all the time under the permits received for those HVAC units. Thus, the MEPA analysis and the MassDEP analyses rely on inherently different characterizations of a Project's operations.)

As discussed with MEPA, in addition to showing the Project's Baseline GHG emissions, Table 5-1 below also shows GHG emissions under selected additional operating scenarios which represent the maximum potential emissions under expected DEP permits.

Table 5-1 Direct GHG Emissions – Baseline and Maximum Potential Operating Scenarios

Case	Operation Conditions	CO_2 Emissions (tons/year)
Baseline	33% CF and 10 days ULSD	377,000
Maximum 1-year potential missions	60% CF, 30 days ULSD	695,875
Maximum emissions using 3-year rolling average based on NSPS Regulations	43% CF and 30 days ULSD	505,000
Maximum emissions in years 2 and 3 (if facility operates at 60% CF, 30 days ULDS in year 1)	34.5% CF and 15 days ULSD	394,000

As mentioned above, consistent with other estimates of actual operations made by Exelon, the GHG review is based on the expected actual operating rate of a 33% capacity factor, with 10 days of ULSD firing.

Consistent with Exelon's estimates of expected actual emissions elsewhere in the FEIR, this comparison shows that the Project's Baseline expected actual CO_2 emissions (377,000 tpy) represent a 46% reduction from the proposed 1-year maximum potential GHG emissions (695,875 tpy)in the MCPA application (1-377000/695875). This is consistent with all types of air permit applications, where contingency must be made for differences between maximum operation and expected actual. It is particularly true for a peaking power plant which must respond to ISO calls for electricity.

5.2.3 Effect of Pilgrim Nuclear Shutdown

The Pilgrim Nuclear Station recently announced plans to cease operations in some future year, prior to the end of its operating license. Assuming that market forces induce entry of other generating units and/or other electrical resources, the replacement capacity (in whatever form it would take) would likely be a combination of different forms of capacity (i.e., baseload and other capacity). Exelon is aware of announced projects (e.g. the Clear River Energy Project in Burrillville Rhode Island) and based on a review of interconnection requests made has reason to believe that other baseload generating projects are in the planning stages in ISO-New England.

The impact of the change in baseload capacity on the Project's expected operating hours would be minimal. It is possible that the Medway Facility would operate more frequently for some period(s) of time, resulting in even further net emissions reductions (taking into account Medway's emissions at its site and the resulting larger emission reductions at other power plant locations) compared to a world where the Project did not exist and did not operate. Exelon has not made any changes to its internal assessments of the projected Project performance, and has not identified any reason why the expected actual operating hours estimates for the Project would change based on the retirement of the Pilgrim Nuclear Station.

5.3 Additional comparison to other generation technologies

5.3.1 Minimum Standards for Project Needs

As stated in Section 1.1.2 of this FEIR, the Proposed Project is intended to provide additional needed capacity in ISO-NE's SEMA/RI load district to help meet energy demand during peak times, and to provide a quick-starting back-up for intermittent renewable energy sources such as solar and wind. Both of these functions support electric system reliability in a part of the New England electric grid called the SEMA/RI electrical zone. Alternative generating technologies that do not provide peak capacity and quick-starting back-up would not meet the needs of the Project as identified by Exelon.

As such, the minimum standards for to meet the project needs include the following:

1. Ability to provide 200 MW within 10 minutes of startup.
2. Use a technology with a proven track record, to limit the risk of exposure to ISO-NE's pay-for-performance penalties as-described in Section 1.1.2 of this FEIR.
3. Load-following from 25% to 100% of full load.
4. Ramp rate of 50 MW per minute.
5. Ability to provide multiple starts per day without damaging equipment or incurring a maintenance penalty on the equipment guarantees.
6. Ability to fire natural gas or ultra-low sulfur diesel.
7. Efficient operation within the first minutes of operation.
8. Capital cost low enough to support a successful bid into ISO-NE's forward capacity market.
9. Operating costs low enough to support operation when starting and stopping repeatedly (i.e., without incurring maintenance cost penalties).

As discussed in Section 5.5 of the DEIR, combined-cycle steam electric combustion turbines use a heat recovery steam generator (HRSG) to make steam which is then ducted to a steam turbine to make additional electricity. During full-load steady-state operation (but not during start-up periods or less-than-full load operations), combined-cycle technology is typically more efficient than combustion turbines alone. However, combined-cycle systems have slower startup times, have more maintenance issues when started and stopped frequently, operate within a narrower range of capacity, and change load with more difficulty compared to a simple-cycle project. As discussed further in the sections below, combined-cycle technology generally, and flex plants (which can decouple the combustion turbine from the HRSG) specifically, do not meet the key goals and are not viable options for the Project.

5.3.2 General Combined-Cycle Technology

Exelon is proposing to construct a peaking power plant to address a significant electricity supply challenge facing New England – ensuring that the electricity system includes sufficient resources with operational flexibility and responsiveness to support the region's growing reliance on intermittent and variable resources, including renewable resources. Exelon concluded that a new 200 MW quick-start flexible generation plant would help address that challenge. (Indeed, the last forward capacity auction – FCA 9 – identified a 238 MW shortfall in capacity.) Exelon was also looking for a flexible technology that could operate across a very wide rating range – 25% load to 100% load in emissions compliance. The wholesale electric system in New England depends upon private actors (like Exelon and other developers) coming forth in response to signals in power markets to propose projects to meet future energy and/or capacity requirements.

Exelon concluded that a combined-cycle facility did not align with this objective for a variety of reasons. Combined-cycle technology has higher capital costs than simple-cycle technology. Accordingly, combined-cycle technology is only cost-effective when it operates around the clock day in and day out, thereby spreading the large up-front investment across a lot of electricity production. Additionally, as set forth above, Exelon requires technology that has the ability to operate from 25% load to 100% load while remaining in emissions compliance, an attribute that combined-cycle units do not have.

In addition, Exelon requires technology that can quickly start-up and stop multiple times per day with low maintenance costs. Combined-cycle technology is not well suited to numerous starts and stops in a single day because the variable maintenance costs over the life of the turbine are higher and maintenance intervals are shortened with frequent starts and stops. Significant exposure to heat stresses from rapid heating and cooling of the HRSG and related equipment associated with combined-cycle technology causes damage to the unit. Repeated starts and stops would induce elevated maintenance costs correlated with this damage that is avoided with simple-cycle technology.

As set forth above, Exelon determined that there was a need in the region's wholesale electricity market for a 200 MW peaking facility and therefore sought only to develop a peaking facility of that size. Key factors in Exelon's selection of the GE LMS100 were capital costs, fixed and variable operations and maintenance costs; and speed of ramping capability. Specifically, Exelon required technology that could operate over a wide range of operating loads – 25% to 100%. A combined-cycle turbine operating at low load is less efficient than the GE LMS100. A simple-cycle turbine such as the GE LMS100 can be started almost an unlimited number of times a day and it can be started every hour, run for ten minutes and come off line without incurring a maintenance penalty. In contrast, if a combined-cycle turbine is frequently started and stopped, it will incur more maintenance costs due to its more complex technology. As a result, the operation and maintenance costs are much greater for a combined-cycle turbine when it is run in a typical peaking configuration. While a combined-cycle turbine does not experience these high costs when it runs in a base load configuration, Exelon is not proposing a base load plant because it is responding to a variety of market signals that indicate that a relatively small (200 MW) peaking plant capable of flexible operations and relatively short construction periods was needed in the Southeastern Massachusetts zone of New England's market. Similarly, the GE LMS100 has higher availability (i.e., lower outage rates due in part to quicker, shorter maintenance periods) than combined-cycle technology. Simple-cycle technology such as the GE LMS100 has a shorter construction period, thereby allowing the proposed facility to enter service by the mid-2018 capacity obligation period. The relatively low capital and fixed O&M costs of the GE LMS100 provided the opportunity for the proposed facility to bid into and successfully clear in ISO-NE's forward capacity auction (FCA 9) for a period commencing in the 2018/2019 time frame. In contrast, with its higher capital cost, a combined-cycle unit would have faced a higher economic hurdle to enter the market (due to electric energy prices being expected to remain relatively low in many hours of the year), thereby making it challenging for even a new natural gas combined-cycle plant to receive sufficient revenues to support a combined-cycle technology's relatively high capital costs. Accordingly, combined-cycle facilities are not feasible for use in meeting the Project's needs.

5.3.3 Siemens Flex-Plant Specifically

Regardless of the potential technical feasibility of a Siemens Flex Plant, Exelon did not and cannot selected the Siemens Flex Plant 10 (or 30 for that matter) because it has insufficient operating history to be considered reliable proven technology for this Project. As a threshold matter, there is only one Siemens Flex Plant 10 operating in the United States, residing at El Segundo Repowering, which began operation in July-Sept 2013. By direct contrast, there are 35 GE LMS100 units in operation in the United States and 16 more operating internationally as of March 2015. For the West Medway Project, Exelon has determined that a proven technology system with a significant track record of successful projects operation is necessary, because of the system reliability needs associated with the project and the very substantial penalties imposed by ISO-New England for non-performance. The Siemens Flex Plant units' limited history simply does not have sufficient operating experience and was determined to an unproven technology for which the Company would be unwilling to take on a capacity supply obligation.

Furthermore, as described below, the Siemens Flex Plant 10 is not a technically feasible option to meet the needs of this Project:

- A flex plant is limited to the capacity of its combustion turbine until the HRSG has warmed up to allow steam turbine operation. Based on a review of sales literature for the Flex Plant 10, the output is 275 MW in combined-cycle mode, and the combustion turbine has the ability to reach 150 MW in 10 minutes. Importantly however, the 150 MW rating only represents the output in a simple-cycle configuration and is 50 MW short of the necessary 200 MW required by Exelon.

- A flex plant is a combined-cycle plant where the combustion turbine can bypass the heat recovery steam generator (HRSG) and provide power while the HRSG is warming up. It is a more complicated system with more support equipment needed. The frequent starts and stops associated with peaking operation will create additional mechanical stresses on a flex plant, decreasing reliability and increasing maintenance outages and maintenance costs.

- The ability to ramp quickly to match load is a key project design requirement. The GE LMS100 has the ability to ramp up at a rate of 50 MW per minute, while the Siemens Flex Plant 10 can only achieve a rate of 30 MW per minute.

- The Siemens sales brochure indicates that while the efficiency of the unit when operating in combined-cycle mode and producing its full rated output of 275 MW is 48.8%, the efficiency of the unit when operating in simple-cycle mode and producing 150 MW is only approximately 37%. Such efficiency is significantly lower than the GE LMS100, which has a simple-cycle efficiency of approximately 43%. A flex plant is based on frame technology, which is inherently much less efficient than the aeroderivative style turbine that Exelon is proposing. Because Exelon is proposing a peaking facility, it would expect to be running the flex plant in simple-cycle mode at times when ISO-NE calls for less than the full output of the facility and therefore the heat rate benefits that one would normally expect for a combined-cycle would not occur at all times when the unit is operating. When a flex plant is operated in simple-cycle, which would be the case for a turbine powering a facility that is going to stop and start multiple times per day, the flex plant turbine will have a less efficient heat rate than the GE LMS100.

For the reasons stated above, the Siemens Flex Plant would not meet the Project goals and is not a viable alternative.

5.4 Clarified Comparison to Other Combustion Turbines

The DEIR showed that the GE LMS100 turbine is the most efficient turbine choice for this Project, resulting in substantial GHG savings over other alternative technologies. For comparison to other turbine options, Section 5.7 of the DEIR explained that the electrical output of a combustion turbine can be expressed in terms of gross output from the turbine itself or net output to the electrical grid (less parasitic loads for such internal plant uses such as intercooling, gas compression, etc.), and explained that the heat input to the turbine can be expressed as lower or higher heating values (LHV or HHV). The HHV is equal to the LHV with the addition of the heat of vaporization of the water content in the fuel; for natural gas the ratio of HHV to LHV is 1.109. Most system design and engineering is performed using LHV; most environmental review is performed using HHV.

As stated in Section 1.2.4.1, GE has recently made several improvements to the GE LMS100. The GE LMS100 was, and remains, the world's most efficient simple-cycle gas turbine engine. The LMS100PA+, the current engine from GE, has approximately a 0.6% improvement in heat rate over the prior model. GE achieved this efficiency improvement by optimizing the power turbine flow function that allowed:

- Optimized high-pressure compressor inlet temperature
- Increased compressor discharge pressure
- Increase/open the booster (low-pressure compressor) inlet guide vane angle

On an HHV basis, these changes allowed GE to improve the engine heat rate from 8,675 BTU/kW-hr HHV (LMS100PA) to 8,624 BTU/kW-hr HHV (LMS100PA+).

Table 5-1 of the DEIR provided a comparison of simple-cycle aeroderivative CTG thermal efficiencies on a gross heat rate, LHV basis at ISO conditions (industry-standard temperature, barometric pressure & relative humidity), and Section 5.7 provided the Project thermal efficiency on the same basis. This basis was chosen because it was the basis most commonly provided by equipment vendors, and therefore allowed simple confirmation against the original data sources. Table 5-2 below updates the information in the DEIR based on the latest available information from the equipment vendors, converts the efficiencies to HHV basis, and compares to the Project efficiency under the same conditions. The table also notes which units are not technically feasible for Project use.

Table 5-2 CTG Gross Thermal Efficiency Comparison from Vendor Literature

Vendor	*Model*	*Gross Heat Rate* (BTU/kWh HHV) (lower is better)*	*Notes*
GE Energy	LM6000-PC-SPRINT	9,389	
	LM6000-PH-SPRINT	9,099	
	LM6000-PG Base	9,478	
	LM-6000-PC	9,448	
	LM-6000-PD	9,072	
	LM-6000-PD Sprint	9,061	
	LM-6000-PF	9,072	Not feasible for this project- no backup fuel capability
	LM-6000-PF Sprint	9,061	Not feasible for this project- no backup fuel capability
	LM-6000-PG	9,478	
	LM-6000-PG Sprint	9,515	
	LM-6000-PH	9,113	
Pratt & Whitney	FT4000 SWIFTPAC 120	9,144	
	FT8 SWIFTPAC 60 (2 CTGs)	9,099	
Siemens	SGT-750	9,771	Not feasible for this project- no backup fuel capability
	SGT-800	10,087	Not feasible for this project- no backup fuel capability
Siemens/Rolls Royce	Trent 60 DLE	9,025	Not feasible for this project- no backup fuel capability
	Trent 60 DLE w/ ISI	8,873	Not feasible for this project- no backup fuel capability
	Trent 60 WLE DF	9,236	
	Trent 60 WLE DF w/ ISI	9,104	
Proposed Project	GE LMS100-PA+	8,624	Vendor brochure for direct comparison to other vendor literature

*Natural gas fuel, 100-percent load, ISO conditions.

The table above confirms that, on a consistent basis (full load, natural gas, ISO conditions – expected but not guaranteed performance), the Project is using the most efficient equipment available for this service.

As described in Section 5.8.1 of the DEIR, the original review of technology alternatives for the Project included analysis of performance and emissions for four (4) simple-cycle designs. This analysis included preliminary engineering, and therefore is more detailed than the review of vendor literature summarized in Table 5-2 above. In the review provided in the DEIR, Exelon also estimated parasitic loads to provide an apples-to-apples comparison of efficiencies on a net heat rate basis. Full-load performance on natural gas and ULSD was reviewed; results converted to HHV are summarized in Table 5-3 below.

Table 5-3 CTG Net Heat Rate Comparison based on Original Review of Technology Alternatives

Model	*Net Heat Rate on Natural Gas (BTU/kWh HHV) (lower is better)*	*Net Heat Rate firing ULSD (BTU/kWh HHV) (lower is better)*
GE LM6000 PC Sprint	9,618	9,400
Rolls Royce Trent 60 WLE ISI	9,504	9,296
Pratt & Whitney FT4000 Swiftpac 120	9,560	9,442
GE LMS100 PA*	8,956	8,724

*Original review based on the LMS100PA unit. The newer LMS100PA+ unit has better heat rate.

The comparative values in Table 5-3 show that on a consistent preliminary engineering design basis, and accounting for parasitic loads, the proposed GE LMS100 turbines are the most efficient available.

5.5 Opportunities to Reduce GHG Emissions through Plant Design

Section 5.8 of the DEIR provided analysis of potential reductions that can be achieved through plant design and operations. This section of the FEIR updates and expands on the review of opportunities to reduce emissions through plant design. Section 5.6 of this FEIR reviews and expands on opportunities to reduce emissions through plant operation. Table 5-16 in Section 5.10 summarizes the analysis and conclusions across both the DEIR and FEIR.

5.5.1 Pressure Drop Minimization

As stated in Section 5.8.4 of the DEIR, limiting the pressure drop across the CTG combustion train would reduce the amount of work the CTG needs to do to move and expand combustion air and gas through the system, resulting in lower GHG emissions However, keeping a low pressure drop needs to be balanced against other system needs, including inlet air filters, noise reduction silencers, and air pollution control catalysts.

To correlate a reduction in back pressure with reduction in the heat rate, GE generated system performance runs with a "hypothetical" back pressure reduction of ½″ and 1″ of water column. The results, and the related hypothetical improvement in annual GHG emissions, are summarized in Table 5-4 below.

Table 5-4 Effect of Hypothetical Pressure Drop

Hypothetical Pressure Drop	*Heat Rate Improvement, Btu/kWH HHV*	*Heat Rate Improvement, percent of baseline heat rate*	*Hypothetical GHG improvement, tons/year*
½″ of water column	4.4 Btu/kWH HHV	0.05%	191
1″ of water column	8.9 Btu/kWH HHV	0.1%	383

In order to achieve the hypothetical improvement, the actual system back pressure would need to be reduced. For the CTG, the total system back pressure is approximately 12″ of water column, broken down as shown in Table 5-5 below. In addition, there is a draft effect created by the stack, which serves to reduce the backpressure (improving efficiency).

Table 5-5 Contributions to Pressure Drop

System component	*Approximate contribution to back pressure, inches water column*
Duct losses	1.0″ w.c.
Flow distribution device	1.0″ w.c.
Acoustic Treatment	1.0″ w.c.
Oxidation Catalyst	2.5″ w.c.
SCR Catalyst	6.5″ w.c.

Back pressure due to, duct losses, flow distribution and acoustic treatment has already been minimized to the extent feasible while still maintaining the required turbine performance, and system layout. In addition, the pressure drop from acoustic treatment cannot be reduced without jeopardizing compliance with noise emissions limits. Acoustic treatments such as inlet and exhaust silencers by their nature break the air flow path to disrupt noise propagation. While reducing silencing would minimize pressure drop, it would also result in unacceptable noise impacts.

Decreasing the pressure drop across the catalysts could be achieved by increasing the cross sectional area of the catalyst. However, such an increase is not technically feasible because it would jeopardize compliance with LAER and BACT emission limits. The SCR system in particular is carefully designed to simultaneously minimize NOx emissions and ammonia slip. A wider catalyst would either need additional flow distribution (essentially eliminating the pressure drop improvement) or would have inconsistent flow through the catalyst. Inconsistent flow through the catalyst will either allow unreacted NOx or unreacted ammonia to escape the SCR system. Even if catalyst performance issues could be overcome, the catalyst cross section is limited by the available space at the site (leaving room for minimum maintenance access areas), and catalyst cost can increase significantly due to the larger cross section without increasing the performance of the catalyst.

An increase in stack diameter could also reduce the system back-pressure by improving the draft effect. However, there is a trade-off inherent in the use of a wider stack as a GHG reduction measure, as increased efficiency could come at an increased impact on ambient air quality (because the exhaust velocity would be lower), and would come with an increased impact associated with stack visibility. A wider stack would also cost significantly more (estimated to be over 1-million dollars) for a relatively minor GHG improvement. The air quality, visibility, and cost impacts outweigh the GHG improvement associated with an increased stack diameter.

For all the reasons discussed above, pressure drop has been minimized to the extent feasible and further pressure drop measures have not been selected for the Project.

5.5.2 Evaporative Cooling

As described in Section 5.8.5 of the DEIR, the operating efficiency of any CTG is dependent on the mass of combustion air that can be moved through it. Because cold air is denser, a CTG tends to be more efficient when its inlet air is colder. For some CTG models and operating conditions, this efficiency improvement can be greater than the energy loss associated with pre-cooling the inlet air when ambient air is warmer. However, the GE LMS100 turbine already offers good hot day performance which allows the machine to sustain power with less drop-off as the temperature rises than other CTGs.

The expected impact of evaporative cooling use on GHG emissions is revised in this FEIR, and is presented in Table 5-6, below. The table summarizes the projected impact on the heat rate, GHG emissions and consumption of water for temperatures between 75°F and 100°F when evaporative cooling is typically used.

Table 5-6 Effect of Evaporative Cooling

Ambient Dry Bulb Temperature, F:	70	75	80	85	90	95	100
Typical hours per year in this temperature range(2):	680	446	232	89	17	1	0
Expected operating hours/year:	442	335	197	80	15	1	0
Without Evaporative Cooling							
Heat Rate, Btu/KWh, gross LHV at 100% load(1):	7,930	7,971	8,011	8,042	8,073	8,121	8,168
Estimated kW Gross generation rate, per unit:	108,440	106,350	104,260	102,287	100,313	97,207	94,101
CO2 emissions, pounds/hour per unit	113,486	111,867	110,226	108,558	106,874	104,174	101,435

Table 5-6 Effect of Evaporative Cooling (Continued)

With Evaporative Cooling							
Heat Rate, Btu/KWh, gross LHV at 100% load[1]:	7,890	7,940	7,989	8,003	8,017	8,049	8,081
Estimated kW Gross generation rate:	110,280	107,945	105,610	104,242	102,873	100,336	97,798
CO2 emissions, pounds/hour per unit	114,829	113,103	111,346	110,096	108,841	106,580	104,297
Additional Water use for evap. cooling, gallons/hour per unit	1,118	1,118	1,118	1,054	992	2,506	3,962

(1) In practice the Project load will vary based on ISO requirements
(2) Worcester meteorological record 1980 – 2015

This analysis assumes full-load operation; in practice the Project load will vary based on ISO requirements. As shown in Table 5-6 above, the GHG mass emissions are higher for all evaporative cooling conditions analyzed. This reflects the fact that the turbines can generate more electricity (and use more fuel) when the inlet air temperature is cooler. For the expected operating hours estimated above, if the Project were to implement evaporative cooling for a typical year the Project would generate an additional 3,600 MWh, emit an additional 1,400 tons of GHG, and use an additional 2.4 million gallons of water (or about 26,500 gallons per day averaged over three summer months). Operational efficiency of the CTG with evaporative cooling would improve by about 0.4% (weighted average Btu/kWh % reduction from a baseline of full load operation without evaporative cooling). Calculations are provided in Technical Appendix H. Water use for the Project is currently limited to water injection for NOx control. As discussed in Section 8.0, water is expected to be sourced from an on-site well and from the Town of Millis. Adding 26,500 gallons per day of water from the Town of Millis would be a significant increase and may not be available.

There is a trade-off inherent in the use of evaporative cooling as a GHG reduction measure, as increased efficiency comes at an increased impact on water resources. For the case of the GE LMS100 proposed for this Project, the GHG relatively minor heat rate improvement associated with evaporative cooling use is outweighed by the potential unavailability and environmental impacts of additional water use and the economic impacts of installing the evaporative cooling system (estimated over $1 million). The use of evaporative cooling is therefore not selected for this Project.

5.5.3 Ammonia Vaporization

As stated in Section 5.8.10 of the DEIR, the Project will use 19% aqueous ammonia, with electric vaporizers to generate the ammonia vapor as needed to supply the reagent for the SCR for NOx control. While not available during startup, hot gas recirculation could potentially be used as an energy source to vaporize the ammonia once one or both CTGs are on-line. Exelon continues to work with the CTG and SCR/CO module manufacturers to review options to use hot gas recirculation as an energy source for ammonia vaporization, and will implement in the final design if technically and economically feasible.

Exelon's experience with the use of hot gas recirculation for ammonia vaporization is mixed. Steady-state operation works well, but systems have difficulty supplying enough ammonia during startup. Further, GE has indicated that startup air emissions cannot be guaranteed if relying on hot gas recirculation for ammonia supply. Therefore, for this analysis, it is assumed that 50% of the required heat is supplied though hot gas recirculation, and 50% of the heat is supplied by electric heaters. The potential for projected reductions of parasitic loss is therefore approximately 300 kW during operation. This equates to an approximate 0.1% improvement in the station net heat rate and an approximate 400 ton/year reduction in GHG emissions. Exelon will continue to work with the CTG and SCR/CO module manufacturers to review options to use hot gas recirculation as an energy source for ammonia vaporization, and will implement in the final design if technically and economically feasible.

5.5.4 Transformers

As stated in Section 5.8.9 of the DEIR, Generator Step-Up Unit (GSU) transformers elevate the voltage of electric power from the individual electric generators to that compatible with the interfacing high voltage transmission voltage system. The base case involves using individual two-winding 13.8 kV to 115 kV GSU transformers for each generator. The proposed case involves the use of a single three-winding 13.8kV to 115 kV transformer to elevate voltage of power from each generator at a separate low voltage winding to a single outbound 115 kV circuit; in terms of efficiency, this provides approximately 50 kW in reduced energy loss compared to the base case involving multiple transformers; however, introduces a single point of failure into the power plant design.

Exelon has recently completed review of options for GSU and auxiliary transformers. Based on a broader review of transformer options, four vendors provided proposals which were evaluated based on a range of criteria as displayed in Table 5-7.

Table 5-7 Transformer Impedance Comparison

GSU Transformer				
	Baseline	**Proposed**	Other Alternatives	
Vendor	Hitachi (+ second transformer)	Hyundai	GE (Prolec)	Siemens
Total losses at 318 MVA, kW	1,193 (+ 50 kW associated with use of second transformer)	879	850	1,097
Losses at expected operating rate, MWh/year	4,635	3,279	3,171	4,092
Indirect GHG emissions, tons/year	1,692	1,197	1,157	1,494
GHG reductions from baseline, tons/year		495 (29%)	535 (32%)	198 (12%)

Table 5-7 Transformer Impedance Comparison (Continued)

Auxiliary Transformer				
	Baseline	**Proposed**	Other Alternatives	
Vendor	VTC	Hyundai	Niagara Transformer	GE
Total losses at 85C at max nameplate KVA and rated voltage	94	93	80	76
Losses at expected operating rate, MWh/year	349	347	298	282
Indirect GHG emissions, tons/year	127	127	109	103
GHG reductions from baseline, tons/year		0 (0%)	18 (14%)	24 (19%)

Exelon has tentatively selected Hyundai as the supplier for both the GSU and the auxiliary transformer. This represents a GHG reduction of 428 tons/year over the highest-impedance transformers analyzed.

Transformer selection takes into account several criteria, and involves trade-offs. For example, more efficient (lower impedance) transformers tend to have higher short-circuit potential. The Hyundai transformers were selected in large part because of their superior noise performance. As discussed in Section 6.5.4.1 of the DEIR, in order to meet MassDEP noise requirements, significant attention has been paid to reduce sound levels from the Proposed Project through a combination of noise controls and enhancements to the equipment layout; this includes selection of quiet transformers. While the GSU transformer proposed by GE is slightly (3%) more efficient than the proposed transformer, the GE transformer was not selected because of noise and reliability concerns. Similarly, the Hyundai auxiliary transformer is chosen over other alternatives because it has better noise performance.

5.5.5 Electric Transmission

The connection from the Project to the substation is relatively short (nominal 1,100 feet). Electric transmission line losses beyond that point are minimized by having the Project properly located to serve the needs of the electric grid.

For the approximately 1,100-foot interconnection, Exelon has selected a conductor system that balances cost with impedance and reliability. Exelon's payments for electric sales account for losses in this short interconnection, so Exelon has a financial incentive to optimize the system.

A large number of parameters affect the conductor sizing and amount of heat and resistive losses that occur, including ambient weather, solar exposure, conductor material and fabrication (resistance), support spacing, and others. Conventional conductors are aluminum (AAC), aluminum-alloy (AAAC), and steel-reinforced aluminum (ACSR) conductors. More expensive solutions with higher temperature capacity include steel supported aluminum (ACSS), thermal resistant, and composite core (ACCC) conductors. Bulk pricing per a recent study suggests these conductors are 1.5 to 6 times as costly as ACSR conductor. These cables also tend to have greater cross sectional area to achieve comparable ampacity (ampere capacity).

Exelon has selected a conductor size of 795 kcmil (thousand circular mils, about 7/8ths of an inch in diameter) with three separate conductors in the circuit as appropriate size for the Project. A baseline "business as usual" case for the design would be an ACSR 795 conductor. The proposed conductor is an ACSS 795 conductor with a lower resistance. Additional resistance reduction could be achieved by using the next larger cable size (900 kcmil). However, the larger 900 kcmil conductor is not the appropriate size for the Project equipment and it also induces an increase in cost. Line losses and associated GHG emissions based on expected actual operation are described in Table 5-8, below:

Table 5-8 Electrical Line Losses Comparison

	Baseline	Proposed	Other Alternative
Conductor type/size	ACSR, 795 kcmil	ACSS, 795 kcmil	ACSS, 900 kcmil
Line loss, MWh/year	19.3	19.2	17.7
Indirect GHG emissions, tons/year	7.1	7.0	6.4
GHG reductions from baseline, tons/year		0.1 (1%)	0.7 (9%)

Because of the short line length, the indirect GHG emissions associated with electricity losses are minimal. Additional mitigation beyond the proposed case would not provide significant reductions in GHG emissions.

5.6 Opportunities to Reduce GHG Emissions through Operations

Operation of the proposed Project will minimize GHG emissions through efficient use of fuel to generate electricity at this generating unit compared to the worse efficiency of other generating units in New England that would otherwise be called upon in the absence of the Project. Efficient operation at the Project itself is maintained through careful combustion controls (as described in Section 5.8.2 of the DEIR) and regular system maintenance (as described in Section 5.8.3 of the DEIR). Operation per GE and other manufacturer guidelines will serve to minimize GHG emissions by maximizing efficiency; additional operational steps or maintenance will not further reduce GHG emissions.

Broadly, curtailing Project operations will not minimize GHG emissions, as follows:

- Limiting facility operation to (more efficient) full-load operations would eliminate the key goal of the Project to assist ISO-NE with load following generation. Absent load-following services from the Project, ISO-NE would have to call on other generation to respond to load changes. This could include having facilities on "spinning reserve," whereby they are firing fuel (and generating GHG emissions) but not generating any power (so they can be brought on quickly to match increasing load).

- Limiting facility operation on ULSD would eliminate the key goal of providing reliable capacity to the electric market. Also, at times of low natural gas availability and high natural gas prices, curtailing Project operations on ULSD will likely mean that ISO will dispatch a lower-efficiency oil-fired unit, which would generate higher GHG emissions.

5.6.1 Detection and Avoidance of Methane Leaks

As described in Section 5.8.13 of the DEIR, small amounts of natural gas can leak from valves and flanges in the metering station and natural gas supply system at the Project site. Expected actual CO_2 equivalent emissions are 12.8 tons/year, and will be minimized by system leak checks and monitoring. Additional leak checks and monitoring beyond manufacturer's recommendations and industry guidelines are not likely to result in any actual reduction in leak rates, so no mitigation beyond the baseline is feasible. Exelon will minimize methane leaks through the implementation of leak checks and monitoring to manufacturer's recommendation and industry guidelines.

5.7 Building Related Stationary Source Emissions

5.7.1 Updated Design

Efforts through the design so far to minimize GHG emissions from building related stationary source emissions have been associated with the limiting and consolidation of conditioned space. Much of the building space is warehouse space, which will have minimal (freeze protection) heating. Since the DEIR, the overall square footage of the building has increased slightly (from 15,000 to 15,708 square feet), associated with the incorporation of electrical equipment space that was previously at a separate location. As the electrical equipment needs to have HVAC to ensure proper operation, the change actually reflects a slight decrease in overall facility-wide conditioned space.

The DEIR reviewed the administrative space only as fully conditioned space. This FEIR reviews the entire building, with components as-described in Table 5-9.

Table 5-9 Administration Building Space Use

Building Area	*Size, square feet*
Administration/offices	5,148
Electrical equipment room	1,154
Battery room	66
Warehouse and Water Treatment Area	9,340
Total	15,708

Of these building components, the Warehouse and Water Treatment Area have freeze-protection heating only (50°F set point). The other building areas are conditioned space.

5.7.1.1 Baseline and Proposed Case

Designation of baseline and proposed cases for building related stationary source emissions is complicated by the state of flux of the building code and the stretch code. Per the GHG Policy, the baseline is a building designed to meet the applicable state building code (Code) that is in effect at the time the ENF is filed. As described in the DEIR, the Code at the time of filing the Project's ENF was the 8th edition, amended to incorporate the building energy provisions of International Energy Conservation Code (IECC) 2012. In accordance with the GHG Policy, this, together with the guidance of the modeling protocol of ASHRAE 90.1 Appendix G, defines the baseline for this GHG analysis. For the stationary sources component, the proposed case presents the proposed development that achieves greater reductions in energy use and GHG emissions than required by the Baseline Building Code.

The Town of Medway has elected to include the state's optional Stretch (Energy) Code in its building requirements. It is anticipated that the 9th edition and a new stretch code will be adopted in early 2016 and be effective sometime in the 2nd or 3rd quarter, although the final form it will take is unknown at present.

The proposed case is consistent with current prescriptive stretch code compliance. This FEIR reviews design parameters in more detail and provides commitments for additional mitigation beyond that discussed in the DEIR. The updated calculations are also expanded to include the non-conditioned (warehouse) space, and to reflect design updates since the DEIR.

Modeling of HVAC and domestic hot water use was performed using the Commercial Energy Calculator[1], an online screening tool designed to model single-building/single-use facilities and estimate electric and fuel usage. Modeling of lighting and plug load is performed using spreadsheet calculations using power density and building area. The assumptions and GHG reduction measures area described in each section below. The screening modeling and calculations do not address improvements in building envelope or HVAC efficiency, and use general weather data appropriate for the climate zone. Despite these limitations, the calculation methods are sufficient to provide perspective on the administration building GHG impact relative to other Project elements, and to provide a reasonable ability to compare alternative mitigation strategies and show the resulting differences in energy use. Model printouts and calculations are included in Technical Appendix H.

5.7.1.2 Building Envelope

Baseline and proposed building envelope design parameters are included in Table 5-10.

Table 5-10 Building Envelope

Model Input Parameter	Baseline (ASHRAE 90.1-2010, App. G)	Proposed
Roofs	R and U factors – R-19+R-11 liner system / U-0.035 (total R30)	insulated with R13 plus R-19
Walls - Above Grade	R and U factors - R-13+R-13 continuous insulation / U-0.052 (total R26)	same
Vertical Glazing U-factor	U-0.38 (for fixed fenestration)	same
Vertical Glazing Solar Heat Gain Coefficient	SHGC-0.4	SHGC from 0.4 to 0.64 based on orientation and projection factor

Notes: LS – Liner System, Ci – Continuous Insulation

5.7.1.3 Lighting Power Density and Plug Load

GHG reductions will be achieved through improvements in lighting from the baseline case, as shown in Table 5-11.

[1] Prepared by Apogee Interactive, Inc. and hosted by Con Ed (http://www.coned.com/customercentral/calculators/EC_bus_Calc.html) and other utilities.

Table 5-11 Lighting Power Usage - Baseline and Proposed

			Baseline (ASHRAE 90.1-2010, App. G)		Proposed	
Zone	Description	Area (sf.)	Light Power Density[1] [fluorescent] (W/sf.)	Fluorescent Lighting power use[2] (kW-hr/year)	LED Lighting power use[3] (kW-hr/year)	Savings in LED alternative (kW-hr/year)
1A	Administration/offices	5,148	1.1	49,470	34,629	14,841
1B	Electrical equipment room	1,154	1.6	16,130	5,646	10,485
2	Battery room	66	0.6	346	121	225
3	Warehouse & water treatment area	9,340	0.6	48,957	17,135	31,822
TOTAL		**15,708**		**114,903**	**57,531**	**57,372**

Notes: 1. Fluorescent lighting power density estimates based on space use provided from International Energy Conservation Code

2. Baseline calculations based on lit spaces 24 hr/day, 7 days/wk for a full year

3. Proposed calculations based on lit spaces 24 hr/day, 7 days/wk for a full year in Zone 1A. Proposed calculations for Zones 1B, 2, and 3 are based on 12 hrs/day, 7 days/wk for a full year

Lighting baseline and GHG emissions are summarized in Table 5-12, below.

Table 5-12 GHG Reductions from Improved Indoor Lighting

	Baseline	Proposed	Savings	
Indoor Lighting Power Use (kW-hr/yr)	114,903	57,531	57,372	49.9%
Indoor Lighting CO_2 Emissions[2] (ton/year)	41.9	21.0	20.9	49.9%

Notes: 1. Baseline and Proposed calculations based on 12 hrs/day, 7 days/wk for a full year and power usage of approximately 91.5 kW for Baseline 64 kW for Proposed

2. CO_2 emission savings calculations based on 730 lb/MWh

Exterior lighting power density is also reduced, associated with the use of LED fixtures. The estimated outdoor lighting power use is 64 kW, an approximate 30% reduction. Outdoor lighting is addressed as part of plant auxiliary loads (to avoid double-counting). Updated calculation details are in Technical Appendix H.

5.7.1.4 Air Conditioning, DHW, and Plug Load

Air conditioning baseline and proposed design parameters are in Table 5-13, below:

Table 5-13 Air Conditioning

Model Input Parameter	Baseline (ASHRAE 90.1-2010, App. G)	Proposed
Air conditioners, air cooled, ≥ 65,000 Btu/h and < 135,000 Btu/h	11.2 EER, 11.4 IEER	11.5 EER, 11.9 IPLV

Notes: EER – Energy Efficiency Ratio, IEER – Integrated Energy Efficiency Ratio, IPLV – Integrated Part Load Value

The administration building will have a small (30 gallon) heater for domestic hot water (DHW). The estimated plug load for the administration/offices is 0.88 watts per square foot. Plug load assumed to include those devices in the office/control room area such as work stations, computers, printers and appliances such as refrigerators, etc. Energy Star-rated appliances will be given preferential consideration in the purchasing process, but no specific credit can be taken for reductions from the baseline estimated plug load at this point in the design.

Total calculated energy use for air conditioning, DHW, and plug loads is 99 MWh/year, which equates to indirect emissions of 36 tons of CO2/year. Credit is not taken for air conditioning efficiency improvements and the use of Energy Star appliances, so no difference is calculated "baseline-to-proposed."

5.7.1.5 Heating

The Project baseline is electric resistive heaters, as described in the DEIR. This system has the advantage of being industry standard and part of the basic package design specification for buildings such as this. Heating alternatives are as follows:

- Natural gas from the local delivery system would have a long tie-in for relatively small service, with the significant disadvantage that the piping would compete with available space for other service connections and related lines at a complicated site. Exelon has requested confirmation that supply from the local delivery system is available.
- Natural gas from the high-pressure supply system would involve specialized equipment to reduce the pressure, plus the same complications for connection across a busy site the use of low-pressure gas would have.
- Propane would add delivery complications, and would be more costly, but could be simpler to implement onsite than natural gas.
- Cold-Climate Air-Source Heat Pumps are relatively new technology that allows heating in all but the coldest days (previously, air source heat pumps would be ineffective at temperatures near or below freezing). They have an advantage in that they will serve as both air conditioning and heating systems, but as a relatively new

technology there are concerns regarding whether the system will be properly designed and implemented, and whether it will provide necessary equipment protection and worker comfort.

Calculation of energy use and associated GHG emissions is summarized in Table 5-14, below. This calculation is for the heating season only, based on heating degree days and using the proposed building envelope as described above.

Table 5-14 GHG Reductions from Improved HVAC

Model Input Parameter	Baseline	Proposed (one of the options below to be determined in final design)		
	Electric Resistive Heating	Propane	Natural Gas	Cold-climate air source heat pumps
Administration/offices energy use	60.0 MWh/yr	2390 gal/yr	220 MMbtu/yr	28.6 MWh/yr
Electric room/battery room energy use	5.3 MWh/yr	211 gal/yr	19 MMbtu/yr	2.5 MWh/yr
Total energy use	65.3 MWh/yr	2601 gal/yr	239 MMbtu/yr	31.1 MWh/yr
CO_2 emission factor	730 lb/MWh	13.1 lb/gal	119 lb/MMbtu	730 lb/MWh
CO_2 emission rate	23.8 ton/year	17.1 ton/year	14.2 ton/year	11.4 ton/year
CO_2 reduction from baseline:		At least 28%, depending on final option selected		

The calculation results show that, on a GHG basis, propane, natural gas, or cold-climate air source heat pumps provide a reduction from the baseline of electric resistance heating. Exelon commits to the use of propane heating, natural gas heating, or cold-climate air source heat pumps, depending on final system design. The final system selection will depend on a balance of cost, complexity, and reliability concerns.

5.7.1.6 GHG Mitigation Technologies

To illustrate the Proponent's commitments to GHG reduction at the administration building, Table 5-15 details the GHG Mitigation Technologies examined as part of the GHG Policy analysis. The proponent has committed to a high-performance building envelope, a light or reflective roof, premium electric motors, room occupancy sensors, natural lighting, reduced interior lighting power density, high-performance exterior lighting, Energy-Star appliance and high-efficiency mechanical equipment as part of the building's overall energy reduction strategy.

Additionally, the building will be constructed as PV-ready. Other, less quantifiable mitigation measures will include a recycling collection area and construction waste recycling.

Table 5-15 GHG Mitigation Technologies

KEY: **P** = Proposed Case
A = Examined as alternative
S = to be studied at later design phase - no quantitative analysis, potential for inclusion at a later date
X = Not applicable or not feasible

Mitigation Measure/Technology	Building	Remarks
Building Use	Medway C/A&FS	
Energy Use Reduction		
Building Orientation	P	Building is located south of the noise wall which will provide it more sun and less shading than had it been located on the north side
High performance building envelope	P	Better than code insulation and roof performance proposed
Green roof/podium areas	X	Roof will be light or white
Light or reflective roof	P	Roof will be light or white
Exterior shading devices	X	Not suitable for this type of building
Premium electric motors	P	Proposed
Radiant heat	X	Not suitable for this type of building
Under-floor air distribution/displacement	X	Not suitable for this type of building
Heat or energy recovery	X	Not suitable for this type of building
Demand-controlled Ventilation	X	Not suitable for this type of building
Room occupancy sensors, lighting	P	Proposed for conference rooms, bathrroms, storage, etc.
Natural lighting	P	Typical natural lighting for this building type
Daylighting Controls	X	Not suitable for this type of building
Reduced LPD interior	P	Better than code LPD proposed
High performance lighting, exterior	P	Proposed
Energy-Star appliances	P	Proposed
Advanced elevators	X	Not applicable
High efficiency mechanical equipment	P	Proposed
Energy Generation		
Cogeneration, CHP	X	Not suitable for this type of building
District heating/cooling	X	Not applicable
Fuel cell	X	Not suitable for this type of building
Solar hot water generation	X	Not suitable for this type of building
PV - rooftop	A	Study included in FEIR, will be considered
PV- parking lot	A	Study included in FEIR, will be considered
3rd Party PV	S	Will be studied and considered
PV-ready construction	P	Proposed
Ground source heat pumps	X	Not suitable at a power plant site (air source heat pumps considered)
Wind turbines	X	Not suitable for this type of building
Purchased Green Energy	S	To be studied later in construction
Other Related (not quantified)		
LEED target	X	Not pursued
Owner Influence on tenant (lease provisions, tenant manual)	X	Not applicable
Rainwater harvesting	X	Not applicable, no landscape irrigation
Low flow fixtures, water conservation	X	Code fixtures and measures
Recycling collection areas	P	Proposed
Enhanced refrigerant management	S	To be studied later in design
Energy management system	X	Not suitable for this type of building
Enhanced building commissioning	X	Not suitable for this type of building
Construction waste recycling	P	Proposed
Recycled content materials	S	To be studied later in design
Regional materials	S	To be studied later in design

5.8 Updated On-Site Solar Analysis

This GHG Policy analysis updates the one presented in Section 5.11 of the DEIR. Specifically, this analysis revises the available space on the new Administration building/warehouse, reviews other potential locations for solar PV (including existing buildings and parking spaces), and provides an estimate of financial feasibility. Wetlands resource areas, site access requirements, and other space constraints preclude the use of ground-mounted solar PV onsite.

This updated analysis examines additional on-site opportunities for solar PV installations. The existing power plant roofs do not have the structural capacity to accommodate a PV installation. Additionally, the existing administration building is constructed from converted trailers and is unlikely to support a roof-top solar installation. Further, the existing administration building is in the shadow of the 25 ft noise wall for gas compressors on the north side of the site. However, if these structures were structurally capable and unshadowed, there would be approximately 14,400 sf. of existing rooftop area. If we assume 50% of this area is occupied by rooftop equipment and mechanicals, and 40% of the remaining area would be set aside for setbacks and row spacing, this would leave approximately 4,320 sf remaining for panel areas. This area would result in approximately 67 MWh annually, or a reduction of 24.5 tons of GHG. Calculations and assumptions including panel efficiency are included in Technical Appendix H.

In addition, this updated analysis examines the use of canopy PV at existing and planned parking areas. However, it is noted that when the facilities require modification, renovation or repair, large cranes are located in these parking areas and PV canopies would hinder this work. Even during routine outages, tractor trailers and heavy equipment will need to be temporarily located in parking areas, rendering PV canopies infeasible. Nonetheless, as requested in the FEIR Scope the following is an analysis of the hypothetical GHG reductions from such a canopy solar array. There is approximately 7,400 sf. of parking canopy space available, spread over four parking areas. Using canopy PV in these areas would result in approximately 115.7 MWh annually, or a reduction of 42.2 tons of GHG. Calculations and assumptions including panel efficiency are included in Appendix H.

The planned Administration building/warehouse also has a roof area of approximately 14,400 sf. However, it is noted that this building will be partially in shade due to the noise wall barrier and water tanks. The shading reduces available area for solar PV to approximately 7,200 sf. The new administration building will be built structurally PV ready. Following the same logic as above, approximately 67 MWh of electricity could be produced annually, or a reduction of 24.5 tons of GHG. Calculations and assumptions including panel efficiency are included in Appendix H.

Utilizing the DOER's solar financial modeling spreadsheet, the total potential PV system size of 192.5 kW DC would cost approximately $577,000, and would have a simple payback of 5 years. This assumes 100% cash financing, which is unlikely. The spreadsheet does not account for loss of efficiency due to the PV system being spread over 5 buildings and 4 parking areas. This spreadsheet has been included in Technical Appendix H.

Actual costs and payback periods are a function of the status of incentives, the cost of electricity, net metering, and installation/operation logistics. Based on a preliminary review by Exelon's solar group, for solar PV installation on the administration building roof the estimates in the DOER solar financial modeling spreadsheet may underestimate capital costs by 30%, and may underestimate operating and maintenance costs by a factor of five.

The only technically feasible onsite location for solar PV is on the unshaded portions of the new administration building. The planned building will be built solar-ready. During final design, Exelon will review development of a solar PV array on administration building roof with potential to offset approximately 24.5 tons per year GHG emissions, and implement solar PV if technically and economically feasible. If solar PV on the administration building roof is not technically feasible at Project construction, Exelon will review feasibility of PV retrofit on a periodic schedule.

5.9 Summary of Offsite Mitigation

As discussed in Section 1.0 of this FEIR, Exelon has signed a Host Community Agreement (HCA) with the Town of Medway and has reached agreement on a Payment In Lieu Of Taxes (PILOT) agreement with the Town. These agreements are included in this FEIR as Appendices C and B, respectively. The PILOT agreement is valued at approximately $73,000,000 over a 20-year period. Also, with certain caveats, Exelon agrees to the pay the Town $5 per megawatt hour for power generated using ULSD. On an annual basis, 10 days (full load equivalent) of ULSD operation would result in a payment of approximately $240,000 to the Town of Medway.

The Town of Medway is already a leader in the field of energy efficiency and renewable energy initiatives, as witnessed by their local energy action plan (http://www.townofmedway.org/Pages/MedwayMA_Bcomm/Energy/Medway%20Energy%20Action%20Plan_Combined.pdf) and its participation as a Massachusetts Green Community. Recognizing that the Proposed Project will put very little burden on Town services, the Town is in an excellent position to fund energy efficiency projects as described by MEPA, without being forced to do so. Decisions as to how to use the PILOT and ULSD penalty revenues are, of course, a matter for the Town, its elected leaders and citizens to decide.

Also, as stated in Section 5.13 of the DEIR, Exelon will support and sponsor a program (contributing at least $20,000 per year over the life of the Project) with funds to be utilized by the Medway Public Schools, the Medway Energy Committee, and the Town, for purposes related to energy conservation awareness, including, but not limited to, public awareness and education, energy efficiency expenses and programs, energy grants and support for Medway's activities as a "Green Community" approved by the Massachusetts Department of Energy Resources.

Exelon has provided and will continue to offer specific energy efficiency assistance. As discussed further in Section 8.0 of this FEIR, Exelon has also funded a leak detection study for the Town of Medway water distribution system, finding major leaks that (once repaired) allowed a reduction in electricity use by the Town well pumps. The annual total electricity use for the 12 months before the water leak was corrected (7/2014 through 6/2015) was 627.3 megawatt-hours (MWh). After the water leak was corrected, the electricity use dropped 30% (difference between 2014/2015 totals for the available July-November time frame). An annual 30% electricity use decrease will result in a savings of 187.4 MW-hr/year. The electricity use reduction will result in a savings of 68.4 tons of CO_2 per year. Assuming a retail electricity cost of $0.20/kW-hr this will result in a cost savings of over $37,000/year for the Town of Medway.

Looking forward, Exelon has a division that develops renewable energy projects including municipal-scale solar PV projects. Exelon will offer to meet with the Town of Medway to review options that Exelon can offer for municipal renewable energy projects.

5.10 Updated Summary and Commitments

5.10.1 Consistency with the Objectives of MEPA Review

The GHG analysis in the DEIR and this FEIR document serves to calculate the Project baseline, estimate emissions associated with the preferred alternative, and outline and commit to a series of mitigation measures that will help to reduce GHG emissions from the Proposed Project. The Project is consistent with the objectives of MEPA guidelines, one of which is to document the means by which damage to the environment can be avoided, minimized and mitigated to the maximum extent feasible.

Mitigation measures that were considered are summarized in Table 5-16, with justification comments, and the related decision.

Table 5-16 Mitigation Measures Summary

GHG Mitigation Measure	Decision	Reasons/Comments
Pressure Drop Minimization – Flow Distribution (FEIR Section 5.5.1)	Adopted	Back pressure due to flow distribution, duct losses, and acoustic treatment are minimized to the extent feasible while maintaining the required turbine performance, system layout, and noise control.
Pressure Drop Minimization – Duct Losses (FEIR Section 5.5.1)	Adopted	Back pressure due to flow distribution, duct losses, and acoustic treatment are minimized to the extent feasible while maintaining the required turbine performance, system layout, and noise control. SCR/CO module configuration based on computational fluid dynamics and avoidance of flow disturbances.
Pressure Drop Minimization – Acoustic Treatment (FEIR Section 5.5.1)	Adopted	Back pressure due to flow distribution, duct losses, and acoustic treatment are minimized to the extent feasible while maintaining the required turbine performance, system layout, and noise control.
Pressure Drop Minimization – Stack Diameter Increase (FEIR Section 5.5.1)	Rejected	Diameter increase has negative impact on ambient air quality impact and stack visibility, and significant cost for relatively minor GHG reduction
Pressure Drop Minimization – Catalyst Cross Sectional Area Increase (FEIR Section 5.5.1)	Rejected	Measure jeopardizes LAER and BACT compliance, limited available space, cost, and potential negative impact to ambient air quality impact
Evaporative Cooling(FEIR Section 5.5.2)	Rejected	Measure would significantly increase fresh water consumption (which may not be available) and the economic penalty of installing the system outweigh GHG improvements
Ammonia Vaporization by Hot Gas Recirculation (FEIR Section 5.5.3)	Study Further	Exelon will continue to work with SCR/CO module manufacturers to review this option and determine if it is technically and economically feasible
GSU Transformers (FEIR Section 5.5.4)	Adopted	Exelon has tentatively selected Hyundai as the supplier for the GSU and auxiliary transformer for a reduction in GHG emissions by 428 tons/yr when compared to the highest-impedance transformers analyzed (there is also a trade-off on impedance with practicality to withstand associated short circuits and this is balanced in detailed design).
Electric Transmission Efficiency (FEIR Section 5.5.5)	Adopted	Relatively short connection from the Project to substation that makes use of a conductor system that balances installed cost with reduced resistance and reliability.
Limiting Facility Operation to Full-Load Operations (FEIR Section 5.6)	Rejected	This would eliminate the key goal of the Project to assist ISO-NE with load following generation
Further Limiting Facility Operation on ULSD (FEIR Section 5.6)	Rejected	This would eliminate the key goal of providing reliable capacity to the electric market. This can also result in ISO-NE dispatching lower-efficiency oil-fired units that generate higher GHG emissions in times of low natural gas availability and high natural gas prices.
Detection and Avoidance of Methane Leaks to Manufacturer's Recommendations and Industry Guidelines (FEIR Section 5.6.1)	Adopted	Leaks are minimized through system leak checks and monitoring to manufacturer's recommendations and industry guidelines.
Detection and Avoidance of Methane Leaks Beyond Manufacturer's Recommendations and Industry Guidelines (FEIR Section 5.6.1)	Rejected	System checks and monitoring beyond the manufacturer's recommendations and industry guidelines are unlikely to result in actual reduction in leak rates, so no mitigation beyond the baseline case that is adopted is feasible.

Table 5-16 Mitigation Measures Summary (Continued)

GHG Mitigation Measure	Decision	Reasons/Comments
Use of Combined-Cycle Turbine (FEIR Section 5.3 and DEIR Section 5.5)	Rejected	The as-defined simple-cycle GE LMS100 CTGs were bid to meet ISO-New England's capacity and ancillary service needs and were sized to align with available space on-site. . A combined-cycle is also unlikely to have a flexible enough operating range for this Project given ISO dispatch.
Most Efficient Combustion Turbine (CTG) (FEIR Section 5.4)	Adopted	Exelon has selected CTGs with industry-leading energy efficiency and appropriate turndown and scale.
Implementation of Modern Instrumentation and Control Package (DEIR Section 5.8.2)	Adopted	This control package will be designed and maintained to control turbine operation, including fuel and air flow, to optimize combustion for control of criteria pollutant emissions (NOx and CO) in addition to maintaining high operating efficiency to minimize fuel usage over the full range of operating conditions and loads.
Periodic Maintenance (DEIR Section 5.8.3)	Adopted	Inspection and tune up of equipment to restore performance to near original conditions will be implemented. This will allow for the maintenance of condition, high efficiency, and reliability.
Use of Efficient Natural Gas Compressors (DEIR Section 5.8.6)	Adopted	The Project will use efficient compressors to meet manufacturer minimum inlet pressure limits and to minimize electricity use, while responding to changes in both the gas supply pressure and Project electricity generation
Efficient Ventilation and Pumps (DEIR Section 5.8.8)	Adopted	Fans and pumps on each CTG enclosure will use high efficiency motors. Other fans and pumps will also use high efficiency motors, as will ventilating units in other enclosures and the singular Facility building. Efficiency and noise attenuation required careful balance.
Use of Variable Frequency Drives (DEIR Section 5.8.8)	Rejected	The Project design generally avoids the need for VFDs by having systems that operate at full load, or by having banks of systems that can be sequentially turned on and off to meet demand (e.g. cooling fans).
Alternative Battery Technologies (DEIR Section 5.8.11)	Rejected	Given the intermittent charging requirements and the small difference in efficiency, the potential for GHG reductions is small (about one ton CO2 per year). Alternative battery technology cannot supply for long enough periods.
Minimization of Sulfur Hexafluoride Leaks (DEIR Section 5.8.12)	Adopted	Exelon expects little to no leakage of SF6, based on the purchase and maintenance of equipment with leakage guarantees and pressure monitoring; said breakers will be continuously monitored.
Use of Solar PV array on Administration Building Roof (FEIR Section 5.8 and 5.10.3)	Study Further	Implementation will occur if the mitigation measure is deemed technically and economically feasible
Use of Solar Hot Water Systems (DEIR Section 5.12)	Rejected	There is no significant need for thermal energy at the Property or nearby and hot water demand by a small (6-person) operating staff will be small and infrequent.
Efficient Building Design for Administrative Building (FEIR Section 5.10.3)	Adopted	Administrative building designed with improved insulation, and either high-efficiency gas or propane heating or cold-climate air source heat pumps (to be determined in final design).
Efficient Lighting (FEIR Section 5.10.3)	Adopted	Project will make use of LED reduced lighting power for interior and exterior lighting, which constitutes an ~30% improvement from current interior lighting code requirements

5.10.2 Emissions Summary

Summarizing emissions and mitigation measures across the DEIR and FEIR as described in Table 5-16 above, baseline and Proposed Project emission rates are summarized in Table 5-17 below.

Table 5-17 Baseline and Proposed Emissions Summary

	Baseline CO2 tons/year, expected actual	*Proposed CO2 tons/year, expected actual*
Combustion Turbine (CTG), direct emissions	377,000	377,000
Auxiliary Electric loads, indirect emissions (except transformers)	12,400	11,300
Transformers, indirect emissions	1,819	1,324
Transportation, direct emissions	77	77
Building electricity use, indirect emissions	78	57
Building heat (baseline indirect, proposed direct emissions)	24	17
Engines, direct emissions	16	16
Methane leaks*	13	13
SF6 leaks*	0	0
Total, rounded	391,414	389,791
	Reduction from Baseline:	0.41%

* per MEPA guidance, totals include CO2 emissions only

The summary above does not account for the most significant Project GHG reduction, which is the selection of the highly-efficient GE LMS100 turbine as combustion turbine for the Project. Most of the available efficiency improvements that allow GHG reductions have already been pre-engineered into the GE system. As stated in Section 5.2 of the DEIR, the Medway Project will more than offset its own emissions and will lead to overall emission reductions in the region's electric system. Using conservatively low estimates of the Project's projected generation output, the analysis shows that the Proposed Project would lead to a net reduction in overall cumulative CO_2 emissions in the region by over 226,000 tons for the 2018-2030 period. If the Project operates more, the net reduction will be higher. As such, the Project itself can be considered a GHG mitigation measure, reducing regional GHG emissions.

5.10.3 Commitments

Summarizing the specific GHG-related commitments made in the DEIR and this FEIR, Exelon commits to the following:

- use of efficient GE LMS100 turbines over all other less efficient generators;

- acquisition of one RGGI allowance for each ton of CO2 emitted (contributing to energy efficiency and other programs funded through RGGI);
- review with GE the options to use hot gas recirculation for aqueous ammonia vaporization in the SCR systems, and implementation if technically and economically feasible;
- review of solar PV array on administration building roof with potential to offset approximately 24.5 tons per year GHG emissions, and implementation if technically and economically feasible;
- if solar PV on the administration building roof is not technically feasible at Project construction, construct the administration building roof as solar-ready, enabling retrofit of PV in the future, and review feasibility on a periodic schedule;
- administrative building envelope designed to meet or exceed the 8th Edition of the Massachusetts Building Code, obtaining an approximate 9% improvement in energy efficiency in the heating season;
- use of natural gas, or propane/LP gas, combined with an efficient condensing furnace, for administration building heat, or alternatively Cold-Climate Air-Source Heat Pumps and condensers for heating and air conditioning;
- use of switchable LED-based lighting fixtures for interior and exterior lighting constitutes an ~30% improvement from current lighting code requirements;
- Energy Star-rated appliances will be given preferential consideration in the purchasing process (very few appliances exist in the Project configuration);
- Certification to the MEPA Office indicating that all of the measures proposed to mitigate GHG emissions, or measures that will achieve equivalent reductions, are included in the Project (Section 5.10.4);
- Exelon's renewable project division will offer to meet with the Town of Medway regarding options that Exelon can offer for municipal-scale renewable energy projects;
- Contribution of at least $20,000 per year over the life of the Project to the Town of Medway dedicated to the development of an energy conservation awareness program;
- Neither Exelon nor the high pressure gas supplier will use natural gas or any other or non-inert or GHG in any blow-out cleaning of the Project piping (NFPA 56 standards will be complied with).

- Regular Exelon operator rounds will verify the absence of leaks in natural gas piping and SF6-insulated circuit breakers. These breakers will also be procured with maximum leakage guarantees and means for on-line monitoring.

5.10.4 Self-Certification

Consistent with the instructions in the MEPA GHG Policy and Protocol and in comment MEPA 25, Exelon will provide a self-certification to the MEPA Office at the completion of the Project that will be signed by an appropriate professional (e.g. engineer, architect, transportation planner, general contractor) indicating that all of the GHG mitigation measures, or equivalent measures that are designed to collectively achieve identified reductions in stationary source GHG emission and transportation-related measures, have been incorporated into the Project. Section 11.0 of this FEIR summarizes mitigation commitments, including GHG mitigation commitments, and includes draft Section 61 findings for use by agencies issuing Project permits, including a draft Section 61 finding that the Project will provide the self-certification.

Section 6.0

Climate Change Resiliency and Adaptation

6.0 CLIMATE CHANGE RESILIENCY AND ADAPTATION

6.1 Site Elevation, Potential Flooding

As shown on mapping in the DEIR, the Project Site is located at an approximate elevation of 201 feet MSL (NAVD88). The Project Site is located well inland, approximately 24 miles from Boston Harbor and approximately 30 miles from the open Atlantic, just outside Hull. Accordingly, sea level rise is not an issue for this Project.

As was also noted in the DEIR, Section 9.3, the Project Site itself is located approximately 570 feet from the nearest floodplain, and the portion of the Project Site in closest proximity to the floodplain lies approximately 15 feet above the floodplain elevation. Therefore, the Project Site is not at risk of flooding from Hopping Brook or the upper Charles River.

As discussed in Section 7.0 of this FEIR, the site stormwater system is designed such that the post-development peak runoff rates will not exceed the pre-development peak runoff rates up to and including the 100-year storm event. Infiltration has been maximized to reduce the overall stormwater discharge from the site. The proposed stormwater management system will provide an average annual recharge of 15,528 gpd. The required recharge rate for the Proposed Project is 7,800 gpd. Accordingly, the proposed stormwater management system will recharge an additional 7,728 gpd, which is nearly 100% more recharge than is required under the MADEP Stormwater Handbook. Infiltration basins and rain gardens have been designed to fully dewater within 72 hours. Accordingly, the proposed stormwater management system will contribute to base flow of nearby wetlands and streams rather than surface flow, which will reduce the potential for off-site flooding.

Further, the stormwater management system has been designed to improve water quality through pre-treatment prior to recharge. The proposed system is anticipated to achieve an 83.5% reduction in total phosphorous for the Proposed Project. Furthermore, the weighted average reduction for the existing and proposed facilities is anticipated to be 46.5%. Accordingly, the Project Site will achieve a significantly greater reduction than the total phosphorous target reduction of 32% for the Town of Medway in accordance with the Draft MA MS4 General Permit. In addition, the proposed system meets MassDEP standards for removal of total suspended solids with BMPS including the deep sump hooded catch basins, water quality treatment systems, and rain gardens. Accordingly, the Proposed Project will be adaptive to the potential for increased rainfall associated with climate change, thereby protecting the water quality of nearby rivers and streams.

6.2 Project Design Features, Reliability and Resiliency

As discussed in the DEIR, the Project successfully bid into ISO-NE's Forward Capacity Auction #9 on February 2, 2015 with a bid for 195 MW peaking project to sell power into the SEMA/RI load zone. The Project is obligated to be on line by June 2018 and will be subject to ISO-NE's "Pay-for-Performance" program. Under this program, a generator that is not available when called on by ISO-NE to run is subject to serious financial penalties. While utility scale power generation and transmission facilities are designed, built and maintained to operate reliably under a wide range of conditions, the FCA and accompanying "Pay for Performance" program provides an additional incentive for reliability which is reflected in the design on the Proposed Project.

Siting, equipment selection, design and maintenance features which support highly reliable operations and resiliency include:

- The Project will be owned and operated by Exelon West Medway II, LLC. Exelon is one of the Nation's leading competitive power operators, with approximately 32,000 MW of capacity across the country and will bring its depth of expertise and experience to the Project;

- Site location: The Medway site is located well inland at an elevation of approximately 201 ft.;

- The core of the Project is two GE LMS100 aeroderivative simple-cycle combustion turbines. The LMS100 is a robust and proven generation technology. As of March 2015, there were 51 GE LMS100 units in commercial operation worldwide. Thirty-five of the fifty-one units are operating in the United States. With units located in climates ranging from near equatorial (Venezuela), to hot and arid (New Mexico, Texas) to colder areas (Montana, Canada), the LMS100 operates across a very wide range of temperatures. As of March 2015, the GE LMS100 fleet had accumulated over 370,000 operating hours and more than 47,000 total starts. GE fleet data shows availability of 98.66% with reliability at 99.83% (12-month rolling average data).

- The Project is equipped with a 475 kW diesel emergency generator as well as diesel powered fire pump;

- Electric transmission: The Project is located immediately adjacent to an Eversource 115 kV switching station and a network of 115 kV transmission lines. The short (1,100 ft.) 115 kV connecting line will be built to utility standards. The transmission lines are designed to maintain proper clearances under conditions of maximum ambient temperatures combined with maximum load (i.e., maximum sag);

- Natural Gas Supply: the Project is located in the immediate vicinity of the main Spectra/Algonquin high pressure interstate gas pipeline serving eastern Massachusetts. The Project has two 100% capacity on site gas compressors;

- Backup Fuel: the Project will use ULSD as a backup fuel with a new 1 million gallon storage tank. The site is readily accessible from I-495 for ULSD fuel oil deliveries;

- The site access road and perimeter interior road will be paved so as to facilitate deliveries under all weather conditions (demineralizer trailers, aqueous ammonia, ULSD, etc.). The site area is accessed via I-495 and two state highways;

- The Project will have 950,000 gallons of water storage on site (raw water, finished water) as well as arrangements for trucked water should there be any issues with the normal water supply (on-site well, Town of Millis water conveyed via the Medway system);

- The Project Site is primarily open field with some hedge rows and some deciduous trees on the east side of the site. The trees will be cleared as part of site development, thus removing any risk of trees falling on facilities near the perimeter of the site;

- Facility design will be by a team of experienced engineers and subject to a long list of structural, mechanical, electrical and fire protection codes and standards (see Table 6-1). Facility components which are specific to the Project (i.e., the 55-foot tall perimeter sound wall) will be designed and constructed for worst case local conditions;

- The entire facility will be of robust utility grade construction;

- The site will be fenced and will have other security features.

As noted above the entire facility will be of robust utility grade construction. The potential local changes associated with climate change (small increases in current high summer temperatures, increased frequency of severe weather, etc.) are all well within the design tolerances of the Project. The GE LMS100 has a proven track record of operating reliably in areas where existing ambient temperatures routinely exceed high temperatures experienced in New England, plus the potential for increases of a few degrees resulting from climate change.

Lastly, the completed Project will be operated by experienced engineers and plant operators and will be carefully maintained throughout its operating life. For perspective, meticulous maintenance practices have allowed for the longevity of existing equipment at the existing West Medway facility including three 45 MW electric generators, each powered by two combustion turbines. The existing equipment was installed in 1970, and remains in excellent operating condition. Similar maintenance practices will be utilized at the Project.

Looking forward, the potential effect of climate change/temperature increases on electric power demand is appropriately dealt with by ISO-NE at a regional level. The power grid (generation, transmission, distribution, demand response) is structured to deal with peak demands as typically experienced during several consecutive weekdays of hot and humid weather. Looking out over several decades, and assuming all other things remain unchanged, a few degree increase in ambient temperature during such a "heat wave" could result in a small increase in peak demand. However, over a span of several decades, a number of other factors should serve to offset growth in the peak demand (and off peak use). Examples include the routine change-out of older air conditioning units, refrigerators, dehumidifiers and other appliances with more energy efficient current models; ongoing energy conservation programs as funded by charges on residential, commercial and industrial electric bills, and the continued ability of demand response programs to compete with generation. Of course, population growth and increases in commercial and industrial activity could push the curve in the opposite direction. These potential changes, coupled with increasing use of intermittent renewables, underscore the need for efficient, flexible and responsive generation as is being proposed by Exelon.

Table 6-1 West Medway II Generating Station Codes and Standards

1. Acoustics Society of America (ASA)
2. American Association of State Highway and Transportation Officials (AASHTO)
3. American Bearing Manufacturers Association (ABMA)
4. American Concrete Institute (ACI)
5. American Gear Manufacturers Association (AGMA)
6. American Institute of Steel Construction (AISC)
7. American National Standards Institute (ANSI)
8. American Petroleum Institute (API), including RP 500
9. ASTM International (ASTM)
10. American Society of Civil Engineers (ASCE)
11. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), including: a. ASHRAE 90.1 Energy Standard
12. American Society of Mechanical Engineers (ASME)
13. Americans with Disabilities Act (ADA)
14. American Water Works Association (AWWA)
15. American Welding Society (AWS)
16. Asphalt Institute (AI)
17. Concrete Reinforcing Steel Institute (CRSI)
18. Crane Manufacturer's Association of America (CMAA)
19. FM Global (insurance carrier requirements)
20. Heat Exchange Institute (HEI)
21. Hydraulic Institute (HI)
22. Illuminating Engineering Society of North America (IESNA)
23. Institute of Electrical and Electronics Engineers (IEEE)
24. Insulated Cable Engineers Association (ICEA)
25. International Building Code (IBC), as adopted by Massachusetts Building Code

Table 6-1 West Medway II Generating Station Codes and Standards (Continued)

26. International Society of Automation (ISA)
27. Manufacturers Standardization Society (MSS)
28. Massachusetts Base Building Code (MBBC 780-CMR) 8th Edition, Massachusetts Fire Code, and Massachusetts Plumbing Code
29. Massachusetts Department of Environmental Protection (MassDEP) standards
30. Massachusetts Department of Transportation (MassDOT) standards
31. Metal Building Manufacturers Association (MMBA)
32. National Association of Architectural Metal Manufacturers (NAAMMA)
33. National Electrical Manufacturers Association (NEMA)
34. National Electric Safety Code (NESC)
35. National Fire Protection Association (NFPA), including: a. NFPA 70, National Electrical Code (NEC) (2014 Edition) as amended by 527 CMR 12.00: Massachusetts Electrical Code b. NFPA 497 Classification requirements c. NFPA 850 Power Plants
36. North American Electric Reliability Corporation (NERC)
37. Occupational Safety and Health Administration (OSHA)
38. Sheet Metal & Air Conditioning Contractor's National Association (SMACNA)
39. Society of Protective Coatings
40. The Greenbook – Standard Plans for Public Works Construction
41. The Greenbook – Standard Specifications for Public Works Construction
42. Town of Medway Codes and Ordinances
43. Tubular Exchanger Manufacturers Association (TEMA)
44. Underwriters Laboratories (UL)
45. U.S. Environmental Protection Agency (EPA)
46. U.S. Occupational Safety and Health Administration (OSHA)

Section 7.0

Wetlands and Stormwater

7.0 WETLANDS AND STORMWATER

7.1 Wetlands

7.1.1 Wetlands Delineation

As described in the DEIR, Section 9.0, wetland resource areas were delineated on and adjacent to the Project Site in the vicinity of proposed work. The purpose of the delineation was to define the extent of wetland resource areas and buffer zones regulated under the Massachusetts Wetlands Protection Act ("WPA") (MGL Ch. 131 § 40), Sections 401/404 of the U.S. Clean Water Act (CWA, 33 U.S.C. 1344), and Town of Medway Wetlands Bylaw. Delineated wetland resource areas on and adjacent to the Project Site were shown on DEIR Figure 9-1, "Wetland Resource Areas, Buffer Zones and Proposed Impact Locations".

On September 8, 2015, the Medway Conservation Commission issued an Order of Resource Area ("ORAD") (MassDEP File No.216-0849) confirming the extent of state and locally-regulated wetland resource areas, as depicted on the figures provided herein. A copy of the ORAD and the accompanying "Resource Area Delineation Plan" was provided in Attachment J of the DEIR.

Subsequent to the issuance of the ORAD the Medway Conservation Commission Agent identified an additional pocket wetland (~183 sf. ±) located in the vicinity of the previously delineated linear shaped Bordering Vegetated Wetland (BVW) (Flag Series 8/C, "BVW-8/C") situated to the west of the proposed Facility within Eversource's transmission line right-of-way. The small, well defined BVW (identified as Flag Series Z, "BVW-Z") is separated from the larger BVW-8/C by a gravel access road; although it appears to have originally been created as a small ditch during construction of an adjacent underground 24-inch clay tile drain. This drain begins in the BVW-8/C wetland and traverses south under the gravel road, vegetated area, and the Eversource 115 kV switchyard towards West Street. As requested by the Commission's Agent, this additional BVW was field delineated, surveyed and incorporated onto the current drawing set (see Figure 1-7).

Based on the final approved wetland boundaries, the recently delineated BVW-Z, and refinements to the conceptual design, the proposed electric transmission line interconnection work adjacent to the existing Eversource 115 kV switchyard will result in approximately 206 sf. of permanent BVW fill (± 53 sf. of BVW-Z and ± 153 sf. of BVW-8/C). An additional approximately 323 sf. of temporary alteration to the BVWs will occur during the construction process. The temporarily altered area of BVW will be restored substantially to its preexisting condition upon completion of the work. To mitigate impacts associated with the permanent BVW alterations, the Proponent is proposing to create approximately 500 sf. of new BVW. The proposed more than 2:1 impact to replication ratio exceeds the requirements of the Wetlands Protection Act regulations which only require that the replacement area shall be equal to the lost area. The potential location of the BVW replication area is depicted on Figure 1-7. These proposed mitigation measures will ensure that the proposed work will not permanently impair the BVW's ability to perform the functions identified in the Wetlands Protection Act regulations and further demonstrates that the proposed work will not have an adverse effect upon the interests protected under the Act. The final design, location and construction details of the BVW replication and restoration areas will be worked out with the Conservation Commission through the Notice of Intent review process.

7.1.2 Pipeline Wetlands Considerations

As was reported in the DEIR, the proposed route of the pipeline that will carry natural gas to the Proposed Project from a Spectra/AGT meter station northwest of the Summer Street Site near Route 109 was refined to minimize wetlands impacts. It should be noted that the proposed pipeline interconnection location was selected with input from Spectra. A potential interconnection point further to the south was not selected because of its proximity to residences to the west of the Exelon property.

Temporary BVW/IVW impacts to install the approximately 3,080-linear-foot gas pipeline will occur in three discrete locations along the pipeline route totaling approximately 1,241 square feet of temporary BVW impact and 734 square feet of temporary IVW impact (see Figure 1-7). These BVW/IVW impacts are conservatively based on an approximately 50-foot wide construction workspace corridor centered over the pipeline.

As shown on Figure 1-8, the pipeline itself crosses only one BVW area, that being a narrow portion of a wetland area to the north of the Exelon 94-acre parcel. By locating the necessary crossing at the narrowest part of the wetland, the actual length of the crossing is limited to approximately 10 feet. The computed temporary impact area of approximately 880 square feet is based on an assumed 50-foot wide construction area. Given the very limited length of the crossing, it may be possible to reduce this impact area by staging equipment on either side of the wetland itself. This will be examined in further detail as the Notice of Intent filing is prepared for submittal to the Medway Conservation Commission. The use of HDD or other trenchless crossing techniques, is not, in the opinion of the Project, warranted to avoid such limited temporary BVW impacts. Moreover, use of HDD or jack and bore in this area would be very difficult because of the close proximity of the existing Spectra/AGT high pressure interstate gas line. As shown on Figure 1-8, the high pressure gas line is less than 100 feet to the west of the very short wetlands crossing.

The balance of the noted BVW/IVW impacts arise from the assumed 50-foot work area for the pipeline as it passes between two mapped wetlands areas just to the northwest of the existing Exelon 135 MW power station (see Figure 1-9). The pipeline itself has been routed to avoid the small mapped BVW and small IVW on the north side of the pipeline route. As with the short wetland crossing discussed above, it may be possible to reduce these impact areas by limiting work to the 25-foot area between the two mapped wetlands and/or by staging equipment on either side of the mapped wetlands thus reducing the assumed 50-foot wide construction area. This will be examined in further detail as the Notice of Intent filing is prepared for submittal to the Medway Conservation Commission. Given the very limited temporary impacts, the use of HDD or other trenchless crossing techniques, is not warranted in this area. Moreover, the pipeline has a bend in this immediate area, thus complicating any trenchless crossing. Further, the south side of any trenchless crossing would require work in the immediate proximity of the existing 135 MW generation facility and its electric connection to the adjoining switchyard, with attendant reliability and personnel safety concerns. As shown on Figure 1-9, these facilities are located less than 50 feet from the pipeline as it passes between the small BVW and small IVW.

7.2 Stormwater

7.2.1 Existing Conditions

The 94-acre Exelon Property is generally bordered on the north by land abutting Route 109/Milford Street, on the east by Route 126/Summer Street, and on the south and west by West Street. The Property is largely developed and contains the nominal 135 MW West Medway Generating Station peaking facility on approximately five (5) fully-fenced acres. The 5-acre site is occupied by buildings and paved surfaces. In addition, a 345 kilovolt ("kV") switchyard, a 115 kV switchyard, and extensive transmission line easements are located on approximately 54 acres of the Exelon Property, generally to the west of the existing and proposed facility. The switchyards areas are finished with crushed stone, the transmission line easements are largely vegetated (low growing vegetation).

The Proposed Project will occupy approximately 15 acres on the east side of the Exelon Property. As described in Section 1.0, approximately 4 acres of the Project Site will be impermeable surface with a balance of a mix of crushed stone and vegetated areas. The proposed Project Site is currently vegetated, primarily by mowed grass fields separated by hedgerows.

The remainder of the overall 94-acre parcel (approximately 20 acres), is a mix of wooded and open field areas. As shown on Figure 1-7, the eastern portion of the Property contains a section of Center Brook and associated bordering vegetated wetlands (BVW). The southwestern corner and the northern boundary of the Property also contain BVW.

7.2.2 Existing Stormwater Management System

The five acres occupied by the existing 135 MW generating facility drains to a series of catch basins and trench drains that convey runoff to a 22,000 gallon oil-water separator for treatment. From the oil-water separator, runoff is conveyed to an existing detention basin located to the west of the existing facility. The detention basin was designed with a multi-stage outlet and retains flows up to the 100-year design storm. The outlet control structure conveys runoff to a 24-inch culvert that daylights to the BVW located to the southwest of the existing facility.

The Project Site is located on the hydrologic divide between two tributary streams in the upper reaches of the Charles River watershed. Runoff from the Project Site drains to the east to Center Brook and to the west toward Hopping Brook. South of the Property, Hopping Brook and Center Brook merge and drain into the Charles River. To ensure the Proposed Project development will not cause flooding on abutting properties the hydrologic analysis considered four primary locations: Center Brook, Summer Street Abutters, West Street Abutters, and On-site BVW. These design points have been named correspondingly in the hydrologic analyses. The existing facility is up-gradient from the Project Site. Runoff from the Project Site does not enter the existing detention basin and will not impact the stormwater management system for the existing facility.

The site does not contain, nor is it tributary to, any Critical Areas as defined.

7.2.3 Proposed Stormwater Management System

During the design phase of the site layout, consideration was given to conserving environmentally sensitive features and minimizing impact on the existing hydrology. To achieve this, extensive grading was avoided and the site was designed to match the existing terrain where feasible. Minimizing earthwork helps to maintain the existing drainage patterns to the maximum extent practicable under post-development conditions. On-site resource areas, such as the BVW along the perimeter of the Project Site, were excluded to the maximum extent from the development envelope. Through careful site planning the proposed impervious surfaces have been minimized. Large portions of the power block, fuel gas yard and switchyard are proposed to be surfaced with crushed stone, a pervious surface. . As discussed in Section 3.0, the impervious areas associated with the roadways and parking area were minimized, while complying with local bylaw requirements and providing the necessary vehicular safety.

The stormwater management system is depicted in Figure 7-1. Please note that the stormwater system as depicted on this this conceptual drawing is the basis for a more detailed set of design drawings which are being finalized and will be included in upcoming submittals to the Town of Medway (NOI, Site Plan Review).

A copy of the Draft Stormwater Management Report is provided as Technical Appendix D.

7.2.4 Construction-Period BMPs

Figure 7-2 locates the construction-period parking, staging and laydown areas and BMPs. As shown on the figure, the Proponent has sited the construction parking, staging, and laydown areas to avoid wetlands resource areas and their associated buffer zones. The construction parking, laydown and staging areas total approximately 5.8 acres.

Similarly, the Proponent has endeavored to minimize the use of future permanent stormwater BMP areas for construction stage laydown and staging. However, given the extent of the necessary laydown and staging areas and the need to maintain proximity to the active construction area, some overlap is necessary. Accordingly, the Proponent has taken measures to deal with potential construction-related impacts on the permanent stormwater system.

- The bioretention area will be composed of engineered layers of planting medium and other materials. Any areas disturbed during construction will be excavated and replaced with new material.

- The primary infiltration basin will be constructed in two stages. During the construction phase, only the western portion of the basin will be constructed to provide sufficient sedimentation control volume. The sedimentation basin bottom elevation will be one foot higher than the final grade during the construction period. Following substantial completion of site work, the remainder of the infiltration basin will be excavated, and the basin bottom elevation will be lowered to final grade. This phased approach will remove the limited area of soils impacted from sedimentation during construction.

- Construction parking areas will be surfaced with crushed stone. This permeable surface treatment provides a suitable all-weather surface, minimizes dust, and helps to limit sediment runoff.

7.3 Upper-Middle Charles River Nutrient TMDL

The Property is located within Charles River watershed, which has a drainage area of approximately 310+ square miles (198,400 acres); the Charles River ultimately drains to Boston Harbor.

The 13-acre Proposed Project is tributary to the Upper Charles River. The Massachusetts Department of Environmental Protection has issued two Total Maximum Daily Loads (TMDLs) for this portion of the Charles River. The first is a Final Pathogen TMDL for the Charles River Watershed, dated January 2007. This TMDL address bacterial and other fecal-related pollution, which are largely caused by the improper management of human wastes, barnyard animals, pet feces and agricultural applications.

The Proposed Project will connect to the municipal sewer and will not cause further pathogen impairment of the Charles River. The site will be fenced and will be off limits to the public and any pets. There are no barnyard animals on the site, nor any agricultural applications of manure. In accordance with the recommendations of Mitigations Measures to Address Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts, prepared for USEPA New England Region 1, stormwater infiltration has been maximized on-site to reduce the overall stormwater discharge from the site, which in turn reduces the probability of pathogens discharging from the site.

Additionally a Long Term Pollution Prevention Plan and Long Term Operation and Maintenance Plan has been developed for the site outlining source control measures and will ensure that the stormwater management system continues to operate as designed.

The second TMDL released for this portion of the Charles River is the Total Maximum Daily Load for Nutrients in the Upper/ Middle Charles River, Massachusetts, dated May 2011. The pollutant of concern for this TMDL is phosphorus. In addition, the Draft MA MS4 General Permit released by the Environmental Protection Agency on September 30, 2014 requires that the Town of Medway reduce the its total phosphorus discharge from stormwater by 32%.

The proposed stormwater management system maximizes on-site stormwater infiltration which is an effective way to mitigate phosphorus in stormwater runoff. In addition, good housekeeping controls such as regular maintenance of the stormwater management system will also be performed to reduce the overall phosphorus loading from the site. Calculations demonstrating the total phosphorus removal achieved by the stormwater management system are provided in the Stormwater Management Report. The Proponent anticipates achieving greater than 65% reduction in total phosphorous for the Proposed Project and anticipates that the weighted average reduction for the existing and proposed facilities will be greater than or equal to 32%.

Hopping Brook is listed in the Massachusetts Year 2014 Integrated List of Waters as Category 2 water, which means it has been found to be unimpaired for some uses, specifically aquatic life and aesthetics. It has not been assessed for primary or secondary contact recreation, or fish consumption. No TMDLs have been assigned to this water body.

Center Brook to the east of the Property has not been assessed by the Massachusetts Integrated List of Waters program, and does not have a TMDL or impairment assigned to it.

The Proposed Project will not cause further impairment to Hopping Brook or the un-named brook to the east of the site. The proposed stormwater management system will be designed in accordance with the 2008 MassDEP Stormwater Handbook and applicable location regulations and will provide adequate water quality treatment, total suspended solids removal, and groundwater recharge.

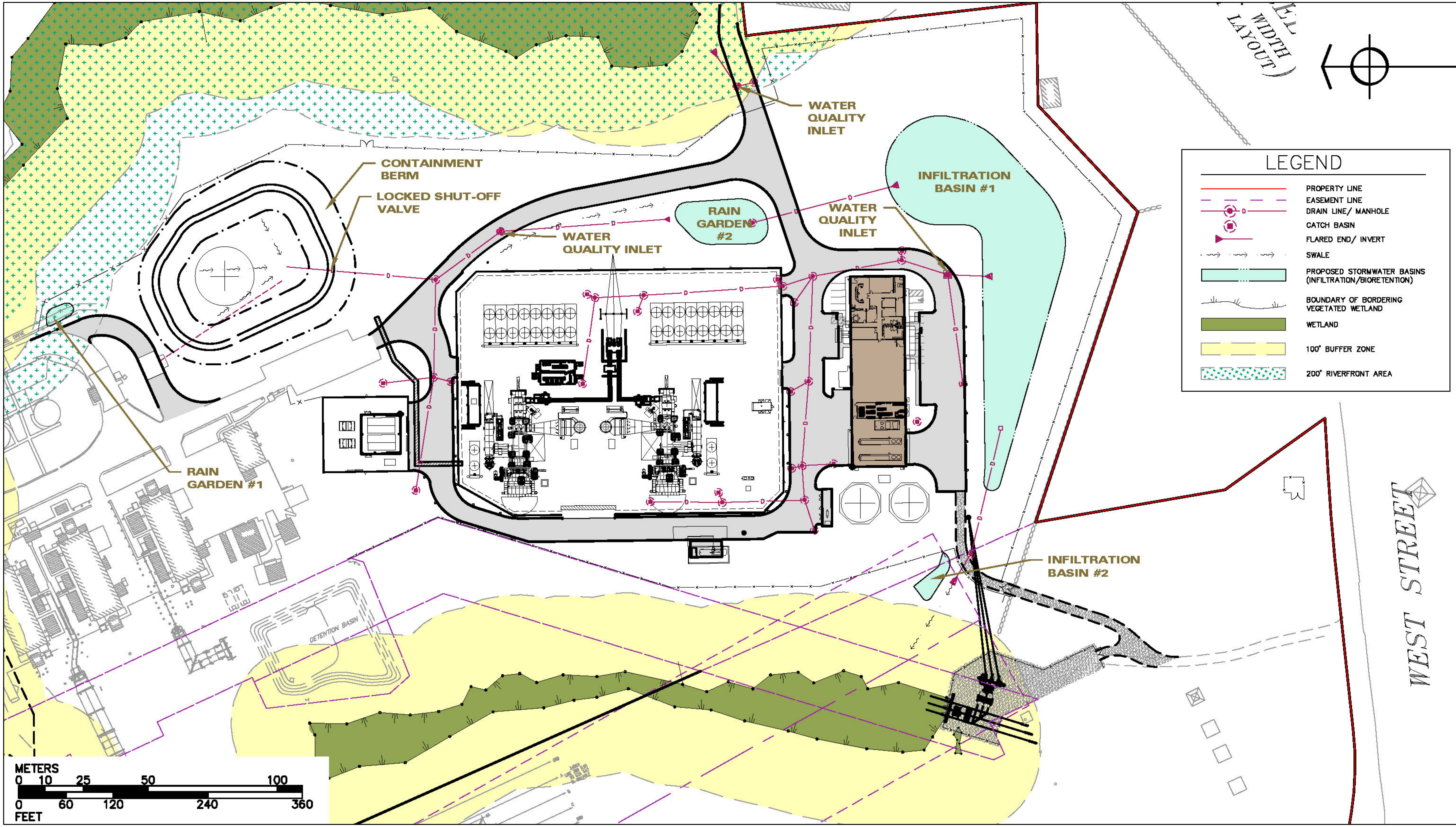
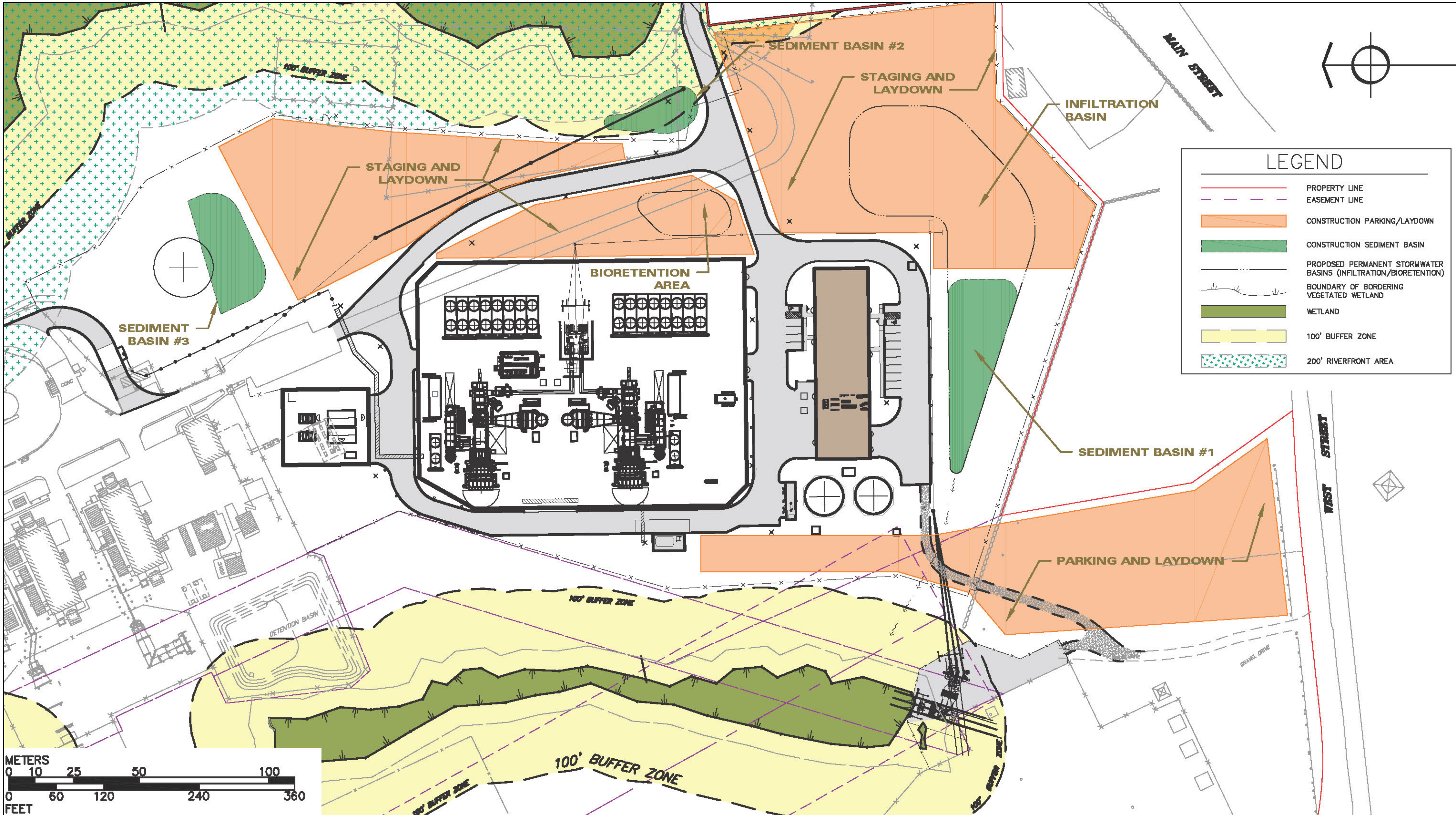


Figure 7-1

Stormwater Management System



West Medway II **Medway, Massachusetts**

Epsilon ASSOCIATES INC.

BEALS + THOMAS Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

Figure 7-2

Construction Staging Exhibit

Section 8.0

Water Use and Supply

8.0 WATER USE AND SUPPLY

8.1 Water Use

As was discussed in Section 7.0 of the DEIR, the Project will now operate at a maximum 60% capacity factor in a given year, subject to a further limit of 43% capacity factor on a three-year rolling average. For example, if the Project were to operate at the maximum 60% capacity factor in year 1, it would be limited to an average capacity factor of 34.5% (3,022 full load hours) in years 2 and 3. This capacity factor refinement results in a considerable reduction in water use by the Project. At a 60% capacity factor, the average water usage for the Project would be approximately 95,206 gallons per day. However, water use based on a three-year rolling average capacity factor (43%) would be approximately 68,880 gallons per day. At an expected level of operations (33% capacity factor, including 10 days of ULSD firing), water use will average 51,900 gallons per day. The onsite well can provide an average of 51,840 gallons per day.

The vast majority of water use at the Proposed Project will be turbine water injection for NOx control. Other water uses (e.g., sanitary, occasional maintenance washes) will be less than 1% of the Project's total water requirement. The two highly efficient GE aero derivative LMS100 turbines require water injection for NOx control when firing either natural gas or ULSD. The water requirement when firing ULSD is approximately 15% higher than when firing natural gas.

The Project's annual, average daily and maximum day water use is summarized in Table 8-1. The first case reflects the maximum permitted operating levels, a maximum 60% capacity factor for a single year including a maximum of 30 days of ULSD firing. The second case reflects a 43% average capacity factor (three-year rolling average) also with 30 days of ULSD firing. For illustrative purposes, the third case reflects a 34.5% capacity factor year with 15 days of ULSD firing. The fourth case reflects a typical peaking plant case of 33% capacity factor with 10 days of ULSD.

The water use calculations summarized in Table 8-1 are based on a 30°F day for ULSD firing and a 50°F day for natural gas firing. These calculations exclude minor potable water use and minor process water uses.

Table 8-1 Water Use Summary

Case	Annual Water Use (gallons)	Peak Day Water Use, 24 hours at 100% load, ULSD firing (gallons)	Average Daily Water Use (gallons)	Well Average Daily Yield (gallons)	Comments
Case 1: 60% capacity factor including 30 days of ULSD firing	34,750,080	178,600	95,206	51,840	Proposed, maximum year
Case 2: 43% capacity factor (3-year rolling average) including 30 days per year of ULSD firing	25,106,500	178,600	68,800	51,840	Proposed, 3 year rolling average
Case 3: 34.5% capacity factor (year 2 and 3 average following a 60% peak year) including 15 days per year of ULSD firing	19,939,500	178,600	54,600	51,840	Two year average following a maximum year
Case 4: 33 % capacity factor, including 10 days per year of ULSD firing	18,961,000	178,600	51,900	51,840	Typical peaking plant capacity factor

NOTE: 24-hour operation with ULSD will be extremely infrequent and would be a winter-only scenario.

The average daily water use for Case 4 (33% capacity factor and 10 days of ULSD) is 51,900 gallons per day. This average daily expected actual water use figure is very close to the conservatively-calculated sustainable yield of the on-site bedrock well (51,840 gpd). The well was pump-tested for five days at a constant rate of 69,120 gpd. A safety factor from MassDEP's drinking water guidelines was then applied to calculate a conservative 51,840 gpd yield.

An additional perspective on expected plant water use is provided as Table 8-2, below. This table examines water use under the several capacity factors analyzed in Table 8-1 (60%, 43%, 34.4% and 33%) but with a focus on summer conditions. Table 8-2 shows expected water use for July and August, assuming an average temperature of 70F and a per turbine water injection rate of 48 gpm. The Table also assumes that the facility will be running on natural gas; ample supplies of gas are available during the summer months. Depending on the capacity factor, the plant would require supplemental water from Millis at a rate ranging from 3,610 gpd to 55,185 gpd. These supplemental flows would be over and above the 51,840 gpd available from the Project's onsite well.

Table 8-2 Water Use in July/August

Capacity Factor	Days per month	Total gpd	Withdrawal from on-site well	Withdrawal from Millis
60%	24	107,025	51,840	55,185
43%	16	71,350	51,840	19,510
34.4%	13	57,972	51,840	6,132
33.0%	12.5	55,450	51,840	3,610

The Proposed Project plans to use the on-site bedrock well for the majority of its water requirements. As described in the DEIR and repeated in this document, no process water will be supplied from the Medway water supply. The Project is **not** pursuing any supplemental water from the Town of Medway potable water supply system. Rather, as described in Section 8.2.1 below, the approximately 52,000 gpd available from the on-site well is expected to be supplemented by water from the Town of Millis system. Supplemental water from the Millis system would be conveyed to the site via the Medway water system. While the Medway system would covey water from Millis, no process water supply would come from the Town of Medway wells. [1]

8.2 Water Supply

8.2.1 Supplemental Water Supply from the Town of Millis & Draft Kleinfelder Report

As discussed in the September 30, 2015 DEIR, the Proponent's preferred source of water for the Proposed Project is the on-site well, supplemented with water from the Town of Millis municipal supply. Since filing the DEIR, the Proponent attended additional meetings with the Millis Drinking Water Committee on September 14, 2015 and October 29, 2015 to discuss the purchase of water for the Proposed Project. In addition, the Proponent met with representatives of the Towns of Medway and Millis, and the Massachusetts Department of Environmental Protection (MassDEP) on October 26, 2015.

Over the course of these meetings, the Millis Drinking Water Committee authorized an assessment regarding the feasibility of providing water to the Proposed Project via an existing interconnection to the Town of Medway municipal water system, and executed a three-party agreement between the consulting firm Kleinfelder, Town of Millis, and the Proponent. The Proponent, Exelon West Medway II, LLC, has agreed to reimburse Millis for all costs relating to work performed by Kleinfelder, the Town of Millis's current water consultant (Tighe & Bond), and Town counsel in connection with the assessment.

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1 The Project expects to use Town of Medway potable water for the Project's potable water needs of ~120 gallons per day.

On December 15, 2015, Kleinfelder issued Revision 1, of their report entitled "*Draft Water Supply and Demand Assessment In Relation To Exelon Power West Medway II Project".* The report was prepared for the Town of Millis by a team of engineers, hydro-geologists and planners from Kleinfelder's Cambridge, MA office. A copy of the Kleinfelder report is provided as Technical Appendix E; the Kleinfelder report includes a nine-page Executive Summary.

In January, 2016, Kleinfelder issued a supplement to the December 15, 2015 report. The supplemental document is entitled "Minimization & Mitigation Implementation Analysis, Town of Millis Massachusetts". The Supplement is included as part of Technical Appendix E to this FEIR.

The December 15, 2015 Kleinfelder report begins with a background description of the Town of Millis. The Town's population is 7,891 (2010 Census) and is expected to remain flat or decrease (MACP, 2014). Millis has an area of 12.2 square miles and is located immediately to the east of the Town of Medway. All of Millis is located within the Charles River basin.

The Town of Millis provides drinking water to residents and businesses via six local groundwater supply wells; the wells are located in sand and gravel aquifer deposits. The Town's groundwater wells are located in two separate sub-basins within the Charles River Basin (the Bogastow Brook sub-basin and the Charles Chicken Brook to Stop River sub-basin). The Town's supply system is primarily a single pressure zone and includes 42 miles of main (2-inch to 12-inch diameter) and two water storage standpipes (combined usable capacity of 1.54 million gallons). The Town system includes four Water Treatment Facilities (WTF); these facilities typically provide pH control (sodium hydroxide), disinfection (sodium hypochlorite) and fluoridation (sodium fluoride). The WTF have an aggregate capacity of 4.1 MGD. The Town of Millis system has interconnections with three adjoining towns, Medway, Medfield and Franklin; these interconnections are for use during emergencies.

Through the summer of 2015, the Town's six wells had a combined Normal Daily Output (NDO) of 0.884 million gallons per day (mgd), representing the most conservative volume the wells can reliably produce during a time of elevated but not maximum demand. The wells have a combined Maximum Daily Output (MDO) of 4.958 mgd, representing the maximum operational capacity for the wells operating 24 hours per day. The wells' MDO is anticipated to be sufficient to meet current and future needs. The NDO and MDO outlined in the report represent the respective minimum and maximum estimates of reliable yield from the Town's six wells, and the actual yield is anticipated to fall between these values.

Millis' Water Management Act Permit requires that Wells 5 and 6, located closest to the Charles River, cease pumping when stream flow in the Charles River falls below 0.21 cubic feet per second per square mile. Kleinfelder calculated the Town of Millis' MDO without Wells 5 and 6 at 2.838 mgd, and concludes, "…*with the Wells 5 and 6 offline the Town of Millis can still meet its current or future MDD* [Maximum Daily Demand]."

While Millis's wells have sufficient capacity, their actual withdrawal is limited by permit requirements. Millis' Water Management Act Permit authorizes withdrawal up to 0.99 mgd; however, access to the total volume is dependent on MassDEP completing a five-year permit review, or issuing a permit amendment that incorporates the Long-Term Safe Yield determination for the Charles River. The Proponent understands that MassDEP's review of the existing Water Management Act Permit is anticipated to occur in 2017. Until this time, Millis is authorized to withdraw up to 0.80 mgd.[2]

The principal findings of the draft Kleinfelder report are as follows:

- For purposes of the study, Exelon supplemental water needs were defined as an average daily supply of 47,703 gallons per day (this assumes the Project is operating at its 60% one year maximum capacity factor and also includes a 10% "safety factor" as requested by Exelon; the on-site well is providing 51,840 gallons per day)[3].

- For purposes of the study, Exelon's peak day supplemental water need was defined as 138,160 gallons per day. This reflects a total peak day water use of 190,000 gallons with the onsite well providing 51,840 gallons.[4]

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2 The WMA permit annual average withdrawal limit of 0.80 MGD is for "Period 1", the initial 5-year term of the permit. The Millis WMA permit annual average withdrawal limit for "Period 2" is 0.99 MGD. The WMA permit further states that access to water withdrawals for Period 2 and beyond is contingent upon MassDEP completing a 5 –Year Review or permit amendment. DEP has reportedly stated its intent to complete the 5-Year review in 2017.

3 As previously noted, the Project will have a three year rolling average capacity factor limit of 43%. Therefore, if the plant operates at its one year permitted maximum capacity factor of 60%, it will be limited to an average of 34.5% for the other two years which comprise the three year rolling average time period. For these two years, the Project's supplemental water requirement form Medway would be ~3,000 gallons per day (including a 10% safety factor on the Millis portion).

4 As discussed in the DEIR, the maximum day use (190,000 gpd) is expected to be an infrequent occurrence (up to 10 days per year). The Millis supplemental need derived from this peak day flow (138,160 gallons) conservatively assumes that the supplement is provided within the peak day. It does not reflect the operating flexibility afforded by the 950,000 gallons of on-site water storage nor the flexibility to operate the on-site well for short periods at a rate higher than its annual average flow of 51,840 gpd.

- The study also examined a worst case peak day at 190,000 gpd. This assumes that the Project requires a maximum of 190,000 gpd and that the onsite well is out of service.[5] However, in general the study assumes that the onsite well will provide 51,840 gpd and that the Project will require a maximum of 138,160 gpd from the Millis system.

- The Town of Millis draws drinking water from six local groundwater supply wells. The Town has discretion to pump these wells in any combination to meet system demands provided that three requirements from the Town's current (2010) water Management Act permit are met:

  - The maximum average daily withdrawal volume from all six wells is less than or equal to 0.80 MGD over the course of a calendar year;

  - No groundwater wells are pumped above their safe yields shown in Table ES-1 (reproduced below) at any time;

  - The Town of Millis must cease use and operation of Wells 5 and 6 when stream flow in the Charles River falls to 0.21 cubic feet per second per square mile as measured at the USGS gauge #01103280 (equivalent to 13.8 cubic feet per second or 8,919,000 gallons per day/8.92 MGD) except when selling water to upstream municipalities located in the Charles River Basin.

Table 8-3 Kleinfelder Report Table ES-01: Available Water Supply

Table ES-01: Available Water Supply			
		Available Supply (MGD)	
Source Name	WMA Permit Maximum Daily Withdrawal (MGD)	Maximum Daily Output[2]	Normal Daily Output[3]
Well 1	0.72	0.677	0.187
Well 2	0.50	0.383	0.107
Well 3	0.75	0.936	0.302
Well 4	0.86	0.842	0.146
Well 5	1.50[1]	2.120[4]	0.142[4]
Well 6			
Total	**4.33**	**4.958**	**0.884**

[5] As previously noted, the maximum day use (190,000 gpd) is expected to be an infrequent occurrence (up to 10 days per year). The Millis worst case supplemental need (190,000 gpd) conservatively assumes that the full supplement is provided within the peak day. It does not reflect the operating flexibility afforded by the 950,000 gallons of on-site water storage nor the flexibility to operate the on-site well for short periods at a rate higher than its annual average flow of 51,840 gpd. Moreover, Exelon will take measures to ensure that any issues with the onsite well can be addressed promptly (i.e., well service contract, on site spare pump and other critical parts). The Project also intends to install a redundant supply well.

Table 8-3 Kleinfelder Report Table ES-01: Available Water Supply (Continued)

Table ES-01: Available Water Supply			
		Available Supply (MGD)	
Source Name	WMA Permit Maximum Daily Withdrawal (MGD)	Maximum Daily Output[2]	Normal Daily Output[3]

Notes:
WMA: Water Management Act
MGD: million gallons per day

(1) Wells 5 and 6 have a maximum wellfield capacity of 1.50 MGD and the operation of the wells is restricted by streamflow in the Charles River.
(2) Maximum Daily Output values were provided by the Town of Millis (J. McKay, December 2, 2015; J. McKay, December 3, 2015).
(3) Normal Daily Output was calculated from summer 2015 daily pumping records provided by the Town of Millis (J. McKay, November 18, 2015). Summer 2014 was used for Well 4.
(4) The WMA permit provides a combined Maximum Authorized Daily Volume for Wells 5 and 6; therefore, the values for Maximum Daily Output and Normal Daily Output for Wells 5 and 6 are combined for consistency.

- The sum of the individual wells' safe yield provides the maximum total daily withdrawal available of 4.33 MGD.

  The Town of Millis' average daily demand (ADD) has trended downward from 2003 to 2008 and has remained fairly flat for the past six years. Based on 2015 daily pumping records through September, Kleinfelder has estimated that ADD for 2015 will be approximately 0.688 MGD. This estimate is conservative because it includes the higher demand summer period but does not include the lesser demand period of October through December. For perspective, Millis reported a 2014 ADD of 0.63 MGD (~0.058 MGD or 58,000 gpd lower than Kleinfelder's conservative 2015 ADD estimate)[6].

- A conservative estimate of near term demand was provided by using the 2015 estimated ADD (0.688 MGD) and adding an allowance for future development projects of 0.136 MGD for a total of 0.824. This estimate is based on a list of development projects provided by the Town and assumes that all of these projects would be online by 2018.

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[6] For reporting year 2014, the Millis Water Department reports a residential use of 57 gallons per capita per day (see Public Water Supply Annual Statistical Report (ASR), Table DS-8). This figure is below DEP's target of 65 gallons per capita per day. The same report indicates that Unaccounted for Water (UAW) was 7.7% of Finished Water Available for Distribution. This level of UAW is below DEP's target of 10%.

- With respect to longer term supply ADD projections, Kleinfelder examined data from a variety of industry standard sources to develop a water needs forecast for Millis. All of the population projections predict a significant decline in Millis population due to factors such as an aging population and migration trends. The available forecast data indicate an average of a predicted 8% decline in Millis population between 2020 and 2035.

- Future water use projections, excluding the Proposed Project, and assuming that per capita use and unaccounted for water losses stay at Millis 2014 levels, show an ADD of 0.738 MGD in 2020, declining to 0.699 MGD in 2035. If per capita use and unaccounted for water use are adjusted upwards to the most conservative figures allowed under the MA Water Resources Commission (WRC) forecasting methodology the comparable ADD figures are 0.823 MGD in 2020, declining to 0.777 MGD in 2035. Adding the previously discussed Exelon average daily supply of 0.0477 MGD (47,700 gpd)[7] to the most conservative forecast yields a 2020 ADD of 0.871 and a 2035 ADD of 0.825 MGD.

- Based on the highly conservative normal daily output rates, Millis's supply availability of 0.884 MGD is adequate to meet the projected 2018 ADD of 0.872 MGD (including proposed new residential development and Exelon) and the conservative 2035 ADD forecast of 0.825 MGD. Kleinfelder notes that the adequacy of supply to meet the predicted demand will rely on regular maintenance of the wells to maintain current Normal Daily Output (NDO) levels.

- Kleinfelder notes that the current Millis WMA Permit authorizes sufficient water withdrawal (0.8 MGD, annual average basis), to meet the estimated 2015 ADD (0.688 MGD), but not the projected 2018 ADD of 0.872 (including proposed new residential development (0.136 MGD) and Exelon (0.048 MGD)). If the allowance for future residential development in fact materializes, Millis will need to access the Period Two volume of 0.99 MGD specified in its Permit as part of the 5-Year review process. Kleinfelder also observes that the current permit level of 0.8 MGD may authorize sufficient withdrawals to meet the projected 2035 ADD.

[7] For purposes of the study, Exelon supplemental water needs were defined as an average daily supply of 47,703 gallons per day (this assumes the Project is operating at its 60% one year maximum capacity factor and also includes a 10% "safety factor" as requested by Exelon; the on-site well is providing 51,840 gallons per day). As previously noted, the Project will have a three year rolling average capacity factor limit of 43%. Therefore, if the plant operates at its one year permitted maximum capacity factor of 60%, it will be limited to an average of 34.5% for the other two years which comprise the three year rolling average time period. For these two years, the Project's supplemental water requirement form Medway would be ~3,000 gallons per day (including a 10% safety factor on the Millis portion).

- The Kleinfelder report also examines two technical factors: adequacy of storage, fire flows and interconnection with the Medway system. On the basis of a 2010 Woodard & Curran study, the report concludes that storage is adequate. With respect to fire flow, Kleinfelder concludes that the requested Exelon demand will have little impact on the water distribution system and that no new fire flow deficiencies will be created.

- Lastly, the Kleinfelder report examines the mechanics of connecting the Millis system to the Medway system so as to allow the Medway system to receive the Exelon water volumes. Two potential interconnection locations in Millis are examined, Main St and Village St. Village St, which is currently served by a 12-inch main from the east and a 10-inch main from the north, is judged to be the more favorable. A booster pump will be required to compensate for elevation differences between the Millis and Medway systems. On the basis of overflow elevations of the storage tanks, the Medway system is approximately 70 feet higher than the Medway system. The addition of booster pumps at interconnection points commonly occurs throughout Massachusetts.

  The report also notes that there are some differences in chemical dosing and the operational pH range between the Millis and Medway system (with the Medway system having somewhat more treatment). When the Millis system is providing significant flows to Exelon, the Medway system will see a "blended" water chemistry in certain locations. If this is judged to be of any significance, a chemical feed station could be added in conjunction with the necessary booster pump. [8] The addition of a chemical feed station at an interconnection point is not an uncommon occurrence.

- As previously noted, the entire Kleinfelder Report (Revision 1, December 15, 2015) is provided as Technical Appendix E.

In summary, Kleinfelder projects that Millis' average daily demand (ADD) for 2015 will be 0.688 mgd, which is below Millis' existing authorized withdrawal volume of 0.80 mgd. The Town of Millis has permitted a number of pending residential development projects with a total estimated water demand of 0.136 mgd, based upon water use rates established under Title 5. In developing a projected ADD for the near future (2018), Kleinfelder assumed that all developments currently permitted in Millis will come online by 2018 prior

[8] For perspective, in 2014, the Millis system operated at an ADD volume of 0.63 MGD while the Medway system operated at an ADD of 1.1 MGD. The daily volume of water provided from Millis to Exelon via the Medway system could range from zero to 138,000 gpd (0.138 MGD). At the high end of this range, water from the Millis system would represent about 12% of the Medway system ADD. Given expected variations in plant operations, use of the onsite well as "baseload" water supply, and the availability of substantial on site water storage (950,000 gallons, total of raw and finished storage), peak day flows from the Millis system could be considerably lower than 138,000 gpd.

to completion of the Proposed Project. Under this assumption, Millis' 2018 ADD is anticipated to be 0.824 mgd, and Millis will need to access their total permitted volume of 0.99 mgd to meet the projected demand of permitted developments even without the water demand from the Proposed Project.

The Proposed Project's ADD is anticipated to be 0.048 mgd, conservatively assuming the facility's maximum capacity factor of 60% and a 10% safety factor. Accordingly, the 2018 ADD with the Proposed Project is 0.872 mgd. The Proponent understands from the October 26, 2015 meeting with MassDEP that the baseline withdrawal established under the Sustainable Water Management Initiative (SWMI) for Millis' total permitted volume of 0.99 mgd is 0.84 mgd, and that Millis must implement minimization and mitigation for withdrawals above this volume. However, longer-term population projections indicate a decline in water use from 2020 to 2035; therefore, projected ADD also decreases. Under a scenario where Millis maintains its current residential water use rate (57 residential gallons per capita day (RGPCD)) and unaccounted-for water percentage (7%), Millis's withdrawals would exceed 0.84 mgd only in 2018 and 2019, before water use declines below the baseline threshold.

At the request of the Town of Millis, Exelon also agreed to fund a detailed additional study by Kleinfelder to fully evaluate potential minimization and mitigation measures the Town of Millis might implement in order to comply with possible, future requirements pursuant to the baseline withdrawal volume established under SWMI. Should the Town of Millis reach its SWMI baseline ADD volume, Kleinfelder has summarized and prioritized potential water use minimization and mitigation measures, and provided cost estimates for implementation.

In January, 2016, Kleinfelder issued the results of this analysis as a supplement to the December 15, 2015 report. The supplemental document is entitled "Minimization & Mitigation Implementation Analysis, Town of Millis Massachusetts". The Supplement is included as part of Technical Appendix E to this FEIR. Due to the municipal wells' locations within subbasins ranked as Groundwater Category 4 and 5 (greater than 25% August net groundwater depleted), the Town of Millis will be required to develop and implement a plan to minimize impacts from water withdrawal, regardless of the Town's actual withdrawal volume relative to its baseline volume. As summarized on page iv of the Supplement, upon permit renewal, the top three minimization options available to the Town of Millis are 1) optimization of existing sources (increase summer withdrawals from Wells 1 and 2 while reducing flows from wells 3,5 and 6 which are in a sub-basin with higher groundwater depletion levels); 2) enhanced non-essential outdoor water restrictions and 3) using existing the annual leak survey results in a more targeted way (prioritize system into zones based on water main age, material, and break history so as to focus on higher priority areas first). These suggested minimization measures are generally enhancements of minimization measures the Town of Millis is currently implementing.

Should the Town of Millis require a withdrawal above its baseline volume, the Town will need to implement mitigation measures to offset the difference in volume between the permitted volume and the baseline volume. Kleinfelder concluded, "*the Town of Millis could request an adjustment for water efficiency through achieving a higher RGPCD and UAW than stipulated by the WMA Performance Standards. In addition, the Town of Millis could request a potential adjustment for current and future wastewater returns through septic systems. Through these adjustments the Town of Millis has the potential to save an estimated volume of water which is greater than the projected future demand above baseline*." However, if the Town is not able to offset the requested volume above baseline via adjustments the Town would need to implement additional mitigation measures. The Kleinfelder report identified stormwater recharge projects, infiltration/inflow removal, and replacement of the Village Street culver as the most cost-effective and beneficial mitigation options.

As described in the December 15, 2015 Kleinfelder Report, water purchased from Millis would be transported to the site via an existing connection between the Millis and Medway systems and a length of the Medway system. As described in the DEIR and repeated in this document, no process water will be supplied from the Medway water supply.[9] The Project Proponent expects to continue to work with Millis representatives to formulate a mutually agreeable supply arrangement for process water over and above the volumes which can be provided by the on-site well.

8.2.2 On-Site Water Storage and Treatment

To compensate for fluctuations in daily and seasonal water demand, the Proposed Project will include a 500,000-gallon raw water storage tank and a 450,000-gallon finished demineralized water storage tank.

Raw water from the on-site well, as well as supplemental water from the Millis system, (conveyed via the Medway system) will be pumped to and stored in the raw-water storage tank. Water from the raw water storage tank is then pumped into the mobile, trailer-mounted demineralization system where the water moves through a series of cation, anion, and mixed bed resins which remove minerals to achieve the water quality necessary to support plant operations. The trailer-mounted system is a flow-through system meaning that the treatment system itself does not "store" water in tanks; rather, the trailer-mounted system will process water from the plant's raw water storage tank and then send the demineralized water to the demineralized water storage tank. During operations, the demineralization system would operate concurrent with the generation units to move the necessary water from the raw-water storage tank to the demineralized water storage tank.

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9 The Town of Medway will supply small volumes of potable water (~120 gpd) for use at the new Project

The trailer-mounted demineralization tank would be transported off-site for regeneration when the demineralization system becomes "spent." Trailer-mounted demineralization systems have a life expectancy that is dependent on the volume of water that the system is treating and the quality of the water being treated. Based on the use of on-site well water and Town of Millis water for the Proposed Project, the Proponent expects that it will need to replace the demineralization trailer an average of once per week. During weeks of peak operation and/or fluctuations in total dissolved solids content of the water, it is possible that the Proponent could replace the trailer a maximum of three times per week.

When the demineralization treatment system is exhausted, the vendor will send the entire trailer-mounted system off-site for regeneration at the vendor's facility and the vendor will provide a new trailer-mounted demineralization system. Once the demineralization component of the trailer-mounted system has been regenerated off-site it can be reused at either the Project or at another facility serviced by the vendor. The Project layout includes space and piping connections for two trailer-mounted demineralization systems operating in parallel.

Ideally, the raw and demineralization tanks would be filled to capacity by the end of each day. As the combustion turbines draw down water from the treated water tank for operation, the raw water tank and subsequently the treated water tank would be replenished from the on-site well, supplemented as needed with water from the Town of Millis, conveyed via the Town of Medway system.

If sufficient makeup water to the tanks is not available to support a simultaneous replenishment of the tanks, the Proposed Project could fill tanks during overnight hours when there is less demand on the municipal system. It is important to note that the combined tank capacity (950,000 gallons) is much greater than the worst-case single-day water use (~126,760 gpd over and above the on-site well yield of ~51,840 gpd).

Details of how to best manage the Project's water supply by making maximum use of the onsite well (average yield, 51,840 gpd), and using the Project's 500,000 gallon raw water storage tank and 450,000 treated water tank to buffer the volumes of water required on any given day from the Millis system will be the subject of further engineering analysis and further discussions with the Town of Millis and their engineers.

8.2.3 Additional Water Sources

As discussed in Sections 8.1 and 8.2.1, the Project expects that the onsite well, supplemented with water provided by the Town of Millis, will be sufficient for plant operations. However, in the event of unforeseen conditions, the Project has identified two backup water supply and delivery arrangements. The Project proponent, Exelon Generation, has signed letters of interest with two backup water providers, Nala Industries of Framingham MA and Fleet Fuel of Johnston RI. The letters express an interest in entering into contract discussions with Exelon to provide trucked water deliveries up to the peak day demand of 190,000 gallons per day, should other sources of water become unavailable. Copies of the December 7, 2015 letters are attached as Figures 8-1 and 8-2.

Nala Industries would provide water from a private well owned by the Riverdale Water Company in Northbridge MA. Fleet Fuel Inc. would provide water from the Town of Johnston RI municipal supply system. In both cases, Exelon notes that any contract would be dependent on an evaluation that excess water capacity is available from the source and that all withdrawals would comply with any applicable permits.

Should a backup water source be utilized, water would be delivered using standard water tanker trucks (~9,000 gallons). Tanker trucks from Johnston RI (just west of Providence) would travel to the site area via I-95 to I-495, exiting I-495 onto Route 126 (Exit 18) to access the Project site. Tanker trucks originating in Northbridge, approximately 12 miles to the west of the Project Site, would travel via State highways and would likely access the Project Site via Route 109. On arrival at the Project Site, water from the tanker trucks would be pumped into the Facility's 500,000 gallon raw water storage tank.

8.2.4 On-site Recharge

As a corollary to the water supply discussion, it should be noted that the Project Proponent will be installing a full stormwater retention and recharge system for the Project Site. As described in Section 7.2 and as supported by draft Stormwater Report provided as Technical Appendix D, this system will collect, treat and recharge site runoff and is sized from the 100-year storm event. The proposed stormwater management system will provide an average annual recharge of 15,528 gpd. The required recharge rate for the Proposed Project is 7,800 gpd. Accordingly, the proposed stormwater management system will recharge an additional 7,728 gpd, which is nearly 100% more recharge than is required under the MADEP Stormwater Handbook.

While not the subject of this FEIR, the Proponent notes that the existing simple-cycle 135 MW power plant in the northeast quadrant of Exelon's 94 acre property is also equipped with a stormwater collection, treatment, retention and recharge system. This system serves the roughly 5-acre existing site, nearly all of which is impervious surface. The system includes a retention/recharge basin located on the southwest corner of the existing plant site (see Figure 8-3). The basin is trapezoidal in plan and measures approximately 125 feet by 155 feet. The approximately 380,000 gallon basin is sized to accommodate runoff from a 100-year storm.

Exelon Generation.

December 7, 2015

Nala Industries
c/o Derek Davis
P.O. Box 2066
Framingham, MA 01703

Reference: Letter of Intent
West Medway Generating Station
Medway, Massachusetts

Dear Mr. Davis:

We are writing to formally request your interest in providing water delivery services to support the proposed expansion of the West Medway Generating Station in Medway, Massachusetts (the Facility).

The proposed Facility's average annual water demand will be 95,000 gallons per day (gpd), and the anticipated peak demand will be 190,000 gpd, which may occur approximately 10 days per year. While Exelon anticipates obtaining this water from multiple sources, we are interested in securing a contract to provide water supply via trucking up to the peak water demand (190,000 gpd) should other sources of water become unavailable.

We understand that you are able to obtain water from a private well owned by Riverdale Water Company in Northbridge, Massachusetts. Any prospective contract will be dependent on an evaluation that excess water capacity is available from this source, and that all withdrawals comply with any applicable permits.

Please sign below to indicate your interest to enter into contract discussions to provide water to the proposed Facility, contingent upon its approval.

Respectfully,

Tammy D. Sanford

Tammy D. Sanford
Manager, Project Development
Exelon Generation

Upon approval of the expansion of the West Medway Generating Station in Medway, Massachusetts, (the Facility) I hereby express interest in entering contract discussion with Exelon to provide up to 190,000 gpd to the proposed Facility.

Name: Derek DAvis Title: President

Signature: [signature] Date: 12/7/15

www.exeloncorp.com

Exelon Generation

December 7, 2015

Fleet Fuel, Inc.
c/o Tom Ruotolo
141 Shun Pike
Johnston, RI 02919

Reference: Letter of Intent
West Medway Generating Station
Medway, Massachusetts

Dear Mr. Ruotolo:

We are writing to formally request your interest in providing water delivery services to support the proposed expansion of the West Medway Generating Station in Medway, Massachusetts (the Facility).

The proposed Facility's average annual water demand will be 95,000 gallons per day (gpd), and the anticipated peak demand will be 190,000 gpd, which may occur approximately 10 days per year. While Exelon anticipates obtaining this water from multiple sources, we are interested in securing a contract to provide water supply via trucking up to the peak water demand (190,000 gpd) should other sources of water become unavailable.

We understand that you obtain water from the Town of Johnston, Rhode Island municipal water supply. Any prospective contract will be dependent on an evaluation that excess water capacity is available from this source, and that all withdrawals comply with any applicable permits.

Please sign below to indicate your interest to enter into contract discussions to provide water to the proposed Facility, contingent upon its approval.

Respectfully,

Tammy D. Sanford

Tammy D. Sanford
Manager, Project Development
Exelon Generation

Upon approval of the expansion of the West Medway Generating Station in Medway, Massachusetts, (the Facility) I hereby express interest in entering contract discussion with Exelon to provide up to 190,000 gpd to the proposed Facility.

Name: Thomas A. Ruotolo Title: President

Signature: Thomas A. Ruotolo Date: 12/16/15

www.exeloncorp.com

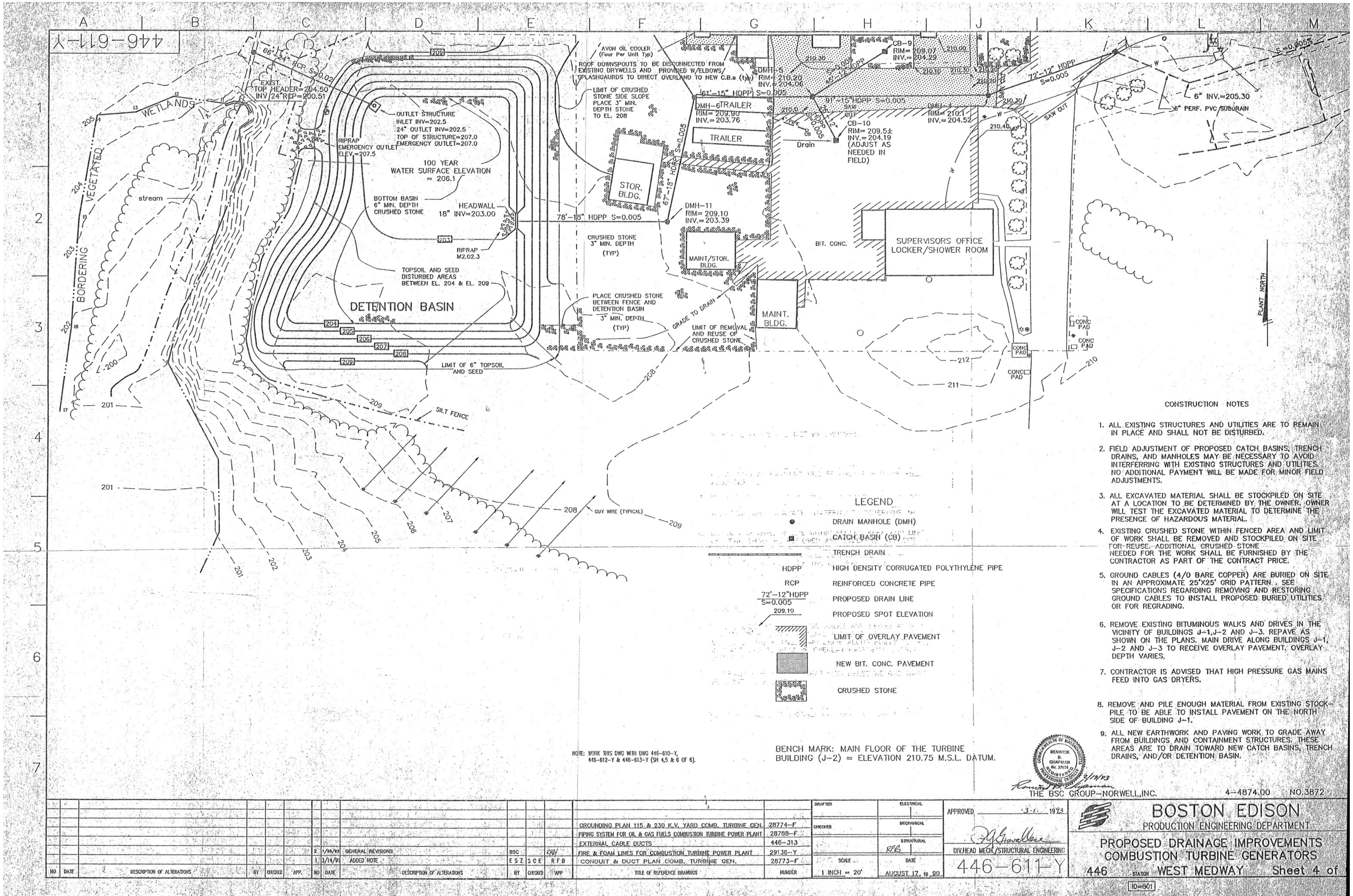


Figure 8-3

Existing Medway Plant Retention Basin

Section 9.0

Wastewater

9.0 WASTEWATER

9.1 Sanitary Wastewater

Sanitary waste from the twelve (12) person operations staff at the existing power generation facility has been discharged to an on-site septic system. This existing on-site septic tank and leaching field will be removed/abandoned in accordance with Title 5. As was described in the DEIR, the Proposed Project will have an operating staff of up to six (6) employees with a very limited sanitary waste generation (~120 gpd). In combination with sanitary flows from the existing plant (~240 gpd), the new sanitary discharge to the Medway sewer system is expected to be approximately 360 gpd.

The Proposed Project includes the construction of a sanitary sewer connection to the Town of Medway municipal sewer system located in West Street (south side of Exelon property). This new sanitary sewer connection will serve both the existing 135 MW power facility as well as the Proposed Project. Figure 9-1 locates the proposed sewer connection on West Street and also locates the new sanitary main to be constructed on Exelon property.

In order to avoid substantial excavation for a gravity system, two sanitary lift stations have been proposed; both are located on Exelon property. The northern lift station will serve the existing facility and will convey flow southerly to the second lift station. From the second lift station, flow is pumped to an on-site sewer manhole. It then travels by gravity to the municipal sewer located in West Street.

As described in the DEIR, connection to the existing Town of Medway sewer along West Street will require an Application for Sewer Service from the Medway Water/Sewer Department and a Street Opening Permit from the Medway Board of Selectmen. The Town of Medway passed an amendment to their General Bylaw in March 2015, placing a moratorium on extensions of the Town's municipal sewer system. The amendment states: *"Nothing in this by-law shall prevent the grant of a sewer connection permit for property that abuts on that portion of a public or private way with an existing sewer line."*

The Property abuts a portion of West Street, a public way with an existing sewer line. As shown on Figure 9-1, the Project will connect to this existing sewer line. Accordingly, the Project's proposed connection to the existing sewer line is exempt from the Sewer Moratorium. The layout of the sewer connection will be finalized prior to submission of the Site Plan Review application with the Medway Planning and Economic Development Board.

No state permits are required to connect to the Medway sewer system.

9.2 Other Wastewater

As was also described in Section 8.2 of the DEIR, non-sanitary wastewater generation from the Proposed Project will be very limited. The vast majority of water used in the plant will be for NOx control in the GE LMS100 simple-cycle combustion turbines; demineralized water is injected into the turbine for this purpose. This high purity water is evaporated by the heat of the exhaust of the combustion turbines and will be discharged as water vapor from the stacks.

9.2.1 Turbine Wash-water

As was described in the DEIR, periodic turbine wash-water will be collected in a wash water drain tank. As needed, the tank contents will be collected by an approved waste hauler and transported off-site to an approved facility for treatment and disposal.

9.2.2 Demineralizer Rinse Water

Raw water (from the new on-site well, expected to be supplemented as needed from the Town of Millis water supply system) will be treated on-site in a trailer-mounted demineralizer system. This system produces the very high purity water required for turbine injection. The spent trailer-mounted demineralizer system is removed from the site and taken to the system vendor's facility where the resin beds are regenerated. As a result, there is no demineralizer regeneration wastewater produced at the site.

When a new, fresh, demineralizer trailer is brought to the site and connected, a small volume of water is discharged. This discharged water is the first slug of raw water (well water, Millis potable water) which has not been fully demineralized and hence is not piped to the finished water storage tank. This partially demineralized raw water is referred to as "demineralizer rinse water". A similar volume of water is discharged when the portable demineralizer system is disconnected. The demineralization rinse water is not wastewater but rather partially demineralized raw water (well water supplemented with Town of Millis potable water).

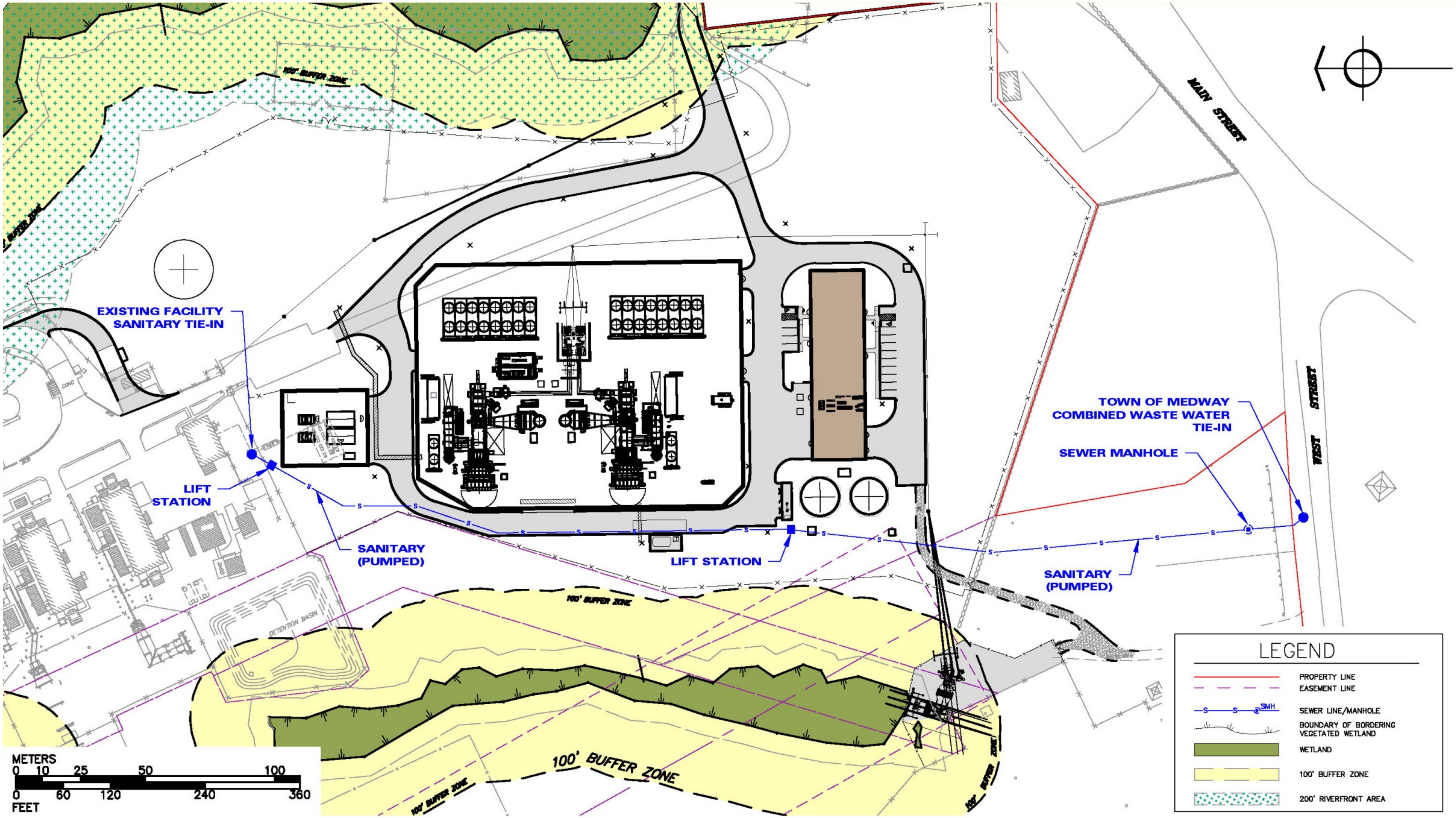
9.2.3 Intermittent Process Wastewater

The Project will also have limited process wastewater flow of approximately 5,000 gallons per day. As previously described, treated process wastewater will be discharged to the Medway sewer system. The 5,000 gpd volume is a conservative allocation used for planning with the Town; actual flow is anticipated to be much lower.

Some low volumes of wastewater will come from plant floor drains. The Proponent proposes to install an oil-water separator for the treatment of wastewater from floor drains and other areas. The oil-water separator will treat wastewater collected from floor drains and the maintenance shop prior to sending the non-sanitary wastewater to an on-site, in-ground wastewater sump for clean wastewater monitoring and periodic discharge to the Medway Sewer System.

More specifically, equipment drains and other non-storm drains from the power block, the gas yard and Control/Admin and Facility Services (C/A&FS) Building (including drain flows from the air compressor skids) will drain via gravity to underground oil-water separator #1. These are low volume, intermittent flows. Treated wastewater from the oil-water separator will be pumped to a wastewater collection sump located west of the C/A&FS Building. The wastewater collection sump will be located adjacent to the sanitary lift station for the Proposed Project (see Figure 9-1). The discharge from this wastewater collection sump will be combined with the discharge of the sanitary lift to form a common discharge line to the Town sewer connection.

Water in the wastewater collection sump will be monitored using in-sump pH, oxidation-reduction potential (ORP), and hydrocarbon instruments. Any exceedances of target levels will trigger an alarm in the control area with appropriate maintenance staff follow-up. Any exceedances will also prevent the discharge pump from starting. Volumes pumped from the sump will be monitored and recorded.



West Medway II   Medway, Massachusetts

Figure 9-1

Sewer Line Exhibit

Section 10.0

Construction and Demolition

10.0 CONSTRUCTION

10.1 SWPPP

A Stormwater Pollution Prevention Plan (SWPPP) is included in the Beals & Thomas authored draft Stormwater Report (FEIR Technical Appendix D). The SWPPP provides contact information for responsible parties, a site evaluation, and a list of federal and state compliance requirements. More specifically, the SWPPP provides detailed best management practices (BMPs) for erosion and sediment control. Descriptions of plans for the final stabilization of the site, inspections and maintenance, recordkeeping and training, and certification and notification are also included in the SWPPP.

10.2 Construction Equipment

The Proponent will require that all heavy construction equipment be fitted with the best available after-engine emission control technology, such as diesel particulate filters (DPFs) or diesel oxidation catalysts (DOCs), in accordance with the Massachusetts Department of Environmental Protection (MassDEP) Clean Air Construction Initiative (CACI).

Construction contractor(s) for the Proposed Project will have their own fleets of construction equipment that will broadly vary in age whereas the life expectancy of such equipment is many years. Although the Environmental Protection Agency's (EPA's) Tier 4 emissions standards for all sizes of off-road vehicles are now in effect for all manufacturers of such equipment, contractors are not required, nor expected, to replace their existing fleet with equipment using engines manufactured to Tier 4 emission standards. Use of contractor equipment meeting the requirements of Tier 4 standards, when available, will be encouraged.

Until a construction contractor(s) is hired for Project construction, a list of engines, their emission tiers, and any BACT installed on each piece of equipment cannot be provided.

Section 11.0

Mitigation and Proposed Section 61 Findings

11.0 MITIGATION AND PROPOSED SECTION 61 FINDINGS

Detailed discussions of mitigation in the following sections are based on subject matter in previous sections of this document. Table 11-1 summarizes potential Project impacts and related mitigation measures. Costs included therein are based on a conceptual mitigation design.

Table 11-1 Summary of Impacts and Mitigation Measures

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Air Quality	NOx emissions from the Proposed Project will be controlled to a stack concentration of 2.5 parts per million (ppm, by volume dry basis corrected to 15% oxygen) with natural gas firing and 5.0 ppm with ULSD firing	The Project will use state-of-the-art emission control techniques to minimize and mitigate air emissions. The Project will be subject to LAER for NO_x emissions, stringent emission limitation achieved in practice. The Project will use GE LMS100 combustion turbine, which is the most efficient simple-cycle technology available, burning less fuel per megawatt hour than any peaking turbine in its size range currently on the market. The Project will use Low-NO_x burners with water injection. These burners can be considered a "process modification" compared to earlier combustion turbine burner designs with diffusion burners. The Project will install Selective Catalytic Reduction (SCR) as an add-on control for NO_X. SCR is a pollution control technology that injects either anhydrous or aqueous ammonia into the flue gas over a catalyst. The NO_x reacts with the ammonia to form water and nitrogen. The catalyst allows this reaction to take place at a relatively low temperature. The emission rate achieved with SCR is considered LAER for this type of application, because it has been demonstrated in practice to achieve the most stringent emission limitation for the source category of simple-cycle combustion turbines. NO_x emissions from the Project will be controlled to a stack concentration of 2.5 parts per million (ppm, by volume dry basis corrected to 15% oxygen) with natural gas firing and 5.0 ppm with ULSD firing. The LAER analysis in the MCPA application in Attachment D of the DEIR documents that this is the lowest emission limit achieved in-practice for this type of source.	During operation. Cost included in overall Project costs.
Greenhouse Gas Emissions	Proposed Project direct and indirect expected emissions 389,791 tons/year (CO_2). Analysis of the New England electric system indicates that the Medway Project will more than offset its own emissions (by displacing less efficient units) and will lead to overall emission CO_2 reductions in the region's electric system.	The Project will use highly efficient equipment to mitigate GHG emissions. The Project will use GE LMS100 combustion turbine, which is the most efficient simple-cycle technology available, burning less fuel per megawatt hour than any peaking turbine in its size range currently on the market. Turbine efficiency will be maximized, and auxiliary electric loads will be minimized, to the extent feasible consistent with minimizing other impacts (air, noise, water). This includes efficiency savings from the use of a natural gas compressor with a slide valve. The Project will purchase CO_2 offsets through the RGGI program (between $2 million and $4 million per year). Much of this money will help fund energy efficiency programs that reduce the demand for electricity and, thus, further reduce CO2 emissions.	During operation. Cost included in overall Project costs.

Table 11-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Greenhouse Gas Emissions (continued)		Mitigation commitments shown in Section 5.10.3 of this FEIR ♦ use of efficient GE LMS100 turbines over all other less efficient generators; ♦ use of efficient natural gas compressor and GSU transformer; ♦ acquisition of one RGGI allowance for each ton of CO2 emitted (contributing to energy efficiency and other programs funded through RGGI); ♦ review with GE the options to use hot gas recirculation for aqueous ammonia vaporization in the SCR systems, and implementation if technically and economically feasible ; ♦ review of solar PV array on administration building roof with potential to offset approximately 24.5 tons per year GHG emissions, and implementation if technically and economically feasible ; ♦ if solar PV on the administration building roof is not technically feasible at Project construction , construct the administration building roof as solar-ready, enabling retrofit of PV in the future, and review feasibility on a periodic schedule; ♦ administrative building envelope designed to meet or exceed the 8th Edition of the Massachusetts Building Code, obtaining an approximate 9% improvement in energy efficiency in the heating season; ♦ use of propane or LP gas, combined with an efficient condensing furnace, for administration building heat, or alternatively Cold-Climate Air-Source Heat Pumps and condensers for heating and air conditioning; ♦ use of switchable LED-based lighting fixtures for interior and exterior lighting constitutes an ~30% improvement from current lighting code requirements; ♦ Energy Star-rated appliances will be given preferential consideration in the purchasing process (very few appliances exist in the Project configuration); ♦ Certification to the MEPA Office indicating that all of the measures proposed to mitigate GHG emissions, or measures that will achieve equivalent reductions, are included in the project (Section 5.10.4);	

Table 11-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Greenhouse Gas Emissions (continued)		Mitigation commitments shown in Section 5.10.3 of this FEIR (continued) ♦ Exelon's renewable project division will consult with the Town of Medway regarding options and feasibility of municipal-scale renewable energy projects; ♦ Contribution of at least $20,000 per year over the life of the project to the Town of Medway dedicated to the development of an energy conservation awareness program; ♦ Neither Exelon nor the high pressure gas supplier will use natural gas or any other or non-inert or GHG in any blow-out cleaning of the Project piping (NFPA 56 standards will be complied with). ♦ Regular Exelon operator rounds will verify the absence of leaks in natural gas piping and SF_6-insulated circuit breakers. These breakers will also be procured with maximum leakage guarantees and means for on-line monitoring.	
Noise	An increase in existing ambient sound pressure levels in the surrounding vicinity of the Project Site.	Exelon intends to purchase every noise control enhancement available from GE at a cost of approximately $6 Million. These enhancements include the following: ♦ GE 'Low Noise' Configuration o Single-entry, louvered combustion air inlets with filters and lagging o Turbine and generator acoustical enclosures o Close-fitting noise barrier walls around turbine & generator enclosures o Turbine roof skid barriers o Turbine vent fan silencers o Acoustic enclosures for VBV stack, water skid, and intercooler pipes o Lube oil sump pump barriers ♦ Combustion Exhaust Noise Control o Stack silencers o CO/SCR catalyst insertion losses o Breech base duct bend insertion losses o Perforated exhaust stacks	During operation. Cost included in overall Project costs.

Table 11-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Noise (continued)		Additionally, Exelon is planning to expend $10 Million for additional noise mitigation which includes the following: ♦ 'Ultra Low Noise' Air Cooled Heat Exchanger Fans ♦ Low Noise Transformers ♦ Gas Compressor Enclosure; ♦ Gas Compressor Yard Noise Barrier Wall (25ft tall); ♦ Power Block Noise Barrier Wall (55ft tall) ($8 Million); and ♦ L-shaped Property-Line Noise Barrier Wall near 5 Summer St. (R3) (20ft tall).	
Water Supply	Annual water use 25.1 MG Daily use 68,000 gallons based on maximum 3-year rolling average operation	The vast majority of water use at the new 200 MW simple-cycle facility is turbine water injection for NOx control. The two proposed highly efficient GE aeroderivative LMS100 turbines require water injection for NOx control when firing either natural gas or ULSD. As described in Section 7.1 of the DEIR, the Project has been refined and is now proposing a maximum 60% capacity factor in a given year, subject to a limit of 43% capacity factor on a three-year rolling average. The effect on water use is dramatic, reducing annual water use to 25.1 MG while the maximum daily use falls to 68,800 gallons on a 3-year rolling average. Expected actual daily average water use is 51,900 gallons. In addition, as previously described, Exelon contributed approximately $40,000 to the Town of Medway's advanced leak detection study, which identified a sizable leak representing a significant portion of the Town of Medway's unaccounted-for water. This leak and several other leaks detected during the survey have been repaired. Exelon provided $50,000 for a water minimization and mitigation study for the Town of Millis to identify opportunities for both direct and indirect mitigation for the town to implement in the future if needed.	Pre-construction and operation. Cost included in overall Project costs.
Wastewater	A new sanitary and process sewer connection of 6- to 12-inch diameter will connect to the existing Town sewer along West Street which will discharge wastewater to West Street. Periodic turbine wash-water will be collected in a wash water drain tank.	Most of the water used by the Proposed Project will be evaporated in the exhaust of the combustion turbines and be discharged as water vapor from the stacks. The Proponent proposes to install an oil-water separator for the treatment of wastewater. The oil-water separator will treat wastewater collected from floor drains and the maintenance shop prior to sending the wastewater to the Medway Sewer System. The wash-water drain tank contents will be collected by an approved waste hauler and transported off-site to an approved facility for treatment and disposal.	During construction and operation. Cost included in overall Project costs.

Table 11-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Wetlands and Stormwater	Electric transmission line interconnection work adjacent to the existing Eversource 115 kV switchyard will result in approximately 206 sf. of permanent BVW fill, and approximately 323 sf. of temporary alteration which will be restored. To mitigate impacts the Proponent is proposing to create approximately 500 sf. of new BVW. The proposed pipeline will temporarily alter approximately 1,975 s.f. of BVW. Other ancillary activities (perimeter fencing, roadway construction, containment area, and sound barrier) will result in alterations to the Riverfront Area.	All proposed work within the 100-foot Buffer Zone and Riverfront Area will incorporate appropriate erosion and sediment controls (e.g., silt fence, filter socks) and BMPs will be installed prior to construction and maintained for the duration of construction and until work areas are stabilized with loam and seed, pavement, gravel or other devices. The BVW temporarily altered by the proposed pipeline construction will be restored upon completion of construction.	During construction and operation. Cost included in overall Project costs.
Transportation	Under the peak operating scenario, the Proposed Project is estimated to generate approximately 98 total daily vehicle-trips, with the majority (86 trips) associated with delivery trucks (fuel oil and service trucks). Peak hour trip generation is estimated at 7 vehicle-trips during a weekday morning peak hour and 7 vehicle-trips during a weekday evening peak hour.	The traffic study recommends access improvements, on-site circulation/traffic management improvements, and a construction traffic management plan that support the proposed operational needs of the Project while minimizing impact to adjacent roadways. The Proponent has identified the following site access improvements: ♦ A STOP sign (R1-1) and STOP line pavement marking is recommended on driveway approach to Summer Street. The sign and pavement marking shall be compliant with the MUTCD. ♦ Plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of two feet or less above the adjacent roadway grade within the sight lines in vicinity of the site driveway in order to continue to provide unobstructed sight lines.	During construction and operation. Cost included in overall Project costs.

Table 11-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Transportation (continued)		The Proponent has identified the following on-site circulation/traffic management improvements: Based on AutoTurn analysis, several internal corner radii require modification to provide more efficient large truck maneuverability and to accommodate the largest anticipated design vehicles (WB-50 and fuel truck). ♦ On-site truck staging areas should be identified to accommodate fuel-truck storage while waiting for an unloading zone to clear. The truck-staging area should be provided in a location with limited impact to on-site mobility. Potential staging areas have been identified adjacent to the existing on-site roadway. ♦ The width of the existing internal roadway link connecting to the entranceway to the existing facility is recommended to be 22 feet to accommodate two-way truck traffic and 30 feet if designated as a staging area. ♦ The provision of a truck by-pass should be considered in the fuel-unloading zone to increase the efficiency of fuel delivery operations.	
Construction	Construction-period impacts will include traffic from trucks and construction employees, fugitive dust generation, construction-related noise, and laydown/staging in the 100-foot buffer zone to wetland resource areas.	<u>Traffic</u> A traffic-construction management plan should be implemented in cooperation with the Town of Medway and the Project's EPC Contractor to accommodate the specific needs of the site and to provide coordination with the Town officials throughout the construction period. Exelon will also coordinate with the Town of Medway with regard to the length of the construction period and any construction permits which may be required. The construction traffic management plan should include but not be limited to: ♦ Designated parking areas should be provided for construction employees. This area will be in an existing material laydown lot in the southern portion of the site along West Street which will be reinforced during the construction phase of the site and returned to grass upon completion of the Project.	During construction. Cost included in overall Project costs.

Table 11-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Construction (continued)		♦ Construction periods (i.e., worker arrival/departure times) and material deliveries should be designated to coincide with off-peak travel periods of the area roadway. ♦ Exelon should establish waiting and staging areas on-site for all material deliveries and the management of truck traffic. Dust suppression methods should be implemented at unpaved construction areas as needed (see "Air Quality" below). Development of the Construction Traffic Management Plan is expected to commence in early 2016; and completed a minimum of 90 days prior to the start of construction in the fall of 2016. Exelon has already met with the Town for preliminary discussions on the Plan. <u>Air Quality</u> Exelon will require that all contractors associated with construction of the Project comply with MassDEP's Clean Air Construction Initiative (see Section 11.2 of the DEIR and Section 10.2 of this FEIR for details). It will also be encouraged that construction equipment meet the EPA's Tier 4 emission standards. In addition, fugitive dust will be minimized by dust suppression during earth moving, and will include: use of water trucks to wet the ground surface, stabilization of soils, creation of wind breaks, and use of stabilized construction and exit points. <u>Noise</u> Construction noise mitigation measures are expected to include: ♦ Using appropriate mufflers on all equipment and ongoing maintenance of intake and exhaust mufflers; ♦ Muffling enclosures on continuously running equipment, such as air compressors and welding generators; ♦ Replacing specific construction operations and techniques with less noisy ones, where feasible; ♦ Selecting the quietest equipment alternatives, where feasible; ♦ Scheduling the noisiest construction activities during daylight hours;	

Table 11-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Construction (continued)		♦ Turning off idling equipment; and Locating noisy equipment at locations that protect sensitive locations through shielding or distance. <u>Erosion Control and Wetlands</u> All proposed work within the 100-foot Buffer Zone will incorporate appropriate erosion and sediment controls (e.g., silt fence, filter socks) and BMPs will be installed prior to construction and maintained for the duration of construction and until work areas are stabilized. If temporary impacts to wetlands are necessary due to placement of mats or staging of equipment, the work will be short-term in duration and all disturbed wetland areas will be substantially restored to pre-existing contours and stabilized using appropriate erosion controls and native seed mixes as necessary. In this manner, pipeline construction, and the use of any associated staging and laydown areas, will not result in adverse impacts to wetlands (see Section 11.4 of the DEIR for additional details). Furthermore, the temporary construction employee parking area, which is primarily grass, will be re-enforced with gravel, stone, or similar material during the construction period. Upon completion of construction, the area will be restored with loam and seed (see Section 10.3 of the DEIR).	

11.1 Air Quality

The Proposed Project will use state-of-the-art emission control techniques to minimize and mitigate air emissions.

The Proposed Project will be subject to LAER for NOx emissions, stringent emission limitation achieved in practice. The Project will use GE LMS100 combustion turbine, which is the most efficient simple-cycle technology available, burning less fuel per megawatt hour than any peaking turbine in its size range currently on the market. The Project will use Low-NOx burners with water injection. These burners can be considered a "process modification" compared to earlier combustion turbine burner designs with diffusion burners.

The Proposed Project will install Selective Catalytic Reduction (SCR) as an add-on control for NOx. SCR is a pollution control technology that injects either anhydrous or aqueous ammonia into the flue gas over a catalyst. The NOx reacts with the ammonia to form water and nitrogen. The catalyst allows this reaction to take place at a relatively low temperature. The emission rate achieved with SCR is considered LAER for this type of application, because it has been demonstrated in practice to achieve the most stringent emission limitation for the source category of simple-cycle combustion turbines. NOx emissions from the Project will be controlled to a stack concentration of 2.5 parts per million (ppm, by volume dry basis corrected to 15% oxygen) with natural gas firing and 5.0 ppm with ULSD firing. The LAER analysis in the MCPA application in Attachment D of the DEIR documents that this is the lowest emission limit achieved in-practice for this type of source.

11.2 Greenhouse Gas Emissions

Exelon proposes the following control and mitigation measures for GHG:

- use of GE LMS100 turbines;
- acquisition of one RGGI allowance for each ton of CO2 emitted (contributing to energy efficiency and other programs funded through RGGI);
- review with GE the options to use hot gas recirculation for aqueous ammonia vaporization, and implementation if technically and economically feasible;
- review of solar PV array on administration building roof with potential to offset approximately 37 tons per year GHG emissions, and implementation if technically and economically feasible;
- administrative building designed to exceed the current building code, through reduced lighting power density and efficient mechanical equipment;

- reduced lighting power for interior and exterior lighting, and reduced lighting when not operating;

- Certification to the MEPA Office indicating that all of the measures proposed to mitigate GHG emissions, or measures that will achieve equivalent reductions, are included in the Project; and

- Contribution of at least $20,000 per year over the life of the Project to the Town of Medway dedicated to the development of an energy conservation awareness program.

11.3 Noise

Noise-related mitigation measures are described below.

11.3.1 Proposed Equipment

Significant attention has been paid to reduce sound levels from the Proposed Project through a combination of noise controls and enhancements to the equipment layout (see Attachment D of the DEIR). Exelon intends to purchase every noise control enhancement available from GE at a cost of approximately $6 Million. These enhancements include the following:

- GE 'Low Noise' Configuration
  - Single-entry, louvered combustion air inlets with filters and lagging
  - Turbine and generator acoustical enclosures
  - Close-fitting noise barrier walls around turbine & generator enclosures
  - Turbine roof skid barriers
  - Turbine vent fan silencers
  - Acoustic enclosures for the VBV stack, water skid, and intercooler pipes
  - Lube oil sump pump barriers
- Combustion Exhaust Noise Control
  - Stack silencers
  - CO/SCR catalyst insertion losses

- o Breech base duct bend insertion losses

- o Perforated exhaust stacks

Additionally, Exelon is planning to expend $10 Million for additional noise mitigation which includes the following:

- ♦ 'Ultra Low Noise' Air Cooled Heat Exchanger Fans;
- ♦ Gas Compressor Enclosure;
- ♦ Gas Compressor Yard Noise Barrier Wall (25ft tall);
- ♦ Power Block Noise Barrier Wall (55ft tall) ($8 Million); and
- ♦ L-shaped Property-Line Noise Barrier Wall near #5 Summer St. (R3) (20ft tall).

The noise barrier wall systems proposed for the gas compressor yard and power block area would need to be constructed of materials with adequate thickness and density to provide significant noise reduction in the lower octave-bands, normally achieved with solid, non-porous material (i.e., steel) or specially designed, commercially available, pre-cast concrete blocks. The proposed barrier locations are situated as close as possible to the equipment while maintaining adequate ventilation and accessibility. Louvered openings and other egress areas in the noise wall will be designed to achieve adequate transmission loss approximately equivalent to the wall itself. As a general design guideline, the interior faces of the barrier wall will be covered with sound absorbing material to avoid reflection from the barrier surface which would increase sound levels at other locations. The sound absorptive material would need to include a protective face that is weather, fire, corrosion, and abuse resistant and exhibits sufficient hanging and tear strength. The contractor selected would be responsible for the design, detailing, and adequacy of the framework, supports, and attachment methods required for the proper construction of the noise barrier wall.

11.3.2 Existing Equipment

A noise control solution has been developed to attenuate sound levels from the six existing CTGs during infrequent daytime periods (6 AM – 11 PM) when all proposed and existing equipment may operate simultaneously. The current design, reflected in the sound level modeling results shown in Attachment D of the DEIR, Table 8-13, consists of an 'L-shaped' noise barrier wall, approximately 25 feet high around the existing J2 lube oil cooler, acoustical louvers on the upper ventilation strips along the northern façades of the J2 and J3 buildings, and close-in 'L-shaped' barrier walls near the J1 and J3 generator inlets. Noise mitigation for the existing units was selected based on noise reduction effectiveness as well as operations/maintenance considerations, including equipment accessibility and ease of maintenance. The Proponent estimates that the cost of these treatments is $1.5 million dollars.

Exelon proposes the following restriction based on operation of the existing CTGs during nighttime hours: "Upon the commencement of operations of the new CTGs, the existing CTGs shall not operate concurrently with the new CTGs between the hours of 11:00 pm and 6:00 a.m. unless required solely by ISO-NE to dispatch the unit as a result of a local or regional system contingency (e.g. VAR Control or transmission reliability) or Security Constrained Unit Commitment. This condition assumes that new CTGs are already running and would require concurrent operation of the existing CTGs". A similar restriction is contained in the Air Plan Approval for the Braintree Electric Lighting Department (BELD) simple-cycle CTGs.

It should be noted that the operation of all six existing CTGs alongside the two proposed units can be thought of as a "worst case" and rare condition. Simultaneous operation of all of the proposed and existing equipment would most likely only occur during daytime hours. Each of the existing units has only operated for a total of less than 80 hours annually over the past five years, and rarely at the same time. Furthermore, over the past five years, the existing units (but not all of them simultaneously) only operated between 11:00 p.m. and 6:00 a.m. during 2014 for a total of approximately six hours.

ISO-NE dispatches units based on achieving the least cost for the system. Accordingly, the most efficient units, i.e., those with the lowest heat rates, are dispatched first, with the least efficient units typically called on to operate only at times of a system peak, or if there are system wide reliability issues. Given the lower efficiency of the existing equipment's heat rate and its operation on fuel oil rather than natural gas, ISO-NE has infrequently called on the existing equipment to operate.

The Proposed Project will utilize the most efficient simple-cycle generator currently available on the market, the GE LMS100, which has a significantly lower heat rate than current peaking plants operating today. This low heat rate will cause ISO-NE to dispatch the Proposed Project much more often than ISO-NE dispatches traditional peaking units, including the existing station.

11.4 Water Supply

The vast majority of water use at the new 200 MW simple-cycle facility is turbine water injection for NOx control. The two proposed highly efficient GE aeroderivative LMS100 turbines require water injection for NOx control when firing either natural gas or ULSD. As described in Section 7.1 of the DEIR, the Project has been refined and is now proposing a maximum 60% capacity factor in a given year, subject to a limit of 43% capacity factor on a three-year rolling average. The effect on water use is dramatic, reducing annual water use to 25.1 MG while the average daily use falls to 68,800 gallons.

In addition, as previously described, Exelon contributed approximately $40,000 to the Town of Medway's advanced leak detection study, which identified a sizable leak representing a significant portion of the Town of Medway's unaccounted-for water. This leak and several other leaks detected during the survey have been repaired.

11.5 Wastewater

A new sanitary and process sewer connection of 6- to 12-inch diameter will connect to the existing Town sewer along West Street which will discharge wastewater to West Street.

Most of the water used by the Proposed Project will be evaporated in the exhaust of the combustion turbines and be discharged as water vapor from the stacks. The Proponent proposes to install an oil-water separator for the treatment of wastewater. The oil-water separator will treat wastewater collected from floor drains and the maintenance shop prior to sending the wastewater to the Medway Sewer System.

11.6 Wetlands and Stormwater

All proposed work within the 100-foot Buffer Zone will incorporate appropriate erosion and sediment controls (e.g., silt fence, filter socks) and BMPs will be installed prior to construction and maintained for the duration of construction and until work areas are stabilized. If temporary impacts to wetlands are necessary due to placement of mats or staging of equipment, the work will be short-term in duration and all disturbed wetland areas will be substantially restored to pre-existing contours and stabilized using appropriate erosion controls and native seed mixes as necessary. In this manner, pipeline construction, and the use of any associated staging and laydown areas, will not result in adverse impacts to wetlands.

Stormwater discharges during construction will be managed in accordance with a Stormwater Pollution Plan (SWPPP) prepared in accordance with the U.S. Environmental Protection Agency NPDES Stormwater Construction General Permit for Massachusetts. Implementation of the SWPPP will incorporate sedimentation and erosion control measures and other BMPs.

The proposed stormwater management system has been designed to conform to the Department's current standards.

11.7 Transportation

Traffic generated by the Proposed Project will be comprised of employee-related trips, truck trips associated with replenishment of oil, and service-vehicle related trips. Daily and hourly trip generation will vary from day to day based on the supplemental power generation needs of the area. As described in Section 10.0 of the DEIR, under the peak operating scenario, the Project is estimated to generate approximately 98 total daily vehicle-trips, with the majority (86 trips) associated with delivery trucks (fuel oil and service trucks). Peak hour trip generation is estimated at seven vehicle-trips during a weekday morning peak hour and seven vehicle-trips during a weekday evening peak hour.

The traffic study recommends access improvements, on-site circulation/traffic management improvements, and a construction traffic management plan that support the proposed operational needs of the Project while minimizing impact to adjacent roadways.

The Proponent has identified the following site access improvements:

- A STOP sign (R1-1) and STOP line pavement marking is recommended on driveway approach to Summer Street. The sign and pavement marking shall be compliant with the MUTCD.

- Plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of two feet or less above the adjacent roadway grade within the sight lines in vicinity of the site driveway in order to continue to provide unobstructed sight lines.

The Proponent has identified the following on-site circulation/traffic management improvements:

- Based on AutoTurn analysis, several internal corner radii require modification to provide more efficient large truck maneuverability and to accommodate the largest anticipated design vehicles (WB-50 and fuel truck).

- On-site truck staging areas should be identified to accommodate fuel-truck storage while waiting for an unloading zone to clear. The truck-staging area should be provided in a location with limited impact to on-site mobility. Potential staging areas have been identified adjacent to the existing on-site roadway.

- The width of the existing internal roadway link connecting to the entranceway to the existing facility is recommended to be 22 feet to accommodate two-way truck traffic and 30 feet if designated as a staging area.

- The provision of a truck by-pass should be considered in the fuel-unloading zone to increase the efficiency of fuel delivery operations.

11.8 Construction

Exelon will require that all contractors associated with construction of the Project comply with MassDEP's Clean Air Construction Initiative (see Section 11.2 of the DEIR and Section 10.2 of this FEIR for details). It will also be encouraged that construction equipment meet the EPA's Tier 4 emission standards. In addition, fugitive dust will be minimized by dust suppression during earth moving, and will include: use of water trucks to wet the ground surface, stabilization of soils, creation of wind breaks, and use of stabilized construction and exit points.

Construction noise mitigation measures are expected to include:

- Using appropriate mufflers on all equipment and ongoing maintenance of intake and exhaust mufflers;
- Muffling enclosures on continuously running equipment, such as air compressors and welding generators;
- Replacing specific construction operations and techniques with less noisy ones, where feasible;
- Selecting the quietest equipment alternatives, where feasible;
- Scheduling the noisiest construction activities during daylight hours;
- Turning off idling equipment; and
- Locating noisy equipment at locations that protect sensitive locations through shielding or distance.

All proposed work within the 100-foot Buffer Zone will incorporate appropriate erosion and sediment controls (e.g., silt fence, filter socks) and BMPs will be installed prior to construction and maintained for the duration of construction and until work areas are stabilized. If temporary impacts to wetlands are necessary due to placement of mats or staging of equipment, the work will be short-term in duration and all disturbed wetland areas will be substantially restored to pre-existing contours and stabilized using appropriate erosion controls and native seed mixes as necessary. In this manner, pipeline construction, and the use of any associated staging and laydown areas, will not result in adverse impacts to wetlands (see Section 11.4 of the DEIR for additional details).

11.9 Proposed Section 61 Findings

In accordance with M.G.L. c. 30, Section 61 and 301 CMR 11.12(5), any State Agency that takes Action on a project for which the Secretary required an EIR shall determine whether the project is likely, directly or indirectly, to cause Damage to the Environment and shall make a finding describing the Damage to the Environment and confirming that all feasible measures have been taken to avoid or minimize the Damage to the Environment.

Contents of Section 61 Findings (301 CMR 11.12(5)(a)): In all cases, the Agency shall base its Section 61 Findings on the EIR and shall specify in detail: all feasible measures to be taken by the Proponent or any other Agency or Person to avoid Damage to the Environment or, to the extent that Damage to the Environment cannot be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable; an Agency or Person responsible for funding and implementing mitigation measures, if not the Proponent; and the anticipated implementation schedule that will ensure that mitigation measures shall be implemented prior to or when appropriate in relation to environmental impacts.

Section 61 Findings and Agency Action (301 CMR 11.12(5)(b): Provided that mitigation measures are specified as conditions to or restrictions on the Agency Action, the Agency shall:

1. make its Section 61 Findings part of the Permit, contract, or other document allowing or approving the Agency Action, which may include additional conditions to or restrictions on the project in accordance with other applicable statutes and regulations; or

2. refer in its Section 61 Findings to applicable sections of the relevant Permit, contract, or other document approving or allowing the Agency Action.

Subject Matter Jurisdiction Limitations (301 CMR 11.12(5)(c)): In the case of a project undertaken by a person that requires state permits or land transfers, but no funding, the Scope of any EIR is limited to those aspects of the project that are within the subject matter of the permit(s) or within the area subject to a land transfer that are likely, directly or indirectly, to cause damage to the environment. Any Participating Agency shall limit its Section 61 Findings, or any mitigation measures specified as conditions to or restrictions on the Agency Action, to those aspects of the project that are within the subject matter of any required Permit or within the area subject to a Land Transfer. In the words of the MEPA statute (M.G.L. ch. 30, sec. 62A), "Any finding required by section sixty-one shall be limited to those matters which are within the scope of the environmental impact report, if any, required by this section."

State Agencies that will be required to make Section 61 Findings for the Project prior to issuing permits for, funding, or otherwise implementing the Project include or may include the Agencies identified in Table 1-1.

Depending on agency procedures, as described above, the various Section 61 Findings may be part of permits or agency actions, or may be stand-alone documents. Moreover, agencies will generally limit Section 61 Findings to impacts and mitigation within the scope of the subject matter of their permits (e.g., MassDEP Section 61 Findings will address wastewater).

The Proposed Section 61 Findings below and the subsequent sections contain commitments the Proponent has made as a basis for respective agency Section 61 Findings. These commitments include mitigation measures for potential impacts related to air quality, greenhouse gas emissions, noise, water supply, wastewater, wetlands and stormwater, transportation, and construction. See also the Summary of Impacts and Mitigation Measures, Table 11-1.

11.9.1 MassDEP Proposed Section 61 Finding

Project Name:	West Medway II
Project Location:	Medway
Project Proponent:	Exelon West Medway LLC and Exelon West Medway II, LLC
EOEA Number:	15363
Date Noticed in Monitor:	

These Findings for the West Medway II Project (EEA #15363) have been prepared in accordance with the provisions of M.G.L. c. 30, Section 61 and 301 CMR 11.00. On [insert date] the Secretary of Energy and Environmental Affairs issued a Certificate stating that the Project's Final Environmental Impact Report (FEIR), dated [insert date] adequately and properly complied with the MEPA statute and regulations.

The West Medway II Project involves constructing a new, highly efficient, fast-starting peaking facility on approximately 13 acres of land located within the same property but immediately south of the existing West Medway Generating Station. The Project will be operated during times of peak energy demand and will run primarily on natural gas, but could also run on ultra-low sulfur distillate (ULSD) fuel to ensure fuel diversity and reliability.

The Project includes two new state-of-the-art, simple-cycle GE LMS electric combustion turbines (100 MW each) with a combined net nominal electric output of 200 MW. The Proposed Project will be equipped with state-of-the-art clean air technologies, an intercooler (air-cooled cooling system) to reduce water demand, and noise attenuation. Other major components of the Project include the following: pollution control equipment; two 160-foot-tall exhaust stacks; natural gas compressors; transformers; above-ground storage tanks for ULSD, water, and aqueous ammonia; combined building for control room, administrative and facility services; maintenance and warehouse area; water treatment area; and stormwater management, systems including infiltration basins.

The Proposed Project will connect to the existing Eversource 115kV Southeastern Massachusetts, Rhode Island (SEMA/RI) switchyard (Station #65) located on the property southeast of the Project. Natural gas will be delivered via an interconnection to the existing Algonquin Gas Transmission (AGT) Company pipeline. The Project is intended to provide additional needed capacity to the SEMA/RI load zone to help meet energy demand during peak times. In addition, the Project will enhance the region's overall electric system and support the future of renewable energy in Massachusetts by providing a fast-starting back-up for intermittent renewable energy sources such as solar and wind.

As this Project is currently described, the following permits will be required from the Department:

- Major Comprehensive Air Plan Approval (BWP AQ03); and
- Title V Air Operating Permit (BWP AQ14).

Based upon its review of the MEPA documents, the permit applications submitted to date, and the Department's regulations, the Department finds that the terms and conditions to be incorporated into the permit required for this Project will constitute all feasible measures to avoid damage to the environment, including consideration of the potential effects of climate change, and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to the Department's authority (see the appended Mitigation Table for mitigation measure, cost and schedule). Implementation of the mitigation measures will occur by the Proponent in accordance with the terms and conditions set forth in the permit.

____

Department of Environmental Protection

____

By

____

[Date]

Section 12.0

Response to Comments

12.0 RESPONSE TO COMMENTS

The Final EIR is structured in response to the Secretary's November 13, 2015 Certificate on the DEIR. A copy of the Certificate is included in this section.

This section responds to comment letters from government agencies and private organizations, and individuals received on the DEIR submitted on September 30, 2015. Each letter has been assigned an abbreviation, listed below in Table 12-1. The comment letters are reprinted in this section, and specific comments within each letter are noted in the margin with this abbreviation and a sequential numbering. Following the Certificate and letters is a listing of all annotated comments accompanied by a response to each.

Table 12-1 Secretary's Certificate and Comment Letters

Commenter	*Abbreviation*
EEA Secretary's Certificate on the ENF	MEPA
Massachusetts Department of Environmental Protection – Central Regional Office	DEP
Massachusetts Department of Energy Resources	DOER
Conservation Law Foundation	CLF
Charles River Watershed Association	CRWA
Adams, Brian	ADA
Cahill, Jeffrey	CAH
Houser, Adam & Sara	HOU
Shepard, Richard	SHE

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November 13, 2015

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
DRAFT ENVIRONMENTAL IMPACT REPORT

PROJECT NAME	: West Medway II
PROJECT MUNICIPALITY	: Medway
PROJECT WATERSHED	: Charles
EEA NUMBER	: 15363
PROJECT PROPONENT	: Exelon West Medway, LLC and Exelon West Medway II, LLC
DATE NOTICED IN MONITOR	: October 7, 2015

Pursuant to the Massachusetts Environmental Policy Act (MEPA; M.G.L. c. 30, ss. 61-62I) and Section 11.08 of the MEPA Regulations (301 CMR 11.00), I have reviewed the Draft Environmental Impact Report (DEIR) for this project and hereby determine that it **adequately and properly complies** with MEPA and its implementing regulations. The Proponent should prepare and submit for review a Final Environmental Impact Report (FEIR) based on the Scope contained herein.

Project Description

As described in the Environmental Notification Form (ENF) and DEIR, the project consists of expansion of an electric generating facility located on a 94-acre site in West Medway. The West Medway Generating Station is a 135 megawatt (MW) peaking facility that consists of three 45 MW electric generators, associated turbine buildings, a control room building, access roads and other associated infrastructure.

The expansion consists of construction of a peaking facility on approximately 13.5 acres in the southern portion of the site. The expansion is proposed to provide additional capacity to the Southeastern Massachusetts/Rhode Island (SEMA/RI) load zone during peak periods of energy demand. The ENF indicated that Exelon Generation cleared a 195 MW peaking project in the Independent System Operator (ISO) New England (NE) Forward Capacity Auction (FCA) to sell power to the SEMA/RI load zone. The ENF indicated a Commercial Operation Date of June 2018.

The expansion will include two simple cycle electric combustion turbine generators (CTGs), each with a capacity of 100 MW (General Electric (GE) LMS100 CTG). The dual-fuel facility will be fueled primarily by natural gas with the capability to run on ultra-low sulfur diesel fuel (ULSD). The project will include pollution control equipment, two 160-foot tall exhaust stacks, natural gas compressors, transformers, above-ground storage tanks for fuel, water and aqueous ammonia, a building to house the control room and administrative functions. It will include closed cycle cooling to reduce water demand, water treatment, a stormwater management system, and noise attenuation. The project will include installation of a new Continuous Emission Monitoring System (CEMS).

Natural gas will be delivered through an interconnection to the Algonquin Gas Transmission (AGT) Company pipeline. The mainline is located near the northwestern edge of the site. The DEIR indicates that the connection will be constructed by the Proponent and identifies the preferred pipeline route.

The facility will connect to an existing 115 kV switchyard owned by Eversource via a 1,200-foot, three-phase 115kV overhead circuit from a circuit breaker at a generator step up transformer. Eversource has an easement on approximately 54 acres of the property located to the southwest of the project site.

Project Site

The 94-acre project site includes the existing generating facility, two switchyards owned by Eversource Energy and associated transmission rights of way, and infrastructure including access roads. It is zoned for industrial uses. It is bordered on the north by land abutting Route 109 (Milford Street), on the east by Route 126 (Summer Street) and on the south and west by West Street. Adjacent properties consist of forest, residential uses, and limited commercial uses. The remainder of the site is primarily vegetated and undeveloped. It includes wetland resource areas including Bordering Vegetated Wetlands (BVW) and Riverfront Area.

The project site is located within a five mile radius of two Environmental Justice (EJ) communities, which have been identified as English isolation meaning that 25 percent of the residents are lacking English language proficiency.

Changes to the Project Since Filing of the ENF

The DEIR describes the changes to and clarifications of the project since the filing of the ENF. The maximum annual capacity factor (CF) has been reduced to 43 percent on a three-year rolling average, with the ability to operate up to 60 percent in any single year in accordance with the New Source Performance Standards (NSPS) pursuant to 40 CFR 60. Refinements to the project layout include: interconnection with Eversource's existing switchyard; reduction in aqueous ammonia storage tank size; stormwater management system modifications; wastewater tank replacement with an in-ground wastewater sump; increase in project footprint to accommodate noise mitigation measures; construction access routes; and location of ULSD unloading and delivery. The DEIR indicates that the project does require a Section 404 General

Permit from U.S. Army Corps of Engineers (ACOE). In addition, the DEIR identifies the following changes:

- Limit on use of ULSD to a maximum of 30 days per year;
- Reduction in the volatile organic compound (VOC) emission rate when firing ULSD from 5.0 parts per million by volume (ppmv) to 4.5 ppmv; and
- Reduction in water demand based on the change in the CF;
- Use of an on-site well as the primary water supply. Remaining water demand is proposed to be met through a water supply agreement with the Town of Millis (via the Town of Medway distribution system);
- Natural gas interconnection to a Spectra/AGT meter station through a proposed route that will minimize impacts to wetlands;
- Increase in land alteration from 10 acres to 13.5 acres; and
- Reduction in impervious area from 7 acres to 4.3 acres.

Environmental Impacts

Potential environmental impacts associated with the project include: alteration of approximately 13.5 acres of land; creation of an additional 4.3 acres of impervious surfaces; temporary alteration of BVW for construction of the pipeline interconnection; permanent alteration of 14,941 sf of Riverfront Area; generation of an additional 98 average daily vehicle trips (adt); 178,600 gallons per day (gpd) of peak day water demand; average daily use of 68,800 gpd of process and sanitary water; and generation of 5,120 gpd of process and sanitary wastewater. It will generate emissions of criteria pollutants including the potential to emit 0.734 tons per day (tpd) of particulate matter (PM), 0.213 tpd of carbon monoxide (CO), 0.051 tpd of sulfur dioxide (SO_2), 0.138 tpd of VOCs, 0.331 tpd of nitrogen oxides (NO_X), 3.13 tpd of lead (Pb), and 0.018 tpd of hazardous air pollutants (HAP). The project will also emit 3,989 tpd of carbon dioxide (CO_2), a Greenhouse Gas (GHG).

Measures to avoid, minimize and mitigate project impacts include expansion of an existing facility, emissions controls and conformance with Best Available Control Technologies (BACT), use of closed cycle cooling to reduce water demand, noise control including construction of a 55-foot sound wall around the power block area, installation of a stormwater management system, and a construction management plan.

Permitting and Jurisdiction

The project is subject to a mandatory EIR pursuant to 301 CMR Section 11.03(7)(a)(2) and 11.03 (8)(a)(2) of the MEPA regulations because it requires State Agency Actions and includes the expansion of an existing electric generating facility by 100 or more MW and consists of the construction of a New Stationary Source with federal potential emissions, after construction and the imposition of required controls, of: 250 tons per year (tpy) of any criteria air pollutant, 40 tpy of any HAP, 100 tpy of any combination of HAPs; or 100,000 tpy of GHGs based on CO_2 Equivalent. The project also exceeds the following ENF threshold[1]: conversion of land in active agricultural use to nonagricultural use (301 CMR (1)(b)(4)).

[1] The project as described in the DEIR no longer exceeds the ENF threshold for creation of five or more acres of impervious area (301 CMR 11.03(1)(b)(2)).

The project will require a Major Comprehensive Air Plan Approval (MCPA), Prevention of Significant Deterioration (PSD) review, and a Title V Operating Permit from the Massachusetts Department of Environmental Protection (MassDEP). It will require an Exemption from Certain Dimensional Provisions of Zoning Bylaw from the Department of Public Utilities (DPU) and an Approval of Petition to Construct from the Energy Facilities Siting Board (EFSB). Petitions for the project have been filed with the EFSB and DPU (Docket EFSB 15-1/DPU 15-25). The project is subject to the MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol. It is also subject to the EEA EJ Policy because it is located within five miles of an EJ community and exceeds an EIR threshold for Air.

The project will also require an Order of Conditions from the Medway Conservation Commission, or in the case of an appeal, a Superseding Order of Conditions from MassDEP, a National Pollutant Discharge Elimination System Construction General Permit (NPDES CGP) from the U.S. Environmental Protection Agency (EPA), and a Section 404 General Permit from ACOE.

The project is not receiving Financial Assistance from the Commonwealth. However, because the project requires review and approval by the DPU and EFSB, subject matter jurisdiction is functionally equivalent to broad scope jurisdiction, in accordance with 301 CMR 11.01(2)(a)(3). Therefore, MEPA jurisdiction for this project extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in the MEPA regulations.

Review of the DEIR

The DEIR includes a detailed description of the proposed project, including the generating facility and interconnections to the natural gas pipeline and the electric transmission system, and describes changes to the project since the filing of the ENF. The DEIR provides a discussion of the objectives and anticipated benefits of the project. The DEIR discusses the project's consistency with applicable policies and plans, including the EEA EJ Policy, Executive Order 385 Planning for Growth, the Commonwealth's Sustainable Development Principles, and the Medway Master Plan. It includes a description of the regional energy supply and demand, reliability concerns, and required and/or planned improvements to the electrical grid. It discusses the project within the context of the Global Warming Solutions Act (GWSA) and state energy policies. It provides an update on the status of the local review and approval process.

The DEIR includes plans (existing and proposed conditions) for the project site, including the proposed power plant, transmission line connections, and gas pipeline routes. The DEIR identifies major project components (buildings, access roads, gas turbine generators, air pollution control and monitoring equipment, tanks, auxiliary equipment, oil and gas pipelines, gas compressor, ammonia storage and piping, etc.), size and capacity of components, and operating parameters. It identifies operating hours, addresses the extent to which ULSD would be used as a back-up fuel, and identifies operating condition parameters used to analyze and model project emissions.

The DEIR identifies project-related impacts and measures to mitigate those impacts. The DEIR provides a description and analysis of applicable State statutory and regulatory standards and requirements, and a description of how the project will meet those standards. The DEIR identifies required State permits and approvals and provides an update on the status of each of these pending actions.

The DEIR indicates that the MCPA and PSD permit applications were submitted to MassDEP on August 24, 2015 and are appended electronically to the DEIR as Attachment D. The project is also undergoing review by the EFSB. The DEIR does not include filings with EFSB; however, some information from EFSB review is included in the appendices.

Environmental Justice

Because the project exceeds an EIR threshold for air and is located within five miles of designated EJ populations in the neighboring Towns of Milford and Franklin, it is subject to the EEA EJ Policy and requirements for enhanced public participation and enhanced analysis of impacts and mitigation. The DEIR includes a description of how these requirements have been met and provides an update on the Proponent's enhanced public outreach efforts through the MEPA and EFSB processes. The Proponent will ensure public participation throughout these processes. The ENF was provided in alternative information repositories and the public notice was published in Spanish and Portuguese in the Milford Daily News. For the EFSB public hearing process, translated notices were published in community newspapers and interpreter services were provided at the hearing. The DEIR was provided to the Milford and Franklin public libraries and is available to the public upon request through the *Environmental Monitor* or the project website (www.medwayenergy.com).

The DEIR also includes the EJ air quality dispersion modeling analysis provided in the PSD application (on CD as Attachment D). The PSD application includes documentation to enable MassDEP to fulfill its obligation under the provisions of the April 11, 2011 PSD Delegation Agreement between MassDEP and EPA to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority and low-income populations. The analysis indicates that there will be no disproportionately high or adverse human health or environmental effects of the project on areas with minority and/or low-income populations.

Alternatives Analysis

The DEIR identifies the project's role in supplying regional electrical energy demands. The DEIR indicates that the project is proposed to provide a fast-starting peaking facility to provide energy to the SEMA/RI region during peak demand periods. The purpose of the alternatives analysis is to evaluate the environmental impacts of the proposed project and potential alternatives that could reduce environmental impacts. The DEIR includes a qualitative alternatives analysis that is generally responsive to the Scope on the DEIR. It does not compare the No-Build Alternative, Off-Site Alternatives, and the Preferred Alternative in a quantitative manner to demonstrate that the Preferred Alternative will avoid, minimize, and mitigate damage to the environment to the maximum extent practicable.

The alternatives analysis indicates that the No-Build Alternative would not meet the project goals. The FEIR provides a brief discussion of Off-Site Alternatives, specifically the Proponent's five sites in Massachusetts: Everett (Mystic), Framingham, New Boston, West

Medway (Preferred), and Weymouth (Fore River). Subsequent to an initial analysis based on the project's ability to serve the Northeastern Massachusetts (NEMA) and SEMA/RI load zones; the availability of natural gas, adequate electricity transmission, and water; sufficient space for a new facility and ancillary structures; and compatibility with zoning and community needs, the Proponent narrowed the choices to two sites: Everett (Mystic) and the West Medway. The Proponent then evaluated the two sites against specific locational, environmental, and community criteria and provided this information in the DEIR (qualitatively in tabular format). The DEIR did not provide a quantitative comparison of environmental impacts of alternatives as directed in the Scope for the DEIR. Comments from CLF request a Supplemental EIR to provide a quantitative comparison as well as to revise the GHG analysis. The Scope for the FEIR includes a revised alternatives analysis including a quantitative comparison of environmental impacts. If the FEIR does not fully address the Scope as directed, a Supplemental FEIR may be warranted.

The Proponent selected the West Medway site because the Everett site would require demolition of existing infrastructure and potential site remediation. The Everett site is located in an industrial zone surrounded by a mix of residential and industrial uses. The West Medway site is surrounded by only residential uses. The Everett site has access to unconstrained water supply, where acquiring adequate water in West Medway site will be more challenging. The DEIR indicates that advantages of the West Medway site include access to two Eversource switchyards and a natural gas interconnection, and the opportunity to provide electricity in both the NEMA and SEMA/RI load zones.

The DEIR also identifies alternative technologies considered to meet project goals. The GHG analysis includes a comparison of the thermal efficiencies and gross heat rates for numerous commercially-available simple cycle CTGs. Information provided in the DEIR also considers the efficiency of a combined cycle unit. Combined cycle turbines use a heat recovery steam generator (HRSG) to make steam which is then ducted to a steam turbine to make additional electricity and, for this reason, are more efficient than a single cycle turbine. The DEIR indicates that a combined cycle unit was not considered further because it would not produce enough power when needed following a cold start; it would take longer to produce full load power following a cold start; achieving a fast start with a combined cycle unit requires a unit with much larger capacity which would not be used; and, it would not have a flexible enough operating range to efficiently serve the needs of a flexible and responsive electric generation system, especially at low loads. CTGs with higher efficiencies were considered but not selected because of the relatively longer start up times.

The project includes an interconnection to the Algonquin gas pipeline. The DEIR identifies and describes two alternative routes for the pipeline connection. The preferred route is 3,080-lf. It will minimize impacts to wetland resource areas and avoid private property by using existing utility right-of-ways.

The DEIR indicates that the project will increase the land alteration from 10 acres as proposed in the ENF to 13.5 acres. However, the project will also reduce the creation of impervious services from 7 acres to 4.3 acres.

Air Quality

The project will require a MCPA, PSD Review, and an Air Operating Permit from MassDEP to ensure that the project, and the facility as a whole, conforms to National Ambient Air Quality Standards (NAAQS) and the Massachusetts Ambient Air Quality Standards (MAAQS). MassDEP's permitting process will include a review of the design of the generating facility to demonstrate compliance with the BACT review. The project will also require Nonattainment New Source Review (NSR) for NO_X, and must be designed in compliance with the NSPS implemented by EPA. In addition, as an electric generating plant with a capacity greater than 25 MW, the project will be subject to the requirements of the Regional Greenhouse Gas Initiative (RGGI). RGGI is a cap-and-trade program aimed at stabilizing and then reducing CO_2 emissions from large fossil-fuel-fired electric generating facilities. The project will also be subject to several other emissions trading programs including the NO_X Budget program (310 CMR 7.28), and the federal Acid Rain Program (40 CFR 63).

The Proponent submitted the MCPA and PSD permit applications to MassDEP on August 24, 2015. Pursuant to the MCPA regulation at 310 CMR 7.02(3)(j), MassDEP will only issue an approval if the project will comply with air quality rules, utilize BACT, and not result in air quality exceeding either the MAAQS or NAAQS. The DEIR summarizes relevant sections of the MCPA application, including the air quality analyses, GHG analysis, and noise analysis, and includes the MCPA and PSD applications on CD (Attachment D).

The project proposes to fuel the facility with natural gas, will use advanced pollution control and monitoring equipment, and use high-efficiency combustion turbines to comply with regulatory standards and requirements. The DEIR quantifies potential emissions from the project for CO_2, SO_2, NO_X, CO, VOC, ammonia (NH_3), PM up to 10 micrometers in size (PM_{10}) and up to 2.5 micrometers in size ($PM_{2.5}$), HAP, Pb, and sulfuric acid (H_2SO_4) and describes proposed control measures for four operating conditions:

1. Maximum annual potential case presented in MCPA application based on 60 percent CF with 30 days ULSD firing;
2. Maximum three-year average according to NSPS limit based on 43 percent CF with 30 days ULSD firing;
3. 34.5 percent CF with 15 days of ULSD firing which represents the average of two years after a full year of 60 percent CF to comply with the NSPS three-year limit; and
4. Typical operating case based on 33 percent CF with 10 days of ULSD.

The DEIR describes proposed pollution control measures for each pollutant. The Proponent indicates that air emissions will be minimized by avoiding any unnecessary generation. The project will use efficient turbines (GE LMS 100); clean fuels to minimize emissions of PM_{10} and $PM_{2.5}$, and SO_2; clean and efficient combustion; and combustion controls, such as water injection and Selective Catalytic Reduction (SCR) to minimize NO_X formation, and an oxidation catalyst to minimize CO, VOC, and HAP formation.

The DEIR provides a summary of Top-Case and Top-Down BACT analysis submitted as part of the MCPA application. It proposes short term emission limits for NO_X, NH_3, CO, VOCs, PM, CO_2, SO_2, H_2SO_4 for both natural gas and ULSD and provides information on energy, environmental, and economic impacts and other costs to support MassDEP determinations that emission limits are the maximum degree of reduction achievable. The MCPA application presents a formal BACT analysis for fuel selection, NO_X, PM, CO, VOC, GHGs, SO_2, and H_2SO_4 mist. The MCPA application also includes BACT analyses for the emergency generator and fire pump.

The proposed project triggers federal air permitting requirements under the Clean Air Act (CAA), specifically the PSD permitting requirements, which MassDEP is delegated to administer in Massachusetts. This program applies to new major sources and major modifications of existing sources of air pollution. The existing facility is a major source. Emissions from the project will be significant for NO_X, PM_{10} and $PM_{2.5}$, H_2SO_4 mist and CO_2 because they exceed the PSD Significant Emission Rate. The PSD review process requires demonstration of BACT for each significant pollutant regulated, and a demonstration of compliance with NAAQS and PSD increments. The PSD application indicates that all applicable requirements will be met including Top-Down BACT for all PSD pollutants.

As a part of the PSD review, the Proponent must identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of federal programs, policies and activities on minority and low income populations. The DEIR describes the air quality impact analyses and indicates that there will be no significant changes in air quality or related public health effects. The DEIR documents projected changes in air quality in comparison with Significant Impact Levels (SILs) as described below. The DEIR includes air quality analyses, including an air toxics analysis, that compare project impacts with NAAQS, SILs, and MassDEP's Ambient Air Levels (AALs) and Threshold Effect Exposure Limits (TELs). In the majority of cases, the analyses demonstrate that the emissions are expected to be lower than the standards, levels, and limits[2].

The MCPA and PSD applications include an Air Quality Dispersion Modeling Analysis that utilized the EPA-approved AERMOD air quality model. The analysis provides additional details on AERMOD's building downwash algorithm, as well as the meteorological data, receptor grid and terrain modeling methods used in the dispersion modeling. Modeling included impacts from the proposed project and the existing facility. Prior to conducting the full modeling analysis, the new turbines were modeled for both fuel options over a range of loads (25, 50, 75, 100 percent) and ambient temperatures (0°F, 30°F, 50°F, and 100°F) to determine the case resulting in the highest air quality impact for each pollutant. The DEIR provides a description of why the AERMOD model is the most appropriate and conservative in projecting impacts. In addition, it notes that this is the recommended EPA model for this application, and the use of any other model would require approval from MassDEP and EPA. AERMOD includes wind direction specific building parameters to account for potential downwash from nearby structures in the dispersion calculations. It also contains algorithms to adjust for low wind speed conditions.

Background pollutant levels were established using the most recent air quality monitoring data reports published by MassDEP (2011 to 2013). Background concentrations were determined for SO_2, CO, NO_2, PM_{10}, and $PM_{2.5}$ from the closest available MassDEP monitoring station, which is located approximately 20 miles west-northwest from the site at Summer Street in Worcester. The DEIR summarizes the results of the dispersion modeling in order to evaluate

[2] Cumulative impact modeling was required for 1-hour NO_2, 24-hour $PM_{2.5}$, and 24-hour PM_{10} which exceeded SILs. The modeling demonstrated these pollutants would not exceed NAAQS.

impacts associated with the project in comparison with the SILs. The modeling demonstrates that maximum predicted concentrations of SO_2, CO, and annual NO_2 will be below the SILs for all averaging periods. However, maximum concentrations of 24-hour average $PM_{2.5}$ and PM_{10} and 1-hour NO_2 will be above SILs. Therefore, the Proponent was required to perform cumulative impact modeling for these pollutants for the applicable averaging period to verify that the project will not contribute significantly to a violation of the NAAQS. The Proponent worked with MassDEP to develop the inventory of emission sources within 10 kilometers of the site that emit significant levels of $PM_{2.5}$, PM_{10}, and NO_2 (greater than 10 tpy, 15 tpy, and 40, tpy, based on actual emissions, respectively); the review identified five facilities. The cumulative modeling included the proposed project, existing facility, and five nearby facilities and compared the cumulative impacts to the NAAQS. The cumulative AERMOD modeling demonstrates that the project and existing facility will not cause or contribute to a violation of the NAAQS for 1-hour NO_2, 24-hour $PM_{2.5}$, and 24-hour PM_{10}.

The Nonattainment NSR requirement for NO_X offsets will apply to the project because the NO_X emission rate is projected to exceed the threshold for review (50 tpy for a new source). Under this requirement, the project must achieve the Lowest Achievable Emission Rate (LAER) for NO_X and procure NO_X emissions offsets at a minimum ratio of 1.26:1. The project will require 83 tpy of NO_X offsets for the 66 tpy of NO_X emissions. The Proponent will either acquire 83 tpy of rate-based NO_X emission reduction credits (ERCs) or surrender five years of mass-based ERCs which it currently holds, or a combination of the two. The Proponent has already secured 31.2 tons of NO_X rate-based ERCs. To achieve LAER, the project will use low-NO_X burners with water injection and install SCR as an add-on control for NO_X.

The DEIR also discusses other offsets that will be required, such as allowances for SO_2 or CO_2 emissions. The project is not subject to Nonattainment NSR for VOC because the existing station is not a major source of VOC and the project's potential VOC emissions will be below 50 tpy. The Commonwealth is in compliance (attainment) with the SO_2 NAAQS; therefore, there is no applicable Nonattainment NSR program for SO_2. Because CO_2 is a global, not a regional, pollutant, attainment standards and Nonattainment NSR are not applicable. The project is subject to the federal Acid Rain Program, the RGGI, and the NO_X Budget Program. The Acid Rain Program will require the Proponent to purchase SO_2 allowances to account for each ton of SO_2 emitted over the prior year, continuous monitoring and quarterly reporting of unit emissions. The Proponent will acquire one RGGI allowance for each ton of CO_2 emitted and will participate in the CO_2 Allowance Tracking System (COATS). Based on the estimates of direct GHG emissions under different operating scenarios, at the auction prices of $6.02 per ton of CO_2 (RGGI allowance auction on September 11, 2015), the project would be required to pay between $2,280,000 and $4,200,000 annually for RGGI allowances. The DEIR indicates that as of January 1, 2015, Massachusetts is no longer subject to the federal Clean Air Interstate Rule (CAIR) since it was determined not to contribute to air pollution in downwind states; therefore, there are no ozone season NO_X allowance holding requirements. The project will participate in the NO_X monitoring and reporting requirements (40 CFR 75 and 310 CMR 7.32) and will obtain allowances in the event that a new program is created.

The DEIR indicates that the Proponent will comply with the project's air emission limits by using CEMS for monitoring of CO and NO_X; stack testing for monitoring of NH3, VOC, PM, and H_2SO_4 (and initial determination of CO_2 emission rate); monitoring of visible emissions; and calculations based on fuel quality for monitoring of SO_2, and CO_2. The DEIR concludes that based on air dispersion modeling, both the project and the facility as a whole, will not cause or contribute to a violation of the NAAQS which provide public health protection, including protecting the health of sensitive populations such as asthmatics, children, and the elderly.

Climate Change Resiliency and Adaptation

The DEIR indicates that the project site is at an elevation approximately 200 feet above mean sea level and is located approximately 570 feet from the nearest floodplain. The portion of the site in closest proximity to the floodplain lies at approximately 15 feet above the floodplain elevation. Therefore, the DEIR asserts that the project is not at risk of flooding. The DEIR does not provide a Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) that identifies this floodplain elevation. The DEIR notes that utility infrastructure projects of this type are typically constructed to strenuous standards and are reinforced to withstand conditions such as heavy snow and strong winds.

This project consists of a major expansion of a power plant to meet energy demands during peak periods. As such, the Proponent should evaluate and document all measures to increase the resiliency of the facility to potential effects of climate change, including increases in the frequency and severity of storms, and the ability of the facility to adapt to these changes. A general reference to construction standards is not sufficient.

Greenhouse Gas Emissions

This project is subject to review under the May 5, 2010 MEPA Greenhouse Gas Emission Policy and Protocol (GHG Policy). The GHG Policy requires identification of GHG emissions associated with the project and adoption of all feasible measures to avoid, minimize and mitigate these increases. The GHG Policy is one element of a comprehensive effort to meet the Commonwealth's obligations under the GWSA which include reducing carbon emissions by between 10 percent and 25 percent below 1990 emissions levels by the year 2020, and by 80 percent below 1990 emissions levels by the year 2050. Consistent with MEPA's overall purpose to evaluate alternatives that avoid, minimize and mitigate environmental impacts to the maximum extent practicable (301 CMR 11.01), the Policy requires that GHG impacts of projects have been carefully considered and that all feasible means and measures to reduce those impacts are adopted. The Policy requires that all projects that are subject to an EIR quantify GHG emissions, evaluate measures that could reduce GHG emissions and quantify potential reductions of mitigation measures. This is a case-by-case inquiry that allows project proponents to select mitigation measures that are determined to be feasible for the particular project being proposed, thereby providing project proponents with maximum flexibility to design their projects.

According to the ENF, the project will release 3,989 tons per day (tpd) of CO_2 (based on a Worst Case Day). The DEIR provides a discussion of the project's compliance with GHG regulatory programs including RGGI, BACT, NSPS, and federal and state GHG reporting requirements. The DEIR provides a review of generation technologies, including combined-cycle steam electric combustion turbines, as previously discussed herein, and a review of alternative fuels.

Project GHG emissions are primarily associated with process-related stationary sources. The project will have direct emissions from natural gas or ULSD consumption and combustion, and indirect emissions from electricity and energy consumption (not including buildings). Building emissions are limited to the 5,200 sf project administration building (a conditioned space). Transportation-related GHG emissions are limited to employee and delivery vehicle trips, which are relatively small. Water use and wastewater generation will not contribute significantly to indirect emissions of GHGs and their quantification was not included in the GHG analysis.

The CTG is the largest stationary source of GHG emissions and therefore the selection of the most efficient unit has the largest impact on GHG emissions of any project-related design decision. The GHG analysis includes a comparison of the thermal efficiencies and gross heat rates for numerous commercially-available simple cycle CTGs. Information provided in the DEIR also considers the efficiency of a combined cycle unit; however, this technology is not addressed in more detail because the Proponent has determined that it cannot meet project criteria. The GHG analysis included the selection of a different simple cycle CTG as the base case (Rolls Royce Trent 60 DLE w/ISI) than the one the project is proposing (GE LMS100). The Trent 60 corresponds to the simple cycle CTG selected for the Braintree Watson III Generating Station project (EEA#15358) and has the highest efficiency of the alternative technologies considered but not selected for the project. The Base Case does include supporting equipment such as compressors, coolers, and fans. The DEIR indicates that the Trent 60 was selected as the Base Case to highlight the GHG reductions associated with the selection of the GE LMS100. The Proponent asserts that this is the most efficient turbine available that also meets the criteria for quick starting, high flexibility, and responsiveness.

The selection of a less efficient turbine as the base case is not consistent with the guidance provided in the Scope for the DEIR. The Scope required that the DEIR provide estimates of GHG emissions of the facility with BACT as the Base Case. Comments from the Department of Energy Resources (DOER) and the Conservation Law Foundation (CLF) note this inconsistency and request revisions to the analysis and additional consideration of alternatives. The Proponent must submit a revised GHG analysis in the FEIR, as described in the Scope. I note that CLF requested a Supplemental DEIR be required, in part, to address the GHG analysis. I expect the Proponent can provide a revised and thorough GHG analysis in the FEIR; however, the Proponent should be aware that a Supplemental FEIR may be required if warranted.

The DEIR includes analysis of measures that could increase the efficiency of the plant as recommended by DOER, such as inclusion of instrumentation and control packages, periodic maintenance, and pressure drop minimization across the system for the base and proposed cases; however, the relative effect of these measures on GHG emissions is difficult to discern as presented. The revised GHG analysis will more clearly present the potential reductions of these measures. The proposed case includes the following measures to increase energy efficiency over the base case: an efficient natural gas compressor which uses a slide gate (800 kW), air cooling with efficient motors (30 kW), ventilation and pumps (varying energy savings), and single three-winding transformer (50 kW).

The Proponent is considering the use of a lower impedance three-winding transformer for an additional 50 kW energy reduction; however, this transformer was not modeled as the selected transformer has the required short circuit protection and was used as the basis for the ISO electric grid interconnection study. The Proponent will also consider hot gas recirculation as an energy source for ammonia vaporization and alternative battery technology. The MCPA application includes calculations for potential leaks of sulfur hexafluoride (6.3 tpy of CO_2) and methane (23.3 tpy of CO_2). Estimated emissions from the emergency generator and an emergency fire pump engine are 13.0 tpy and 3.5 tpy of CO_2, respectively.

Consistent with analysis of the project's air quality emissions, the DEIR documents the project's GHG emissions under the following likely operating scenarios:

Case	CO_2 emissions (tpy)
Potential Emissions in MCPA Application (60% CF; 30 days ULSD)	695,875
Potential Emissions based on 43% CF and 30 days ULSD	505,000
Potential Emissions based on 34.5% CF and 15 days ULSD	394,000
Potential Emissions based on 33% CF and 10 days ULSD	377,000

The potential emission rate at 33 percent CF with 10 days of ULSD firing is used as an approximation of expected actual emissions for the GE LMS100 CTG.

I note that the project, as currently proposed, is not consistent with the EFSB regulations Technology Performance Standards (980 CMR 12.00). It does not meet the TPS parameters for CO or SO_2, assuming use of gas as the primary fuel. As such, the Proponent is required to present additional analysis to the EFSB to support the choice of technology and fuel. Testimony to the EFSB to support their review is included in the DEIR (Appendix I).

The GHG analysis models energy use and GHG emissions of the 15,000-sf administrative building. The project does not include a turbine building. The GE LMS100 CTGs will be housed in weather/acoustical enclosures. The Town of Medway has adopted the Stretch Energy Code and the project is subject to the code. The administrative building was modeled to demonstrate consistency with the Prescriptive Option of the Stretch Code for reduced lighting power density. The analysis considered the following measures to reduce the GHG impacts of the proposed building:

- Energy efficient indoor and outdoor lighting – light emitting diode (LED) fixtures, lighting motion sensors, daylighting, normally off fixtures, and reduced lighting demand;
- High-albedo roofing materials;
- High-efficiency HVAC systems;
- Roof and wall insulation;
- Climate control systems;
- Water conserving fixtures that exceed building code requirements.

Based on data from Energy Star Portfolio Manager (2014), the Energy Use Index (EUI) of a comparable building use (power plant) would be 123.1 thousand BTU per square foot (kBTU/sf). The target EUI for the administration building would be less than 110 kBTU/sf. The project's stationary source CO_2 emissions for the building were estimated at 68 tpy in the base case, with the Preferred Alternative achieving a reduction of 7 tpy of CO_2, for a total of 61 tpy of CO_2 subsequent to the implementation of a number of building energy efficient design measures. Estimated project-related transportation GHG emissions are 77.3 tpy of CO_2.

The GHG analysis considers potential installation of solar photovoltaic (PV) systems on-site. The analysis evaluates two opportunities: rooftop and wall-mounted. The DEIR notes that the majority of the apparently open land on the east, north, and west sides of the project site are mapped wetlands and their buffer zones and insufficient site property exists for ground-mounted PV systems because this space is required for construction phase laydown, trailers, parking, and future maintenance activities. The DEIR does not provide a feasibility analysis of ground-mounted PV systems.

The GHG analysis includes a feasibility analysis for mounting PV panels on the rooftop of the administration building rooftop and the proposed noise barriers. Based on 50 percent of the roof surface, a rooftop array of 7,175 sf would have an output rating of 86 kW (101megawatt hours per year (MWh/yr)) and result in a potential reduction of 37 tpy of CO_2. The noise control design will include a 55-foot noise barrier around the CTGs and other equipment. Based on 50 percent coverage of the noise barrier, a wall-mounted array of 24,900 sf, divided into four directions, would have a combined output rating of 299 kW (308 MWh/yr) and result in a potential reduction of 112 tpy of CO_2. The Proponent will consider the installation of a roof-mounted array during the design phase; however, the DEIR rejects further consideration of the wall-mounted arrays as it notes that installation and operation are more complicated and the panels may interfere with the primary purpose of the walls.

The DEIR indicates that the Proponent will provide at least $20,000 per year to the Town of Medway for an energy conservation awareness program. Funds may be used by the Medway Public Schools, the Medway Energy Committee and the Town for education and energy efficiency expenses and programs. I appreciate the Proponent's commitment to enhance energy conservation within the Town of Medway as a means for reducing energy use and associated costs to the municipality and residents.

Noise

The DEIR provides a description of the applicable noise regulatory requirements, a brief explanation of noise terminology, a summary of the results of the complete ambient sound level monitoring program, and a discussion of the sound level modeling analysis for the proposed addition of the project to the existing West Medway Generating Station. The DEIR also discusses the project's consistency with the MassDEP Noise Policy. The principal noise sources of the project will consist of the two CTGs and associated equipment including air pollution control units, natural gas compressors, air-cooled heat exchangers, electrical transformers, blowers, pumps, and ventilation fans. The Proponent has worked with equipment vendors to develop a noise control program that is fully responsive to MassDEP noise policies for area residences.

The DEIR provides a summary of the results from sound level modeling measured at seven representative locations around the facility and within the surrounding community. The MassDEP Noise Policy limits new noise-generating equipment to a 10-dBA (A-weighted decibel) increase in the ambient sound measured at the property line and at the nearest residences. The locations were selected to represent the closest sensitive receptors (residential and daycare) surrounding the project site. Modeled future daytime and nighttime sound levels from the project are predicted to increase the measured background sound levels by no more than 10 dBA at all modeled receptor locations, thereby demonstrating consistency with the MassDEP

Noise Policy limit. Modeling also indicates that the proposed project is not expected to create any "pure tone" conditions, as defined by MassDEP, when combined with existing background sound levels at any modeled receptor locations.

The Proponent will purchase noise control enhancements available from GE at a cost of approximately $6 million. These enhancements will include GE Low Noise Configuration (equipment enclosures, barriers, and silencers) and Combustion Exhaust Noise Control (silencers, insertion losses, and perforated exhaust stacks). The Proponent will spend $10 million for additional noise mitigation which will include heat exchanger fans, enclosures, and barrier walls. MassDEP will review the noise analysis in more detail during the MCPA application permit review process.

Wetlands and Stormwater

The project will result in impacts to BVW, Riverfront Area, and the 100-foot Buffer Zone. The Medway Conservation Commission will review the project to determine its consistency with the Wetlands Protection Act, the Wetlands Regulations (310 CMR 10.00), and associated performance standards, including stormwater management standards (SMS). Wetland resource areas, including BVW, Riverfront Area, Inland Bank, and Land Under Water (LUW), Isolated Vegetated Wetlands (IVW), and Isolated Land Subject to Flooding (ILSF), were delineated on and adjacent to the project site. The Medway Conservation Commission issued an Order of Resource Area Delineation (ORAD) on September 8, 2015 that confirms the extent of BVW and IVW.

Project plans depict project elements in relation to wetland resource areas and their buffer zones. Construction of the gas line interconnection will result in the temporary alteration of 1,975 sf of BVW in three discrete locations which will be restored upon completion of the work. This work may be reviewed under the Limited Project provisions of the WPA pursuant to 310 CMR 10.53(3)(d). The project does not propose any permanent impacts to BVW. Construction of pavement and driveway near the site entrance will permanently alter 3,096 sf of Riverfront Area. The DEIR indicates that these areas are considered previously developed and degraded pursuant to the WPA. The proposed sound barrier and other construction will permanently alter 11,845 sf of undeveloped Riverfront Area. The DEIR includes a discussion of the project's consistency with the Riverfront Area standards pursuant to 310 CMR 10.58(4) and 310 CMR 10.58(5).

The project proposes the addition of 4.3 acres of impervious area which is a 2.7 acre reduction from what was proposed in the ENF. The existing facility is mostly paved and equipped with a series of catch basins that discharge stormwater to an adjacent detention pond. The proposed project will not use the existing stormwater detention pond. The project will include a new stormwater management system that will be designed to collect, convey, and treat runoff in accordance with the MassDEP Stormwater Handbook and the Town of Medway Stormwater Regulations. The system will provide water quality treatment, groundwater recharge, and post-development runoff rates that will not exceed pre-development rates. The Proponent will consider the use of low impact development (LID) techniques and incorporate a variety of best management practices (BMPs) that may include deep sump hooded catch basins, bioswales, hydrodynamic separators, sediment forebays, bioretention areas, and infiltration basins. The DEIR describes the hydrologic analysis for the project site.

Stormwater in Massachusetts is also managed in compliance with the NPDES program, under which the EPA has issued a Multi-Sector General Permit (MSGP) that covers discharges associated with various sectors of industrial activity. The DEIR indicates that the existing facility is not subject to EPA stormwater permitting since it is not covered by any listed category and was not otherwise deemed to contribute to stormwater pollution. The proposed project may also be exempt from EPA stormwater permitting; however, EPA may choose to require permit coverage on a case-specific basis.

The DEIR includes a brief discussion regarding the Upper-Middle Charles nutrient Total Maximum Daily Load (TMDL) which requires a 65 percent reduction in phosphorus loading. The proposed stormwater management system will use a series of BMPs that will promote pretreatment and removal of total suspended solids (TSS) and total phosphorus loads prior to infiltration within a series of bioretention areas and infiltration basins, and encourage groundwater recharge. The DEIR indicates that the project is not expected to contribute to the phosphorus TMDL.

Water Supply

The DEIR provides a summary of water use for five different scenarios with varying capacity factors and days of ULSD firing. The maximum average daily water usage for the project will be reduced to 95,206 gallons. Usage on a peak day would be 178,600 gallons. As previously mentioned, the project has been refined because of new NSPS regulations requiring a maximum 60 percent CF in a given year, subject to a limit of 43 percent CF on a three-year rolling average. Therefore, annual water use will be reduced to 25.1 million gallons while the average daily use will be reduced to 68,800 gallons. The vast majority of water use will be turbine water injection for NO_X control.

The DEIR indicates that the project no longer involves obtaining water from the Town of Medway or the Town of Bellingham. The majority of water (51,840 gpd) will be obtained from an on-site bedrock well. The well was pump-tested for five days at a constant rate of 69,120 gpd. The balance of water will be purchased from the Town of Millis. The Proponent asserts that Millis has sufficient capacity to accommodate its demand. Comments from MassDEP note that the authorized withdrawal of 0.99 mgd volume is an Interim Allocation pending completion of a new Water Needs Forecast by the Massachusetts Department of Conservation and Recreation (DCR). Water purchased from Millis would be transported to the site via an existing connection between the Millis and Medway system and a length of the Medway system. It is anticipated that a new pumping station may be required to deliver water to the project from the Millis system. The Proponent is consulting with the Town of Medway for this service.

The project will include a 500,000-gallon raw water storage tank and a 450,000-gallon finished demineralized water storage tank. Water from the raw water storage tank will be pumped into a mobile, trailer-mounted demineralization system to achieve the required water quality to support plant operations.

The Proponent contributed approximately $40,000 to the Town of Medway's advanced leak detection study, which identified a sizable leak representing a significant portion of the

Town's unaccounted-for water. This leak and several other leaks detected during the survey have been repaired.

Wastewater

The DEIR identifies a limited amount of wastewater (approximately 120 gpd) and process wastewater (5,000 gpd) that will be generated by the project. The vast majority of water used in the plant will be for NO_X control and is injected into the turbines. This high purity water will be discharged as water vapor from the stacks. The DEIR does not propose infiltration and inflow (I/I) mitigation for project-related wastewater.

The DEIR describes on-site water treatment systems, including the demineralization of raw water for use in NO_X control. A new sanitary and process sewer connection will connect to the existing Town sewer along West Street which will discharge wastewater to West Street and ultimately, the Charles River Pollution Control District's wastewater treatment facility in Medway. The Proponent will install an oil-water separator for the treatment of wastewater from floor drains and the maintenance shop prior to discharge to the Medway Sewer System.

Traffic and Transportation

The Proponent prepared a traffic impact assessment (TIA) for the project that included an evaluation of the baseline traffic characteristics, trip generation, capacity, sight lines, truck routes, on-site circulation, and construction activity. The DEIR identifies how access to the facility will be provided. Employee-related trips will use I-495, Route 109, and Route 126. Truck trips associated with fuel supply will originate in Providence, Rhode Island and use Route I-495 and Route 126. The DEIR indicates that these roadways are established commercial truck routes.

Baseline trip generation was determined based on turning movement counts conducted at the site driveway intersections with Summer Street. Peak construction trip generation was based on a maximum of 200 workers and a vehicle occupancy rate of 1.0. Trip generation for the project was estimated based on a peak operating scenario and full employment at the site. Under a worst case operational scenario with both the existing and proposed facilities operating at peak conditions, the site would generate 7.3 truck trips per hour and 175.2 truck trips per day. However, under normal operating conditions, the project would generate a peak of 86 truck trips per day and 12 employee trips per days (an increase of 98 vehicle trips per day).

The DEIR indicates that there will be adequate capacity along Summer Street and at study area intersections to accommodate the project and does not propose additional off-site roadway improvements. In addition, study area intersections exhibit below-average crash rates based on historic crash data. The project will include access improvements, on-site circulation/traffic management improvements, and a construction traffic management plan (TMP) to support the project's operational needs and minimize on-site and adjacent roadway impacts. Site access improvements will include a STOP sign and pavement markings. The construction TMP will include a communications plan to alert residents, abutters, businesses, and the Town's officials of significant construction milestones and schedules that includes email, mailings, website, social media, and press releases.

The DEIR indicates that parking supply was based on the requirements set forth in the Town of Medway's zoning bylaw. The project's proposed 16 parking spaces will comply with this requirement. Construction worker parking will be located in an existing material laydown lot in the southern portion of the site along West Street and will provide approximately 200 spaces.

Construction and Demolition

The project must comply with MassDEP's Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. c.40, s.54. The project will be required to employ erosion and sedimentation controls and the Proponent will prepare a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the NPDES CGP requirements.

The DEIR describes the project's construction-period and operational stormwater, noise, dust, and other impacts and describes mitigation measures. The DEIR provides a project schedule and discusses the phasing of project elements. It identifies temporary construction laydown areas, equipment storage and construction worker parking, construction access routes (on and off-site, including potential routes in EJ communities), and discusses how associated impacts have been minimized.

The DEIR includes a discussion of construction management and traffic, compliance with MassDEP's Clean Air Construction Initiative, noise, erosion controls and BMPs, construction and demolition debris, and construction safety.

Decommissioning

The DEIR indicates that the physical lifespan of the project is expected to be 40 to 50 years or more. The Proponent will decommission and remove the facility in accordance with all applicable laws at such time that the project is no longer in use and has been formally retired from service on the ISO-NE grid. The Proponent proposes the use of superior equipment and comprehensive maintenance practices to promote efficient operating conditions and equipment lifespan.

Conclusion

Based on a review of the DEIR, the Scope for the DEIR, comments letters and consultation with State Agencies, I have determined that the DEIR adequately and properly complies with MEPA and its implementing regulations. The MEPA regulations indicate that a draft EIR can be determined adequate, even if certain aspects of the Project or issues require additional description or analysis in a final EIR, provided that it is generally responsive to 301 CMR 11.07 and the Scope. The DEIR includes an alternatives analysis, GHG analysis, and air quality analysis and describes project-related impacts and measures to avoid, minimize, and mitigate those impacts. The alternatives analysis and GHG analysis were not fully responsive to the Scope for the DEIR. Additional analysis of project alternatives, GHG emissions, and mitigation measures is necessary to demonstrate that environmental impacts have been avoided, minimized and mitigated to the maximum extent practicable. I am confident that the Proponent can address these issues in the FEIR; however, if warranted, a Supplemental FEIR can be required to address outstanding issues.

SCOPE

General

The FEIR should follow Section 11.07 of the MEPA regulations for outline and content, as modified by this Scope.

Project Description and Permitting

The FEIR should include a description and analysis of applicable State statutory and regulatory standards and requirements, and a description of how the project will meet those standards. The FEIR should identify State permits and approvals and provide an update on the status of each of these pending actions. It should include an update on the status of the local review and approval process. MEPA 01 MEPA 02

The purpose of MEPA review is to evaluate the environmental impacts of a project in light of the Proponent's purpose and goals. MEPA does not approve or deny a project or make a determination regarding its purpose and need. The Proponent has indicated that the purpose of this project is to provide electricity to the Southern Massachusetts/Rhode Island (SEMA/RI) load zone during peak periods of energy demand. The need for this project has been established by the Independent System Operator (ISO) New England (NE). Exelon Generation cleared a 195 MW peaking project in the Forward Capacity Auction (FCA) to sell power to the SEMA/RI load zone.

Several other proposals to expand existing power plants with peaking units will be reviewed by MEPA. These include the Canal Generating Station and the Braintree Electric Light Department (BELD). The recent announcement that the Pilgrim Nuclear Power Plant would be retiring has informed comments on this project and raised concern that peaking facilities, which are typically smaller and less efficient than base plants, may be called on to meet baseline demand. Each of these projects will be reviewed independently, be subject to an alternatives analysis, and be reviewed for compliance with associated regulations and standards, including the GHG Policy and Protocol. Each of these facilities will be evaluated for their ability to meet the identified need, including reliability of the energy supply, as efficiently as possible while avoiding, minimizing and mitigating Damage to the Environment.

Environmental Justice

In accordance with the EJ Policy, the Proponent should continue to provide enhanced public outreach to EJ populations in Milford and Franklin. During the FEIR process, documents should be made available to the public at the respective public libraries and town halls, on the municipal web sites, and upon request by residents. Notification of these documents should be published in the local paper as well as in alternative community resources such as newsletters and church bulletins, if appropriate. The FEIR should provide an update on the Proponent's enhanced public outreach efforts. MEPA 03

Alternatives Analysis

The FEIR should provide a comparative analysis, in a narrative and tabular format, which clearly identifies differences between the environmental impacts associated with each of the alternatives and includes a discussion of the impacts and benefits of each. At a minimum, this comparison should include the No-Build Alternative, a 200 MW expansion of the Everett site, and the Preferred Alternative. The No-Build Alternative should establish baseline environmental conditions in relation to which the project and alternatives can be described and analyzed and its potential environmental impacts and mitigation measures can be assessed. The No Build Alternative should address the context for the proposed project and how the needs of the SEMA-RI zone would be met in the absence of the proposed project. MEPA 04

The FEIR should fully describe the Preferred Alternative, including schematics and diagrams to describe the proposed facility in terms of structural design, project height, the power generation process and its parameters, equipment efficiencies, and the proposed pollution control systems. The FEIR should provide additional information to support the need for a fast start, fast ramp plant. It should identify criteria employed to select the generator type, operating parameters, and cooling method. The FEIR should discuss the selection of a simple-cycle turbine in comparison to a more efficient flex or combined-cycle turbine. MEPA 05 MEPA 06 MEPA 07 MEPA 08

Land Alteration

The FEIR should quantify land alteration and impervious surfaces for each alternative and indicate whether the alteration is temporary or permanent in nature. It should describe how alterations have been quantified. The FEIR should evaluate all measures to reduce the amount of land alteration, including reductions in roadway widths and impervious surfaces. The FEIR should clearly identify in narrative and on project plans the increase in land alteration to 13.5 acres and the reduction in impervious area to 4.3 acres. MEPA 09

The FEIR should describe and compare the environmental impacts of both the alternative and preferred routes for the pipeline connection with the Spectra/AGT interstate mainline. MEPA 10

Air Quality

MassDEP comments identify additional information that will be required to support technical review of the MCPA Application. Specific questions concern the determination of BACT in the permit application. The FEIR should provide an explanation of the BACT determinations for CO and VOCs, additional information to demonstrate compliance with LAER, and further explanation of challenges associated with on-site storage of liquefied natural gas (LNG). MEPA 11

Greenhouse Gas Emissions

The FEIR must include a revised GHG analysis. The base and proposed cases are not consistent with the GHG Policy, the Scope on the DEIR, and guidance provided by DOER in its comments on the ENF. The revised GHG analysis must calculate and compare GHG emissions of the project (process-related stationary sources) associated with: 1) a Base Case corresponding to the project proposed in the ENF (GE LMS100 CTGs) and 2) a Preferred Alternative that MEPA 12 achieves greater reductions in energy use and GHG emissions. The analysis should provide estimates of GHG emissions of the facility with BACT measures as the Base Case and identify any opportunities for efficiency measures related to the balance of plant operations, step-up transformers, operations, and fuel use. The GHG analysis should include additional analysis of an efficient rapid start, fast ramp flex or combined cycle plant such as the Siemens Flex 300 MW or similar. Flex and combined cycle CTG plants generate more electricity for the same amount of fuel compared to a simple cycle CTG plant thereby resulting in a lower heat rate and reduced GHG emissions. It should identify minimum performance standards for identified criteria such as start to full power and ramp rate. The FEIR should discuss the trade-offs involved in balancing reductions in GHG while achieving required reductions in other pollutant emissions. I expect that the FEIR will clearly present this information in a manner consistent with the GHG Policy and will provide equal emphasis on potential reductions that can be achieved through plant design and operations.

MEPA 13

MEPA 14

The FEIR should include a revised GHG emissions analysis for the administration building that calculates and compares GHG emissions associated with: 1) a Base Case corresponding to the 8th Edition of the Massachusetts Building Code and 2) a Preferred Alternative that achieves greater reductions in energy use and GHG emissions than required by the Building Code. DOER comments recommend the Proponent consider using natural gas as the heating fuel and a high efficiency condensing furnace or boiler.

MEPA 15

The GHG analysis should clearly demonstrate consistency with the objectives of MEPA review, one of which is to document the means by which damage to the environment can be avoided, minimized and mitigated to the maximum extent feasible. The Proponent should identify the model used to analyze GHG emissions, clearly state modeling assumptions, and explicitly note which GHG reduction measures have been modeled. The FEIR should include the modeling printout for each alternative and emission tables that compare Base Case emissions in tpy with the Preferred Alternative to demonstrate anticipated emissions reductions in tpy and percentage by emissions source (direct, indirect and transportation). Other tables and graphs may also be included to convey the GHG emissions and potential reductions associated with various mitigation measures as necessary.

MEPA 16

The GHG analysis should use consistent heat rates and efficiencies, expressed in terms of either the lower heating value (LHV) or higher heating value (HHV), for natural gas and ULSD. The GHG analysis should revise the comparison of CTGs based on HHVs. As previously mentioned, the GHG analysis calculated potential emissions based on the operating scenario using a 33 percent CF with 10 days of ULSD firing (377,000 tpy). The FEIR should explain why this operating scenario was selected for quantification of GHG emissions from the proposed project. The FEIR should discuss whether and how the closure of the Plymouth Nuclear Generating Station may affect the likely operating hours over time.

MEPA 17

MEPA 18

The DEIR asserts that some of the plant design and operating measures may only offset a small percentage of emissions. However, the overall level of emissions from the project warrant additional scrutiny of all mitigation measures because they would result in significant GHG reductions. The Proponent should thoroughly consider all measures that could be employed to reduce GHG emissions and energy use associated with the proposed project and existing infrastructure, and consider offsite mitigation, as allowed by the GHG Policy, to ensure project impacts are mitigated to the maximum extent feasible. As noted previously, equal emphasis

MEPA 19

should be placed on opportunities to reduce GHG emissions through plant design and operations. The GHG analysis should thoroughly analyze opportunities to minimize emissions through pressure drop minimization, evaporative cooling, transformer and electrical line losses, ammonia vaporizers, and detection and avoidance of methane leaks. The FEIR should provide a detailed justification for the evaluation of any measure that will not be adopted or will be designated for later study. MEPA 20

In addition, I note the suggestion from CLF that the Proponent could consider a decreasing cap on emissions over time. The FEIR should include a response to this recommendation. MEPA 21

The FEIR should expand its feasibility analysis for on-site PV to include the site and structures associated with the existing facility and parking area canopies. The FEIR should also discuss the installation of off-site PV systems. The solar feasibility analysis should consider ground-mounted and roof-mounted solar PV and the benefits of varying ownership structures (i.e., outright ownership or third party lease). The Proponent should contact the MEPA office or the DOER for recently updated data on solar installation costs and a solar financial modeling spreadsheet. The analysis should: MEPA 22

- Estimate available roof area (excluding areas dedicated for mechanical equipment) on all buildings or available ground area;
- State the assumed panel efficiency;
- Estimate electrical output of the potential system; and
- Estimate annual GHG reductions due to the use of renewable energy.

The analysis should include a narrative and data to support the Proponent's adoption (or dismissal) of solar PV as a feasible measure to avoid, minimize or mitigate project-related GHG emissions and Damage to the Environment. If the Proponent determines that implementation of solar is not feasible the analysis should include: MEPA 23

- A commitment to construct the project as "solar-ready". At a minimum, this commitment should include design of a building structure capable of supporting solar-related infrastructure. Such a commitment may also include provision of interconnection and inverter equipment, or other design features to facilitate future solar installations.
- Completion of cost analysis to determine the overall financial feasibility of installation of solar, including potential payback periods.
- Discussion of potential environmental constraints (shading, excessive tree removal, presence of wetlands, easements encumbrances, etc.) limiting the application of solar on-site.

The FEIR should include more information regarding the proposed energy conservation awareness program for the Town of Medway, including how the level of funding was established and what types of programs and projects may be supported with this level of funding. I encourage the Proponent to increase the amount of funding and to ensure that funds are directed towards projects that will provide concrete results such as a municipal/school revolving fund for energy efficiency projects, a residential revolving fund for efficiency/weatherization projects to MEPA 24 support and enhance existing energy incentives, and/or installation of renewable energy projects in the project area. In addition, I encourage the Proponent to consider working with Medway or Bellingham to support solar installation on municipal buildings.

The FEIR should include a commitment to provide a self-certification to the MEPA Office at the completion of the project that will be signed by an appropriate professional (e.g. engineer, architect, transportation planner, general contractor) indicating that all of the GHG mitigation measures, or equivalent measures that are designed to collectively achieve identified reductions in stationary source GHG emission and transportation-related measures, have been incorporated into the project. MEPA 25

MEPA, MassDEP, and Department of Energy Resources (DOER) staff are available to assist with these efforts. I encourage the Proponent to consult with MEPA, MassDEP and DOER staff regarding the GHG analysis prior to submission of the FEIR.

Climate Change Resiliency and Adaptation

I expect that the Proponent will provide a more comprehensive response in the FEIR to discuss the potential vulnerabilities of the project site and facility associated with the effects of climate change, including more frequent and intense storms and increases in temperature. It should identify measures that can be incorporated into the site and facility design to support the project's resiliency, such as elevation of infrastructure. It should include a discussion of the effect of temperature changes on energy demand, in particular peak energy demand associated with cooling season, and potential impacts on the reliability or efficiency of the facility and associated infrastructure (e.g. transmission lines). It should identify measures that are already incorporated into the project design to ensure resiliency and identify additional measures that could be considered. MEPA 26 MEPA 27

Wetlands

MassDEP comments note that clearing and removal of vegetation will alter the character of the wetland, even though it will remain an area subject to protection. The FEIR should consider alternatives that would result in fewer impacts to wetland resources such as installing the gas line via subsurface directional drilling at the locations of the wetland crossings. The FEIR should quantify the extent to which directional drilling could reduce impacts to wetland resource areas. MEPA 28

The FEIR should provide an update on the project's stormwater management system. The FEIR should provide specific information to demonstrate that the stormwater features depicted on the site plans are appropriately sized or sited. MassDEP comments indicate that site plans depict an existing driveway, and proposed parking and equipment laydown areas at the locations of the proposed bioretention area, the western infiltration basin, and a portion of the southern infiltration basin. BMP specifications contained within the Massachusetts Stormwater Handbook state that compaction must be avoided in areas where infiltration or bioretention is proposed. The FEIR should evaluate the existing soil conditions at the locations of these proposed stormwater BMPs and, if suitable for infiltration, determine whether these soil properties will be adversely impacted during the construction phase of the project. The FEIR should address the impacts from MEPA 29 MEPA 30 MEPA 31 the existing driveway before construction of the BMPs, and the parking and equipment laydown areas should not be located where the BMPs will ultimately be constructed.

The FEIR discusses the Upper-Middle Charles River Nutrient TMDL but does not provide a numerical estimate of the phosphorus loading reduction for the project. The Proponent should provide this information in the FEIR. MEPA 32

Water Supply

Comments from MassDEP note that Millis' Water Management Act (WMA) permit has capacity to provide the project's identified water demand (35 million gallons, the highest volume that would be required); however, the authorized withdrawal of 0.99 mgd volume is an Interim Allocation pending completion of a new Water Needs Forecast by the DCR.

The Proponent's demand in combination with other future development in Millis could result in a need for the town to provide mitigation for future demands. The Proponent should work with the Town to identify existing and potential mitigation measures. These may include stormwater recharge work in Millis, evaluating efforts to exceed the stormwater management requirements at the project site, land conservation and preservation efforts, habitat improvement efforts such as dam or flow barrier removal, or culvert replacements. Millis is also required to cease pumping of two of its wells based on a streamflow trigger in the Charles River. The FEIR should discuss performing a capacity assessment on Millis' water system to evaluate if Millis can meet peak demands in its own system along with the new connection to the proposed project when the shutoff is triggered. MEPA 33 MEPA 34

The Town of Medway will need to make additional improvements to its infrastructure to address leaks in its system to ensure compliance with the 10 percent Unaccounted for Water (UAW) WMA permit standard which it currently exceeds. Medway's Master Plan recommends replacement of water mains to eliminate pipes prone to leakage. The Proponent should continue to evaluate options to assist Medway in resolving issues with its distribution system to allow the Town to be in compliance with the UAW standard and Residential Gallons Per Capita a Day (RGPCD) standard of 65 gallons/capita/day. In addition to providing funding assistance for energy conservation, the Proponent should also consider providing funding to Medway for water conservation outreach and awareness. MEPA 35 MEPA 36

MassDEP will require Millis and Medway to evaluate the feasibility of delivering water to the site that considers effects on water quality and hydraulic changes to the public water system. The feasibility study should identify modifications necessary to ensure drinking water meets water quality standards and adequate pressure. It should estimate associated costs for identified modifications. Modifications to the public water systems' distribution system such as the addition of a new pump station will require a permit from MassDEP (WS32). The FEIR should clarify if the combined 950,000 gallons of stored water will be available at all times or if that volume will vary and on what frequency. The FEIR should identify the source of water if, due to an emergency, water would be needed to be trucked into the site. MEPA 37

The FEIR should provide a detailed response to the comments from MassDEP regarding the water supply. The FEIR should demonstrate that the Towns of Millis and Medway can MEPA 38 reasonably provide and distribute water to the project in compliance with applicable regulations and permits.

Wastewater

The DEIR describes discharge of demineralization rinse water. The FEIR should describe and locate on project plans the groundwater discharge location or the discharge to the industrial wastewater collection system and document compliance with 314 CMR 7.05. The FEIR should explain the Proponent's assertion that rinse water is not wastewater. MEPA 39

Construction and Demolition

The project must comply with MassDEP's Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. c.40, s.54. The project will be required to employ erosion and sedimentation controls and the Proponent will prepare a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the NPDES CGP requirements.

For potential construction-related air impacts, the Proponent should use construction equipment with engines manufactured to Tier 4 federal emission standards, which are the most stringent emission standards currently available for off-road engines. If a piece of equipment is not available in the Tier 4 configuration, then the Proponent should use construction equipment that has been retrofitted with the best available after-engine emission control technology, such as diesel oxidation catalysts (DOCs) or diesel particulate filters (DPFs), to reduce exhaust emissions. The FEIR should include a list of the engines, their emission tiers, and, if applicable, the BACT installed on each piece. MEPA 40

Mitigation and Section 61 Findings

The FEIR should include an updated and revised chapter that summarizes proposed mitigation measures and provides individual draft Section 61 Findings for each State Agency that will issue permits for the project. The FEIR should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation. MEPA 41

Responses to Comments

The FEIR should contain a copy of this Certificate and of each comment letter received. In order to ensure that the issues raised by commenters are addressed, the FEIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended, and shall not be construed, to enlarge the scope of the FEIR beyond what has been expressly identified in this certificate. The Proponent may use either an indexed response to comments format, or a direct narrative response. MEPA 42

Circulation

In accordance with Section 11.16 of the MEPA Regulations and as modified by this Certificate, the Proponent should circulate a hard copy of the FEIR to each State and City Agency from which the Proponent will seek permits or approvals. The Proponent must circulate a copy of the FEIR to all other parties that submitted individual written comments. Per 301 CMR 11.16(5), the Proponent may circulate copies of the FEIR to these other parties in CD-ROM format or by directing commenters to a project website address. However, the Proponent should make available a reasonable number of hard copies to accommodate those without convenient access to a computer and distribute these upon request on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. A CD-ROM copy of the filing should also be provided to the MEPA Office. A copy of the FEIR should be made available for review at the Medway, Bellingham, Milford, Franklin, and Millis public libraries.

November 13, 2015
Date

Matthew A. Beaton

Comments received:

10/13/2015	Brian Adams
10/14/2015	Richard Shepard
10/29/2015	Jeffrey A. Cahill
11/06/2015	Conservation Law Foundation (CLF)
11/06/2015	Adam and Sara Houser
11/09/2015	Charles River Watershed Association (CRWA)
11/10/2015	Massachusetts Department of Energy Resources (DOER)
11/13/2015	Massachusetts Department of Environmental Protection (MassDEP) – Central Regional Office (SERO) (revised)

MAB/PPP/ppp

SECRETARY'S CERTIFICATE ON THE DEIR

MEPA 01 **The FEIR should include a description and analysis of applicable State statutory and regulatory standards and requirements, and a description of how the project will meet those standards.**

An updated summary of applicable State statutory and regulatory standards and requirements may be found in Section 1.5. In addition to the analysis of statutory and regulatory standards provided in the DEIR, the FEIR provides additional analysis on Greenhouse Gases (Section 5.0), climate change and resiliency (Section 6.0), wetlands (Section 7.0), stormwater (Section 7.0), and water supply (Section 8.0).

MEPA 02 **The FEIR should identify State permits and approvals and provide an update on the status of each of these pending actions. It should include an update on the status of the local review and approval process.**

A complete list of State permits and approvals is provided in Section 1.5.

MEPA 03 **In accordance with the EJ Policy, the Proponent should continue to provide enhanced public outreach to EJ populations in Milford and Franklin. During the FEIR process, documents should be made available to the public at the respective public libraries and town halls, on the municipal web sites, and upon request by residents. Notification of these documents should be published in the local paper as well as in alternative community resources such as newsletters and church bulletins, if appropriate. The FEIR should provide an update on the Proponent's enhanced public outreach efforts. The FEIR should identify State permits and approvals and provide an update on the status of each of these pending actions. It should include an update on the status of the local review and approval process.**

Since the submittal of the DEIR on September 30, 2015, the Project has continued its communications and outreach efforts, including enhanced public outreach to EJ populations in Milford and Franklin. In addition to the Monitor, a notice on the filing of the DEIR was published in the Milford Daily News (including Spanish and Portuguese translations). Notices were also provided for posting at two Milford churches with Portuguese and Spanish speaking congregants. Refer to Section 1.4 of this FEIR for further details.

MEPA 04 **The FEIR should provide a comparative analysis, in a narrative and tabular format, which clearly identifies differences between the environmental impacts associated with each of the alternatives and included a discussion of the impacts and benefits of each. At a minimum, this comparison should include the No-Build Alternative, a 200 MW expansion of the Everett site, and the Preferred Alternative. The No-Build Alternative should establish baseline environmental conditions in relation to which the project and alternatives can be described and analyzed and its potential**

environmental impacts and mitigation measured can be assessed. The No Build Alternative should address the context for the proposed project and how the needs of the SEMA-RI zone would be met in the absence of the proposed project.

Section 3.0 of the DEIR, Alternatives, provided a discussion of the No-Build Alternative (Section 3.1). The Alternative Site Analysis performed by Exelon was described in Section 3.2 and included a tabular comparison of the Medway and Everett/Mystic sites. Baseline environmental conditions for the Medway site were described in Section 2.2 of the DEIR.

Based on the Secretary's November 13 Certificate on the DEIR and clarifications provided at a December 17, 2015 meeting with MEPA, DOER and DEP, an expanded comparison of the No-Build Alternative, the proposed 200 MW peaking project at the Medway site and a conceptual 200 MW peaking project at the Mystic Generating Station in Everett has been developed and is provided in Section 2.0 of the FEIR.

MEPA 05 **The FEIR should fully describe the Preferred Alternative, including schematics and diagrams to describe the proposed facility in terms of structural design, project height, the power generation process and its parameters, equipment efficiencies, and the proposed pollution control systems.**

This information was provided in the DEIR; see Section 1.2, Summary Description and Section 2.0, Project Description. A General Arrangement/Site Layout drawing, including specific labeling of 72 specific plant features, was provided as Figure 1-6. Three plant elevations were provided as Figure 1-7. The figures are reproduced in this FEIR as Figure 1-5 and 1-6, respectively. These elevations depict the height of key project structures (power block perimeter sound wall, combustion turbine inlet filters, the SCR/oxidation catalyst trains, the air cooled heat exchangers, exhaust stacks, ULSD and water tanks, the control/admin/maintenance building, the gas yard and its perimeter noise wall, etc.) Section 11.0, Construction Impacts of the DEIR included the Project General Arrangement Drawing, annotated to show the planned construction stage craft parking areas, admin parking and office trailer area and the equipment laydown areas (Figure 11-2). These temporary construction areas are located around the periphery of the plant and total approximately 5.8 acres.

The power generation process and its parameters, equipment efficiencies and air pollution control systems were summarized in Section 1.0 of the DEIR; they were described in more detail in Section 2.0 of the DEIR. Further details were provided in Section 4.4, Control Technology Analysis; Attachment B, GE LMS100 Product Brochure, 2015 and Attachment D, Major Comprehensive Air Plan Application and Prevention of Significant Deterioration Permit Application. Elements of Section 2.0, Project Description, are repeated in Section 2.0 this FEIR for ease of reference.

An update on the improved efficiency of the GE LMS100 is provided as FEIR Section 1.2.4.1.

MEPA 06 **The FEIR should provide additional information to support the need for a fast start, fast ramp plant.**

The energy benefits of the Proposed Project were discussed in Section 1.5.2.1 of the DEIR. Additional context is provided in Section 2.1, Project Objectives, of the DEIR. A fast start, fast ramp project, as is being proposed by Exelon and accepted by ISO-NE in FCA #9, is particularly well suited to a regional power grid which is adding more intermittent renewable resources (PV, onshore wind, possibly offshore wind). Massachusetts alone now has some 900 MW of intermittent PV capacity while DOER and other agencies continue to encourage the installation of more solar capacity. Similarly, as of the end of 2014, New England has added approximately 800 MW of onshore wind power to the grid with reported plans to add as much as 4,000 MW of additional wind capacity. Across New England, the development community continues to look for opportunities to add more onshore and offshore wind capacity. As more and more intermittent renewable capacity is added to the ISO-NE system, more complementary fast start fast ramp capacity will be required.

As was described in Section 2.3.1.1 of the DEIR the GE LMS100 is a particularly flexible machine. In addition to its fast start/fast ramp capability, it can operate efficiently and in compliance with air emissions limits down to 25% of its full rated output.

Additional insight on this issue is provided in a recently issued ISO-NE discussion paper entitled "The Importance of a Performance-Based Capacity Market to Ensure Reliability as the Grid Adapts to a Renewable Energy Future".

MEPA 07 **It should identify criteria employed to select the generator type, operating parameters, and cooling method.**

The rationale for proposing a nominal 200 MW simple-cycle dual fuel project was discussed in Section 1.5.2.1, Energy Benefits and Section 2.1, Project Objectives, of the DEIR. The GE LMS100 was selected based on its high efficiency, fast start/fast ramp capability, operating flexibility and proven operating track record. By selecting the highly efficient, but more expensive GE LMS100 unit, Exelon prioritized reduced carbon emissions over cost considerations.

The high efficiency of the GE LMS100 stems, in part, from its use of an intercooler, which in turn requires a cooling system. The selected cooling method (air cooling) was a function of the limited availability of large volumes of water as required for a wet (or evaporative) cooling cycle.

The rationale for the use of a the most efficient available simple-cycle machine as opposed to a combined-cycle unit is discussed in further detail in Section 2.4 of the FEIR.

MEPA 08 **The FEIR should discuss the selection of a simple-cycle turbine in comparison to a more efficient flex or combined-cycle turbine.**

Please see Section 2.4 of the FEIR.

MEPA 09 **The FEIR should quantify land alteration and impervious surfaces for each alternative and indicate whether the alteration is temporary or permanent in nature. It should describe how alterations have been quantified. The FEIR should evaluate all measures to reduce the amount of land alteration, including reductions in roadway widths and impervious surfaces. The FEIR should clearly identify in narrative and on project plans the increase in land alteration to 13.5 acres and the reduction in impervious area to 4.3 acres.**

Please see text of Section 3.0 and also the response to comment DEP 03.

MEPA 10 **The FEIR should describe and compare the environmental impacts of both the alternative and preferred routes for the pipeline connection with the Spectra/AGT interstate mainline.**

Initial information on possible pipeline interconnection routes was provided in the April 30, 2015 ENF. As described on page 14 of the ENF a final route had not yet been identified. A potential 3,000 ft. long routing was described in the ENF and two possible routes were mapped on ENF Attachment 4. As Project development work progressed and discussions held with Spectra, the more southerly route was set aside as Spectra was concerned that the interconnection tap was in the proximity of residences on the west side of the Exelon property. Spectra asked that the more northerly route be used, with its interconnection next the existing gate station just south of Route 109.

Both the northerly and more southerly routing options pass between the small BVW and IVW just to the northwest of the existing Medway power plant. The more northerly route requested by Spectra unavoidably crosses a single 10 ft. wide strip of BVW. The more southerly route would avoid this small crossing but entails substantially more tree clearing, crossing of private lands to the west of the Exelon site and an interconnection tap location of concern to Spectra.

Updated information on potential temporary impacts to less than 2,000 sf. of BVW and IVW resource areas, together with a discussion of potential measures to reduce these temporary impacts, is provided in Section 1.2.3 of the FEIR. A more detailed discussion of wetlands resource areas with respect to the proposed pipeline interconnection route is provided as Section 7.1.2.

MEPA 11 **The FEIR should provide an explanation of the BACT determinations for CO and VOCs, additional information to demonstrate compliance with LAER, and further explanation of challenges associated with on-site storage of liquefied natural gas (LNG).**

The DEIR included comprehensive BACT and LAER analyses as part of the Major Comprehensive Air Plan Approval Application and the Prevention of Significant Deterioration Permit Applications (DEIR Attachment D). The proposed air pollution control systems were also described in Sections 2.3 and 4.4 of the DEIR

Further details regarding BACT determinations for CO and VOCs may be found in Section 4.1 and additional information on compliance with LAER in Section 4.2.

Section 4.3 of this FEIR provides further explanation of challenges associated with on-site storage of LNG (as an alternative to ULSD).

MEPA 12 **The FEIR must include a revised GHG analysis. The base and proposed cases are not consistent with the GHG Policy, the Scope on the DEIR, and guidance provided by DOER in its comments on the ENF. The revised GHG analysis must calculate and compare GHG emissions of the project (process-related stationary sources) associated with: 1) a Base Case corresponding to the project proposed in the ENF (GE LMS 100 CTGs) and 2) a Preferred Alternative that achieves greater reductions in energy use and GHG emissions. The analysis should provide estimates of GHG emissions of the facility with BACT measures as the Base Case and identify any opportunities for efficiency measures related to the balance of plant operations, step-up transformers, operations, and fuel use.**

Section 5.2.1 of this FEIR updates GHG analysis to reflect a Base Case corresponding to the project proposed in the ENF (GE LMS100 CTGs) by changing the top-left value in DEIR Table 5-5 to match the top-right value. As stated in Section 5.2.1 of this FEIR, the GE LMS100 turbine system is a highly pre-engineered overall package system, and the vast majority of available mitigation is pre-engineered by GE into the system.

MEPA 13 **The GHG analysis should include additional analysis of an efficient rapid start, fast ramp flex or combined cycle plant such as the Siemens Flex 300 MW or similar. Flex and combined cycle CTG plants generate more electricity for the same amount**

of fuel compared to a simple cycle CTG plant thereby resulting in a lower heat rate and reduced GHG emissions. It should identify minimum performance standards for identified criteria such as start to full power and ramp rate.

Section 5.3 of this FEIR documents that a flex-start or combined-cycle plant would not meet Project needs, including the need to generate 200 MW of power within 10 minutes of start with low emissions and the need to be capable of ramping at 50 MW per minute. For expected Project operation, flex-started CTGs would not generate more electricity for the same amount of fuel and in fact would increase startup emissions given the need for exhaust gas bypass. Based on the type of operation planned for the Project, a flex CTG would be operating in simple-cycle mode and not a combined-cycle mode, and in actual operations therefore, the flex plant combustion turbine will have a less efficient heat rate than the GE LMS100. As such, it would also have higher GHG emissions than the Project as proposed.

MEPA 14 **The FEIR should discuss the trade-offs involved in balancing reductions in GHG while achieving required reductions in other pollutant emissions. I expect that the FEIR will clearly present this information in a manner consistent with the GHG Policy and will provide equal emphasis on potential reductions that can be achieved through plant design and operations.**

Potential reductions that could be achieved through plant design are reviewed in Section 5.5 of this FEIR. Potential reductions that could be achieved through operations are reviewed in Section 5.6 of this FEIR. These reductions are summarized in Table 5-16.

MEPA 15 **The FEIR should include a revised GHG emissions analysis for the administration building that calculates and compares GHG emissions associated with: 1) a Base Case corresponding to the 8th Edition of the Massachusetts Building Code and 2) a Preferred Alternative that achieves greater reductions in energy use and GHG emissions than required by the Building Code. DOER comments recommend the Proponent consider using natural gas as the heating fuel and a high efficiency condensing furnace or boiler.**

Section 5.7 provides the revised GHG emissions analysis for the administration building.

The 8th Edition of the Massachusetts Building Code refers to the International Energy Conservation Code (IECC) 2012. During a telephone call with MEPA staff on January 27, 2016, MEPA indicated it may be appropriate to use the older IECC 2009 code as baseline to use because it is the starting point for the Massachusetts stretch code requirements and Medway is a stretch code community. The analysis in Section 5.7 of this FEIR conservatively uses the newer IECC 2012 code as baseline.

Using the IECC 2009 code as baseline would change prescriptive building design requirements in Tables 5-10 and 5-13 as follows:

- Roof: Metal buildings (with R-5 thermal blocks) R-13 + R-13
- Walls, Above Grade: Metal building R-13 + R-5.6 ci (Continuous Insulation)
- Unheated slab-on-grade floor: No requirement
- Windows: U 0.55 for Metal framing with or without thermal break, 0.40 SHGC for projection faction <0.25, no SHGC requirement for projection factor 0.25 or higher.
- Air conditioners, air cooled, ≥ 65,000 Btu/h and < 135,000 Btu/h, electric resistive heating (or none): 11.2 EER (Energy Efficiency Ratio).

MEPA 16 **The GHG analysis should clearly demonstrate consistency with the objectives of MEPA review, one of which is to document the means by which damage to the environment can be avoided, minimized and mitigated to the maximum extent feasible. The Proponent should identify the model used to analyze GHG emissions, clearly state modeling assumptions, and explicitly note which GHG reduction measures have been modeled. The FEIR should include the modeling printout for each alternative and emission tables that compare Base Case-emissions in tpy with the Preferred Alternative to demonstrate anticipated emissions reductions in tpy and percentage by emissions source (direct, indirect and transportation). Other tables and graphs may also be included to convey the GHG emissions and potential reductions associated with various mitigation measures as necessary.**

Section 5.0 of this FEIR reviews the means by which damage to the environment can be avoided, minimized and mitigated to the maximum extent feasible. Section 5.10.1 summarizes consistency with the objectives of MEPA review, and Section 5.10.2 includes emission tables as-requested.

MEPA 17 **The GHG analysis should use consistent heat rates and efficiencies, expressed in terms of either the lower heating value (LHV) or higher heating value (HHV}, for natural gas and ULSD.**

The basis for heat rates and efficiencies is documented for each portion of the FEIR, and HHV is used whenever possible and appropriate in the particular context being discussed.

MEPA 18 **The GHG analysis should revise the comparison of CTGs based on HHVs. As previously, mentioned, the GHG analysis calculated potential emissions based on the operating scenario using a 33 percent CF with 10 days of ULSD firing (377,000 tpy}. The FEIR should explain why this operating scenario was selected for**

quantification of GHG emissions from the proposed project. The FEIR should discuss whether and how the closure of the Plymouth Nuclear Generating Station may affect the likely operating hours over time.

Section 5.2.2 of this FEIR explains that for compliance with the MEPA GHG Policy and Protocol, emissions are calculated based on expected actual, not potential, emissions, explains how this is consistent with analyses of other types of facilities, and explains how the estimate used is consistent with the estimates used by Exelon for other purposes. Section 5.2.4 explains that the closure of the Pilgrim Nuclear Generating Station is unlikely to affect the Project operating hours, because the market is likely to induce entry of replacement resources.

MEPA 19 **The Proponent should thoroughly consider all measures that could be employed to reduce GHG emissions and energy use associated with the proposed project and existing infrastructure, and consider offsite mitigation, as allowed by the GHG Policy, to ensure project impacts are mitigated to the maximum extent feasible.**

Section 5.0 of this FEIR reviews measures that could be employed to reduce GHG emissions and energy use associated with the proposed project. Offsite mitigation is addressed in Section 5.9. Retrofit of solar photovoltaic at the existing facility is reviewed in Section 5.8. Further review of the existing facility is not part of the scope for the Project (noting it operates infrequently and the Project is designed to provide more efficient supply to the grid).

MEPA 20 **As noted previously, equal emphasis should be placed on opportunities to reduce GHG emissions through plant design and operations. The GHG analysis should thoroughly analyze opportunities to minimize emissions through pressure drop minimization, evaporative cooling, transformer and electrical line losses, ammonia vaporizers, and detection and avoidance of methane leaks. The FEIR should provide a detailed justification for the evaluation of any measure that will not be adopted or will be designated for later study.**

Each specific opportunity to minimize emissions is reviewed in-turn in Sections 5.5 and 5.6.

MEPA 21 **In addition, I note the suggestion from CLF that the Proponent could consider a decreasing cap on emissions over time. The FEIR should include a response to this recommendation.**

The CLF suggestion is responded to in Response to Comments Section 12.0.

MEPA 22 **The FEIR should expand its feasibility analysis for on-site PV to include the site and structures associated with the existing facility and parking area canopies. The FEIR should also discuss the installation of off-site PV systems. The solar feasibility** analysis should consider ground-mounted and roof-mounted solar PV and the benefits of varying ownership structures (i.e., outright ownership or third party lease). The Proponent should contact the MEPA office or the DOER for recently updated data on solar installation costs and a solar financial modeling spreadsheet. The analysis should:

- Estimate available roof area (excluding areas dedicated for mechanical equipment) on all buildings or available ground area;
- State the assumed panel efficiency;
- Estimate electrical output of the potential system; and
- Estimate annual GHG reductions due to the use of renewable energy.

Section 5.8 of this FEIR provides an expanded feasibility analysis for onsite solar PV, including installation at existing structures and on parking lots (no onsite ground-mounted space is available). Section 5.9 of this FEIR discusses offsite mitigation, including offsite PV.

MEPA 23 The analysis should include a narrative and data to support the Proponent's adoption (or dismissal) of solar PV as a feasible measure to avoid, minimize or mitigate project-related GHG emissions and Damage to the Environment. If the Proponent determines that implementation of solar is not feasible the analysis should include:

- A commitment to construct 'the project as "solar-ready". At a minimum, this commitment should include design of a 'building' structure capable of supporting solar-related infrastructure. Such a commitment may also include provision of interconnection and inverter equipment, or other design features to facilitate future solar installations.
- Completion of cost analysis to determine the overall financial feasibility of installation of solar, including potential payback periods.
- Discussion of potential environmental constraints (shading, excessive tree removal, presence of wetlands, easements encumbrances, etc.) limiting the application of solar on-site.

Section 5.8 of this FEIR provides an expanded feasibility analysis for onsite solar PV, including steps to allow later implementation of solar installation if appropriate, cost analyses, and environmental constraints.

MEPA 24 **The FEIR should include more information regarding the proposed energy conservation awareness program for the Town of Medway, including how the level of funding was established and what types of programs and projects may be supported with this level of funding. I encourage the Proponent to increase the amount of funding and to ensure that funds are directed towards projects that will provide concrete results such as a municipal/school revolving fund for energy efficiency projects, a residential revolving fund for efficiency/weatherization projects to support and enhance existing energy incentives, and/or installation of renewable energy projects in the project area. In addition, I encourage the Proponent to consider working with Medway or Bellingham to support solar installation on municipal buildings.**

Funding of the energy awareness fund and other funding to the town is discussed in Section 5.9 of this FEIR. As discussed in Section 1.0 of the FEIR, Exelon has signed a Host Community Agreement (HCA) with the Town of Medway and has reached agreement on a Payment In Lieu Of Taxes (PILOT) agreement with the Town. These agreements are included in this FEIR as Technical Appendices C and B, respectively. The PILOT agreement is valued at approximately $73,000,000 over a 20 year period. The Town of Medway is already a leader in the field of energy efficiency and renewable energy initiatives, as witnessed by their local energy action plan (*http://www.townofmedway.org/Pages/MedwayMA_Bcomm/Energy/Medway%20Energy%20Action%20Plan_Combined.pdf*) and its participation as a Massachusetts Green Community. Recognizing that the proposed Project will put very little burden on Town services, the Town is in an excellent position to fund energy efficiency projects as described by MEPA, without being forced to do so. Decisions as to how to use the PILOT revenues are, of course, a matter for the Town, its elected leaders and citizens to decide.

Exelon has provided and will continue to offer specific energy efficiency assistance. As discussed further in the response to MEPA 35 below, Exelon has also funded a leak detection study for the Town of Medway water distribution system, finding major leaks that (once repaired) allowed an approximate 30% reduction in electricity use by the Town well pumps. Looking forward, Exelon has a division that develops renewable energy projects including municipal-scale solar PV projects. Exelon will offer to meet with the Town of Medway to review options that Exelon can offer for municipal renewable energy projects.

MEPA 25 **The FEIR should include a commitment to provide a self-certification to the MEPA Office at the completion of the project that will be signed by an appropriate professional (e.g. engineer, architect, transportation planner, general contractor) indicating that all of the GHG mitigation measures, or equivalent measures that are**

designed to collectively achieve identified reductions in stationary source GHG emission and transportation-related measures, have been incorporated into the project.

The self-certification commitment is provided in Section 5.10.4.

MEPA 26 **I expect that the Proponent will provide a more comprehensive response in the FEIR to discuss the potential vulnerabilities of the project site and facility associated with the effects of climate change, including more frequent and intense storms and increases in temperature. It should identify measures that can be incorporated into the site and facility design to support the project's resiliency, such as elevation of the infrastructure.**

As shown on mapping in the DEIR, the Project Site is located at an approximate elevation of 201 ft. MSL and is located approximately 24 miles inland from Boston Harbor. Accordingly, sea level rise is not an issue for this project.

As was also noted in the DEIR, Section 9.3, the Project Site itself is located approximately 570 feet from the nearest floodplain, and the portion of the Project Site in closest proximity to the floodplain lies approximately 15 feet above the floodplain elevation. Therefore, the Project Site is not at risk of flooding.

A more detailed discussion of facility design with respect to the potential effects of climate change is provided in Section 6.0 of this FEIR.

MEPA 27 **It should include a discussion of the effect of temperature changes on energy demand, in particular peak energy demand associated with cooling season, and potential impacts on the reliability or efficiency of the facility and associated infrastructure (e.g. transmission lines). It should identify measures that are already incorporated into the project design to ensure resiliency and identify additional measures that could be considered.**

The core of the Project is two GE LMS100 aero-derivative simple-cycle combustion turbines. The LMS100 is a robust and proven generation technology. As of March 2015, there were 51 LMS100 units in commercial operation worldwide in locations ranging from southern California, New Mexico and Texas to South Dakota, Montana and Canada. Thirty five of the fifty one units are operating in the United States. With units located in climates ranging from near equatorial (Venezuela), to hot and arid (New Mexico, Texas) to colder areas (Montana, Canada), the GE LMS100 operates across a very wide range of temperatures. As of March 2015, the LMS100 fleet had accumulated over 370,000 operating hours and more than 47,000 total starts. GE fleet data shows availability of 98.66% with reliability at 99.83% (12-month rolling average data).

Additional discussion with respect to facility design and resiliency is provided in Section 6.0 of this FEIR. A discussion of the potential system wide effects of temperature increases is provided in Section 6.2.

MEPA 28 **The FEIR should consider alternatives that would result in fewer impacts to wetland resource such as installing the gas line via subsurface directional drilling at the locations of the wetland crossings. The FEIR should quantify the extent to which directional drilling could reduce impacts to wetland resource areas.**

Please see discussion in Section 1.2.3 and Section 7.1.2. As described in these sections, the direct wetland impact is limited to a single approximately 10 foot crossing of a wetlands area to the northwest of the Project. The pipeline related BVW and IVW impacts (~1,975 sf.) are temporary and arise from the assumed 50-foot wide construction work zone. As detailed plans are advanced for the NOI filing, these temporary impacts may be reduced via use of narrower work zone in these areas. While the use of HDD could, in theory, eliminate these temporary impacts, the proximity of existing facilities (Spectra pipeline, Exelon 135 MW plant) effectively precludes its use in this instance.

MEPA 29 **The FEIR should provide an update on the project's stormwater management system. The FEIR should provide specific information to demonstrate that the stormwater features depicted on the site plans are appropriately sized or sited. MassDEP comments indicate that site plans depict an existing driveway, and proposed parking and equipment laydown areas at the locations of the proposed bioretention area, the western infiltration basin, and a portion of the southern infiltration basin. BMP specifications contained within the Massachusetts Stormwater Handbook state that compaction must be avoided in areas where infiltration or bioretention is proposed.**

The construction stage stormwater system and the permanent stormwater system design have been essentially completed (see Draft Stormwater Management Report prepared by Beals & Thomas, Technical Appendix D). The use of some areas for construction laydown and/or parking, with subsequent reuse for elements of the permanent stormwater system is addressed in Section 7.2 as well as in Technical Appendix D.

MEPA 30 **The FEIR should evaluate the existing soil conditions at the locations of these proposed stormwater BMPs and, if suitable for infiltration, determine whether these soil properties will be adversely impacted during the construction phase of the project.**

Please see the response to MEPA 29.

MEPA 31 **The FEIR should address the impacts from the existing driveway before construction of the BMPs, and the parking and equipment laydown areas should not be located where the BMPs will ultimately be constructed.**

Please see the response to MEPA 29.

MEPA 32 **The [D]EIR discusses the Upper-Middle Charles River Nutrient TMDL but does not provide a numerical estimate of the phosphorus loading reduction for the project. The Proponent should provide this information in the FEIR.**

Please see Section 7.3.

MEPA 33 **The Proponent's demand in combination with other future development in Millis could result in a need for the town to provide mitigation for future demands. The Proponent should work the Town to identify existing and potential mitigation measures. These may include stormwater recharge work in Millis, evaluating efforts to exceed the stormwater management requirements at the project site, land conservation and preservation efforts, habitat improvement efforts such as dam or flow barrier removal, or culvert replacements.**

As discussed in Section 8.0 and the attached Draft Kleinfelder Report (Technical Appendix E), the Millis system has sufficient water to serve current users, potential future development as well as supplemental Exelon needs. As summarized in Section 8.2.1 and detailed in the December 15, 2015 Kleinfelder Report, future demand in Millis is expected to contract as a result of declining population. Accordingly, the Project Proponent would not expect that incremental mitigation measures would be necessary as a result of Exelon's incremental use of Millis water.

However, at the request of the Town of Millis, Exelon also agreed to fund a detailed additional study by Kleinfelder to fully evaluate potential minimization and mitigation measures the Town of Millis might implement in order to comply with possible, future requirements pursuant to the baseline withdrawal volume established under SWMI. Should the Town of Millis reach its SWMI baseline ADD volume, Kleinfelder has summarized and prioritized potential water use minimization and mitigation measures, and provided cost estimates for implementation.

In January, 2016, Kleinfelder issued the results of this analysis as a supplement to the December 15, 2015 report. The supplemental document is entitled "Minimization & Mitigation Implementation Analysis, Town of Millis Massachusetts". The Supplement is included as part of Technical Appendix E to this FEIR. As summarized on page iv of the Supplement, upon permit renewal, the top three minimization options available to the Town of Millis are 1) optimization of existing sources (increase summer withdrawals from Wells 1 and 2 while reducing flows from wells 3,5 and 6 which are in a sub-basin with higher groundwater depletion levels; 2) enhanced non-essential outdoor water restrictions and 3) using existing the annual leak survey results in a more targeted way (prioritize system into zones based on water main age, material and break history so as to focus on higher priority areas first.

The January 2016 Kleinfelder supplement also examines a wide range of other potential mitigation measures available to the Town of Millis.

MEPA 34 **Millis is also required to cease pumping of two of its wells based on stream flow trigger in the Charles River. The FEIR should discuss performing a capacity assessment on Millis' water system to evaluate if Millis can meet peak demands in its own system along with the new connection to the proposed project when the shutoff is triggered.**

This question was addressed in the draft Kleinfelder Report as summarized in Section 8.2.1. The Millis system is served by six supply wells with a combined Maximum Daily Output of 4.958 MGD. The two wells (5 and 6) subject to a low flow shutdown account for 2.1.2 MGD of this total volume. The remaining wells are more than adequate to meet Millis's ADD of 0.63 MGD (2014) plus planned development plus a peak Exelon need. The Project's on site raw water and finished water storage tanks provide additional supply flexibility if needed.

MEPA 35 **The Town of Medway will need to make additional improvements to its infrastructure to address leaks in its system to ensure compliance with the 10 percent Unaccounted for Water (UAW) WMA permit standard which it currently exceeds. Medway's Master Plan recommends replacement of water mains to eliminate pipes prone to leakage. The Proponent should continue to evaluate options to assist Medway in resolving issues with its distribution system to allow the Town to be in compliance with the UAW standard and Residential Gallons Per Capita a Day (RGPCD) standard of 65 gallons/capita/day.**

As explained in Section 8.0 of the FEIR, the Project will not use water from the Medway system (excepting minor potable use of ~120 gallons per day). The Project will rely on an onsite well (51,840 gpd, annual average capacity) for the majority of its process water requirements. Assuming that a supplemental supply agreement is reached with the adjoining Town of Millis, elements of the Medway water distribution system will be used to convey supplemental water volumes to the Project. In accordance with the wishes of the Medway Board of Selectmen, Medway will not be providing any process water to the Project.

Medway's Public water Supply Annual Statistical Report (ASR) for reporting year 2014 (Technical Appendix G1) indicates that residential use was 77 gpcpd versus the standard of 65 gpcpd. With respect to Unaccounted for Water Use, the Town reports a figure of 4.3% versus the target of 10% (Table DS-5). However, it should be noted that the same table reports that an estimated municipal use of 41.3% (169.09 MGY), the vast majority of which (158.99 MGY) is ascribed to "major water main breaks (not leak detection)".

As was briefly discussed in the DEIR (Section 1.5.2.4), during an earlier stage of Project development, Exelon provided $40,000 to the Town of Medway for use in a sophisticated leak detection study. The Town was aware that it was losing sizeable volumes of water but had been unable to find the problem. The Town used the funding provided by Exelon to retain Liston Utility Services (Liston). In late 2014, Liston performed a comprehensive "correlation leak survey" on 74 miles of the Medway distribution system. The study methodology is described on page 2 of the Liston report (Technical Appendix F). The study found two major leaks, a 300 gpm main leak on Village St near Walker Street (southeast "corner" of the Town of Medway) and a 50 gpm main leak at 3 Ellis St.

The 300 gpm leak on Village near Walker (~0.43 MGD or 157.7 MGY) was difficult to locate. The leaking (broken) main was 9 ft. below grade and beneath a utility duct bank and a large sewer interceptor. Moreover, the leak was directly over a drain culvert which allowed the leaking water to flow directly to the nearby Charles River. As a result of the location of the leak it did not "surface' as is typically the case for large volume leaks, making detection particularly challenging. (leak specifics based on personal communication, Mr. Thomas Holder, Director, Department of Public Services, Town of Medway with Ms Tammy Sanford, Exelon).

Once identified, the Town was able to repair this very sizeable leak (as well as the other leaks identified by Liston). While the 2015 ASR is not yet available, the Town reports that electricity use to power the Towns well pumps is down approximately 30%. This is consistent with the magnitude of the leak reduction flows.

Looking forward, as discussed in Section 1.0 of this FEIR, Exelon has signed a Host Community Agreement (HCA) with the Town of Medway and has reached agreement on a Payment In Lieu Of Taxes (PILOT) agreement with the Town. These agreements are included in this FEIR as Technical Appendices C and B, respectively. The PILOT agreement is valued at approximately $73,000,000 over a 20 year period. The Proposed Project will put little burden on Town services, thus the Town may choose to use some of the PILOT revenues to fund ongoing maintenance of its water system and will have the resources available for residential/institutional water conservation initiatives as well. Decisions as to how to use the PILOT revenues are, of course, a matter for the Town, its elected leaders and citizens to decide.

The HCA agreement includes a provision with respect to a $5/MWhr payment to the Town for power generated using ULSD. One of the agreed upon uses for this revenue is conservation. The Project will ask the Town to consider using a portion of these revenues for water conservation initiatives.

Lastly, during 2015, the Project funded an analysis of the Medway water system at the request of the Medway Selectmen. This study was performed by Kleinfelder and provides useful insights to the Town with respect to future management of their water system.

MEPA 36 **In addition to providing funding assistance for energy conservation, the Proponent should also consider providing funding to Medway for water conservation outreach and awareness.**

Please see the response to MEPA 35 above.

MEPA 37 **MassDEP will require Millis and Medway to evaluate the feasibility of delivering water to the site that considers effects on water quality and hydraulic changes to the public water system. The feasibility study should identify modifications necessary to ensure drinking water meets water quality standards and adequate pressure. It should estimate associated costs for identified modifications. Modifications to the public water systems' distribution system such as the addition of a new pump station will require a permit from MassDEP (WS32). The FEIR should clarify if the combined 950,000 gallons of stored water will be available at all times or if that volume will vary and on what frequency. The FEIR should identify the source of water if, due to an emergency, water would be needed to be trucked into the site.**

The first part of this question was examined by Kleinfelder (see Technical Appendix E for the full report). As summarized in FEIR Section 8.2.1, a booster pump station will be required as the hydraulic grade of the Medway system is somewhat higher than the Millis system. Both systems provide similar treatment, but Medway provides somewhat higher doses of certain treatment chemicals. It is not yet certain if any supplemental dosing of Millis water flowing to the Medway system will be required, however, given the relatively modest volumes of water involved, such dosing could be accomplished by a chemical feed system at the new booster pump station.

Specifics of the booster pump station are discussed in Section 3 of the December 15, 2015 Kleinfelder Report. The cost of a precast underground unit, two pumps (one as a spare), a backup generator, and associated controls is expected to be $200,000 to $350,000. Exelon would expect to pay for any necessary improvements as part of its supply agreement with Millis.

The Project design includes a 500,000 gallon raw water storage tank and a 450,000 gallon finished (demineralized) water storage tank. As discussed in Section 8.2.2, the Project's operating approach would be to begin each operating day with both tanks full and to maintain them at full or close to full over the course of the operating day (or portion of a day). Depending on the operating hours in a given day, load factor, and fuel, together with the volume of supplemental water available from the Millis system, there may be some variation in this operating plan. For example, higher volumes of water from the Millis system could be taken at night, when demands on a municipal system are typically low. If a fire reserve is required, it would likely be on the order of 150,000 gallons.

As discussed in Section 8.2.3, Additional Water Sources, the Project has identified two potential sources of water which could be trucked to the site in the event that normal supplies are unavailable or restricted.

MEPA 38 **The FEIR should demonstrate that the Towns of Millis and Medway can reasonably provide and distribute water to the project in compliance with applicable regulations and permits.**

This question was examined by Kleinfelder (see Technical Appendix E for the full report). As summarized in FEIR Section 8.2.1, the mechanics of providing supplemental water from the Millis system via the Medway system are relatively straightforward. Millis has sufficient water available and the transfer can be done in accordance with applicable requirements.

MEPA 39 **The DEIR describes discharge of demineralization rinse water. The FEIR should describe and locate on project plans the groundwater discharge location or the discharge to the industrial wastewater collection system and document compliance with 314 CMR 7.05. The FEIR should explain the Proponent's assertion that rinse water is not wastewater.**

See Section 9.0, Wastewater. The "demineralizer rinse water" is partially demineralized raw water, small volumes of which are discharged when a new portable demineralizer system is connected/disconnected. The "rinse water" is clean water to which no treatment chemicals or other contaminants have been added. The Project plans to discharge this water to the Medway sewer system via the sump system described in the text.

MEPA 40 **For potential construction-related air impacts, the Proponent should use construction equipment with engines manufactured to Tier 4 federal emission standards, which are the most stringent emission standards currently available for off-road engines. If a piece of equipment is not available in the Tier 4 configuration, then the Proponent should use construction equipment that has been retrofitted with the best available after-engine emission control technology, such as diesel** oxidation catalysts (DOCs) or diesel particulate filters (DPFs), to reduce exhaust emissions. The FEIR should include a list of the engines, their emission tiers, and, if applicable, the BACT installed on each piece.

Please refer to Section 10.2 for details regarding construction equipment.

MEPA 41 The FEIR should include an updated and revised chapter that summarizes proposed mitigation measures and provides individual draft Section 61 Findings for each State Agency that will issue permits for the project. The FEIR should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation.

Section 11.0 of this FEIR contains all mitigation measures and Section 61 Findings.

MEPA 42 The FEIR should contain a copy of this Certificate and of each comment letters received. In order to ensure that the issues raised by commenters are addressed, the FEIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended, and shall not be construed, to enlarge the scope of the FEIR beyond what has been expressly identified in this certificate. The Proponent may use either an indexed response to comments format, or a direct narrative response.

Responses to Comments are contained in Section 12.0 of this FEIR.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Central Regional Office • 8 New Bond Street, Worcester MA 01606 • 508-792-7650

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Governor

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Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

November 13, 2015

Secretary Matthew A. Beaton
Executive Office of Environmental Affairs
100 Cambridge Street, 9th Floor
Boston, MA 02114

Attention: MEPA Unit – Purvi Patel

Re: Draft Environmental Impact Report (DEIR)
West Medway II
Medway
EEA # 15363

Dear Secretary Beaton,

The Massachusetts Department of Environmental Protection's ("MassDEP") Central Regional Office (CERO) has reviewed the DEIR for the proposed West Medway II Project in Medway (the "Project"). The Proponent proposes to construct a new 200 MW electric power generation plant that would operate during times of peak energy demand and would run primarily on natural gas. This project will include two simple cycle GE LMS electric combustion turbines ; pollution control equipment; two 160-foot-tall exhaust stacks; natural gas compressors; transformers; above ground storage tanks for diesel fuel, water, and aqueous ammonia; an approximately 15,000 square foot building for a control room, warehouse area, and water treatment area; and stormwater management systems including infiltration basins. Natural gas will be delivered via an interconnection to the existing Algonquin Gas Transmission (AGT) Company pipeline.

The Project is proposed within a 94-acre parcel owned by the Proponent on which it currently operates a 135 MW power plant. The Project will alter approximately 13 acres of land and will create 4.3 acres of impervious area. Additionally, the project will impact 14,941 square feet (sf) of Riverfront Area, 3,096 sf of which is presently developed/degraded; temporarily alter 1,975 sf of Bordering Vegetated Wetland; and 51,098 sf of Buffer Zone, of which 41,530 sf will be temporary alterations.

The maximum annual average daily water usage for the Proposed Project has been reduced from the proposed ENF amount of 190,000 gallons per day (gpd) for process to approximately 95,206 gpd. The Project has very limited increased sanitary wastewater flow, on the order of approximately 120 gallons per day (six operations employees). The Project will also have limited process wastewater flow of approximately 5,000 gpd. The Project is subject to the MEPA Greenhouse Gas Emissions Policy and Protocol.

This project is under MEPA review because it meets or exceeds the following review thresholds:

- 11.03(1)(b)(2) – Creation of five or more acres of impervious area;
- 11.03(1)(b)(4) – Conversion of land in active agricultural use to nonagricultural use;
- 11.03(7)(a)(2) – Expansion of an existing electric generating facility by 100 or more MW;
- 11.03(8)(b)(2) – Modification of an existing major stationary source resulting in a "significant net increase" in actual emissions, provided that the stationary source or facility is major for the pollutant, emission of which is increased by: 15 tpy of PM as PM10; 100 tpy of CO; 40 tpy of SO2; 25 tpy of VOC or NOx; 0.6 tpy of lead.

The Project will require two permits from MassDEP: Major Comprehensive Air Plan Approval (BWP AQ03) and Title V Air Operating Permit (BWP AQ14). If the local Order of Conditions from the Medway Conservation Commission under the Wetlands Protection Act is appealed, MassDEP may issue a Superseding Order of Conditions.

According to the Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form issued on June 19, 2015 (the "Certificate"), because the Project requires review and approval by the Department of Utilities and the Energy Facilities Siting Board, subject matter jurisdiction equivalent to broad scope jurisdiction, in accordance with 301 CMR 11.01(2)(a)(3). Therefore, MEPA jurisdiction extends to all aspects of the Project that are likely, indirectly or directly, to cause Damage to the Environment as defined in the MEPA regulations.

Environmental Justice

The Project Site is located within five miles of two Environmental Justice (EJ) areas in the neighboring towns of Milford and Franklin, and the Project exceeds a mandatory ENF threshold for air, therefore the Proposed Project is subject to enhanced public participation under MEPA. In accordance DEP 01
with the Commonwealth's Executive Office of Energy and Environmental Affairs (EEA) Environmental Justice Policy, the Proponent should continue to provide enhanced public outreach to environmental justice populations in Milford and Franklin. During the FEIR process, documents should be available to the public at the respective public libraries and town halls, on the municipal web sites, and upon request by residents. Notification of these documents should be published in the local paper as well as in alternative community resources such as newsletters and church bulletins, if appropriate. The FEIR should provide an update on the Proponent's enhanced public outreach efforts and summarize steps taken during the FEIR process to advise environmental justice populations of the project.

In addition to the enhanced public participation requirements specified in the EJ Policy, projects undergoing MEPA review shall require enhanced analysis of impacts and mitigation for an EIR (projects that exceed the review threshold for air and are within 5 miles of an EJ Community). The Proponent documented in the DEIR that there is no adverse impact expected within any EJ areas within five miles of the Project.

Alternatives Analysis

The Certificate directed the Proponent to consider a no-build alternative as part of the DEIR. Under the No-Build Alternative, the proposed 200 MW generating facility would not be constructed and none of its benefits would be realized. ISO-NE has determined that this new capacity provided by the Proposed Project is necessary to provide needed capacity and ensure electricity reliability in southeast Massachusetts.

The Proponent analyzed five project sites it owns as potential sites for the Project. The Proponent conducted an evaluation from early 2013 through early 2014 and narrowed the field to two finalist sites: Everett and West Medway. Ultimately, the West Medway site was chosen as the preferred location because the property offers ample available land for construction of the proposed generating facility and ancillary facilities. In addition, two Eversource switchyards and a natural gas interconnection are located on site. Importantly, the West Medway location offered the opportunity to provide electricity in both the NEMA and SEMA/RI load zones. The Proponent identified water supply as a constraint, but also determined that there were a number of reasonable, cost-effective approaches to addressing water needs.

The Proponent concludes that the Preferred Alternative is to construct a new, highly efficient, fast-starting generating facility on an approximately 13-acre Project Site within its existing 94-acre West Medway Generating Station Property in Medway.

In the Certificate, the Proponent was asked to identify alternative routes for the pipeline connection with the Spectra/ Algonquin Gas Transmission (AGT) Company and compare environmental impacts associated with each. The DEIR identifies both the alternative route for a pipeline interconnection and the preferred route. The alternative route starts at the off-site Spectra/AGT interstate mainline system at an existing ROW that runs in a generally northeast direction near the northwestern edge of the Property. The preferred route starts at the off-site Spectra/AGT meter station at an existing ROW northwest of the Summer Street Site near Route 109. This route has been chosen to minimize potential wetlands impacts. The total length of the preferred route (300-750 psig, 12-inch diameter underground pipe) is approximately 3,080 feet. The FEIR should describe and compare the environmental impacts of both the alternative and preferred routes. DEP 02

Land Alteration

The ENF described the project as impacting 10 acres of land and the creation seven acres of impervious area. The DEIR has presented conflicting information; the Proposed Project will be located on approximately 13 acres within the Property and will create 4.3 acres of impervious area. The FEIR should clarify the correct amount of land alternation and impervious area and any impacts that will come with altering an additional land. DEP 03

Air Quality

The Certificate on the ENF encouraged the Proponent to file its air quality plan application with the DEIR; the Proponent filed a Major Comprehensive Plan application (Tr. No. X265409) on August 28, 2015, which is currently under review by MassDEP. MassDEP has determined that the application is administratively complete, but expects to request additional information during the technical review process. Some of MassDEP’s specific questions concern the determination of Best Available Control DEP 04

Technology (BACT) in the permit application. For example, in the BACT determination for carbon monoxide (CO) with natural gas as the fuel, the proposed limit is 5.0 ppmvd. However, Table 5-6 of the permit application identifies multiple facilities that are achieving an emission rate for CO of 4.0 ppmvd.

Similarly, the BACT determination for volatile organic compounds (VOCs) with ultra-low sulfur oil as the fuel is proposed in the permit application as 5.0 ppmvd, but in the DEIR as 4.5 ppmvd. The permit application identifies 4.5 ppmvd as top-case BACT, which should be incorporated into the permit.

In section 4.4 of the permit application, the proponent lists three techniques used to achieve compliance with Lowest Achievable Emission Rate (LAER) standards for NO_x emissions. The application does not identify the source of these techniques, and whether other methods of determining LAER are available. If other methods are available, the Proponent should describe the results of alternative determinations of LAER. DEP 05

Finally, the permit application describes on-site storage of liquefied natural gas (LNG) as infeasible. As a result, the secondary fuel for the Project is oil, with one million gallons of storage required on site, and increased emissions over natural gas. Section 5.3.1 of the permit application generally outlines the basis for the conclusion that LNG as the secondary fuel is infeasible, but MassDEP requests an explanation of the obstacles identified rather than simply a list of reasons. DEP 06

For potential construction-related air impacts, MassDEP requests that the Proponent use construction equipment with engines manufactured to Tier 4 federal emission standards, which are the most stringent emission standards currently available for off-road engines. If a piece of equipment is not available in the Tier 4 configuration, then the Proponent should use construction equipment that has been retrofitted with the best available after-engine emission control technology, such as diesel oxidation catalysts (DOCs) or diesel particulate filters (DPFs), to reduce exhaust emissions. The Proponent should provide a list of the engines, their emission tiers, and, if applicable, the best available control technology installed on each piece in the FEIR. DEP 07

Climate Change Resiliency and Adaptation

The Proponent was asked to discuss the potential vulnerabilities of the project site associated with the effects of climate change. As described in the DEIR, the Project is approximately 200 feet above mean sea level and is located approximately 570 feet from the nearest floodplain. Additionally, the portion of the Project site in closest proximity to the flood plain lies 15 feet above the floodplain elevation and is therefore not as risk of flooding. According to the DEIR, utility infrastructure projects of this type are constructed to withstand challenging conditions such as heavy snow load and strong winds.

Wetlands and Stormwater

The ENF described 5,500 sf of Riverfront Area alteration and did not specify the area of Buffer Zone and Bordering Vegetated Wetland impacts. The DEIR now identifies permanent alteration of 14,941 sf of Riverfront Area, 3,096 sf of which is presently developed/degraded, for construction of the generating facility itself, and temporary alteration of 1,975 sf of Bordering Vegetated Wetlands during installation of the new gas pipeline and electrical transmission interconnections. The DEIR also estimates alteration of 51,098 sf of Buffer Zone to Bordering Vegetated Wetlands, 41,530 sf of which will be temporary.

Although the Proponent describes the alterations associated with the interconnections as temporary, MassDEP notes that clearing and removal of vegetation is likely to change the character of the wetland, even though the area will remain an area subject to protection. For example, restoration by planting shrubs or other vegetation is still an alteration where mature trees have been removed. If possible, the applicant should consider alternatives that would result in fewer impacts to wetland resources such as installing the gas line via subsurface directional drilling at the locations of the wetland crossings. DEP 08

The DEIR describes a general plan for managing stormwater from the 4.3 acres of new impervious surfaces on the site. The Proponent states that the Project will comply with the Massachusetts Stormwater Standards, however, the DEIR does not contain specific information confirming that the stormwater features depicted on the site plans are appropriately sized or sited. DEP 09

Site plans depict an existing driveway, and proposed parking and equipment laydown areas at the locations of the proposed bioretention area, the western infiltration basin, and a portion of the southern infiltration basin. BMP specifications contained within the Massachusetts Stormwater Handbook state that compaction must be avoided in areas where infiltration or bioretention is proposed. The Proponent should investigate the existing soil conditions at the locations of these proposed stormwater BMPs and, if suitable for infiltration, determine whether these soil properties will be adversely impacted during the construction phase of the Project. If so, impacts from the existing driveway should be addressed before construction of the BMPs, and the parking and equipment laydown areas should not be located where the BMPs will ultimately be constructed. DEP 10

The DEIR discusses the Upper-Middle Charles River Nutrient TMDL but does not provide a numerical estimate of the phosphorus loading reduction for the project. The Proponent should provide this information in the FEIR. DEP 11

Water Supply

The DEIR revises the estimates of water usage for the Project. Taking into consideration the capacity limitations required as part of the New Source Performance Standards discussed in the Air Quality section above, average daily water use is now calculated as 68,800 gpd based on a three-year rolling average capacity factor and utilization of diesel fuel 30 days per year. The maximum annual daily average would be 95,206 gpd, based on a 60% capacity factor in a given year. Usage on a peak day would be 178,600 gallons. An on-site well is capable of producing 51,840 gpd. The Proponent plans to use the on-site well for the majority of the Project's water requirements. The Proponent plans to use water from the on-site well and municipal system to supply a 500,000 gallon fire/service water tank, then treat the water using a trailer-mounted demineralization system and store the high purity treated water to a 450,000 gallon demineralization water storage tank until it is needed.

For the balance of the water needs, the Proponent now plans to purchase water from the Town of Millis, which will be delivered to the site through the Town of Medway's distribution system. Millis does have capacity in its Water Management Act (WMA) permit to sell the estimated annual volume of approximately 35 million gallons per year (the highest volume that could be required). However, although the DEIR states that Millis is authorized to withdraw 0.99 million gallons per day (mgd), the permit actually only authorizes 0.80 mgd at this time. The permit that was renewed on February 26, 2010 potentially authorized the town to withdraw up to 0.99 mgd contingent upon MassDEP's completing a 5 Year Review or issuing a permit amendment that incorporated the Long-Term Safe Yield determination for the Charles River into the permit. Until such time as the review or amendment is complete, Millis is authorized to withdraw 0.80 mgd. A permit amendment is not required at this time unless withdrawals for the Project will require Millis to exceed 0.80 mgd. In addition, the contingent 0.99 mgd volume is an Interim Allocation pending completion of a new Water Needs Forecast by the Massachusetts Department of Conservation and Recreation (DCR). Millis may want to work with DCR immediately to identify future water demands including those proposed to be sold to the Proponent and from other proposed projects in town. MassDEP expects to complete permit reviews that incorporate Long-Term Safe Yield and other regulatory changes into Charles River Basin permits in 2017.

While the Department believes the Town of Millis can provide the water proposed to be purchased DEP 12
by the Proponent without exceeding the 0.80 mgd authorized in its permit, that additional demand when considered with other future development in Millis will likely contribute to the Town needing to mitigate for future demands. The Proponent and the Town should work to identify existing mitigation activities and new mitigation opportunities. Those mitigation activities may include stormwater recharge work in Millis, and evaluating efforts to exceed the stormwater management requirements for the construction work at the proposed project site in Medway. Other potential mitigation activities may include land conservation and preservation efforts, habitat improvement efforts such as dam or flow barrier removal, or culvert replacements.

Additionally, Millis is required to cease pumping of two of its wells based on a streamflow trigger DEP 13
in the Charles River. A capacity assessment should be performed on Millis' water system that evaluates if Millis can meet peak demands in its own system along with the new connection to the power plant when the shutoff is triggered.

Although the Town of Medway has made significant improvements to address leaks in its system (they eliminate a leak of approximately 0.40 mgd in late 2014), additional work is needed to improve its infrastructure to ensure compliance with the 10% Unaccounted for Water (UAW) WMA permit standard. Medway's UAW is currently above the 10% standard. Medway has a Master Plan that recommends replacement of water mains to eliminate pipes prone to leakage. The Proponent should continue to DEP 14
evaluate options to assist Medway in resolving issues with its distribution system to allow the Town to be in compliance with the UAW standard. Medway's Residential Gallons Per Capita a Day (RGPCD) also exceeds the standard of 65 gallons/capita/day. In addition to providing funding assistance for energy conservation, the Proponent should also consider providing funding to Medway for water conservation outreach and awareness.

In addition to the available water evaluation, Millis and Medway will also need to evaluate the DEP 15
feasibility of delivering water to the site that considers hydraulic changes and whether there are any water quality compatibility issues in the public water system. The feasibility study should identify any needed modification to ensure the delivery of drinking water that meets all drinking water quality standards and adequate pressure and the associated costs for any modifications to the public water systems. The FEIR should indicate the status of those evaluations, identify any needed modifications and permit submittals to MassDEP. Modifications to the public water systems' distribution system such as the addition of a new pump station will require a permit from MassDEP (WS32).

The Proponent should clarify if the combined 950,000 gallons of stored water will be available at DEP 16
all times or if that volume will vary and on what frequency. The Proponent should identify the source of water if due to an emergency, water would be needed to be trucked into the site.

Wastewater

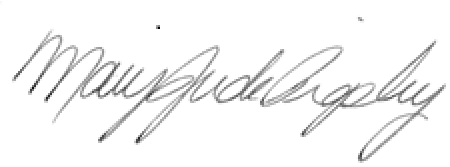
Wastewater as described in the DEIR is generated from current staff of 12 employees that discharge to an on-site wastewater disposal system (i.e., septic system). No other discharge occurs on site or is currently connected to Medway's municipal sewer system. The Proponent proposes to route a new sewer line to the site for the discharge of sanitary wastewater through Medway's sewer system to the Charles River Pollution Control District's wastewater treatment facility in Medway. The Proponent will then abandon the existing septic system. The Proponent must obtain approval from the Medway Board of Health to abandon the existing system in accordance with the provisions of Title 5 regulations.

The Project will increase the sanitary wastewater flow by approximately 120 gpd, assuming six new employees. The DEIR states that process wastewater flow of 5,000 gpd will be generated from floor drains and the maintenance shop, and is stored in an in-ground wastewater sump. The industrial wastewater will pass through an oil-water separator before being collected in the sump, and will be
discharged periodically to the sewer system. The DEIR also describes demineralization rinse water that DEP 17
will be discharged, but it does not describe whether the discharge would be to the ground or to the industrial wastewater collection system. The FEIR should explain the conclusion that this rinse water is not wastewater.

Two sewer lines will be provided for connection to the sewer system, a 6-inch line for sanitary and a 12-inch line for plant wastewater. In order to connect to the town's sewer system, the Proponent will be required to obtain a sewer connection permit from the sewer authority. The Proponent will be required to abide by any sewer use ordinances or possibly any industrial pre-treatment requirements of the wastewater treatment facility. A state permit for this sewer connection is not required provided the proposed connection complies with 314 CMR 7.05, "<u>Activities Not Requiring a Permit</u>."

MassDEP appreciates the opportunity to comment on the proposed project. If you have any questions regarding these comments, please do not hesitate to contact Stella Tamul, Central Regional Office MEPA Coordinator, at (508) 767-2763.

Very truly yours,



Mary Jude Pigsley
Regional Director

cc: Commissioner's Office, MassDEP

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION – CENTRAL REGIONAL OFFICE (DEP)

DEP 01 **In accordance with the Commonwealth's Executive Office of Energy and Environmental Affairs (EEA) Environmental Justice Policy, the Proponent should continue to provide enhanced public outreach to environmental justice populations in Milford and Franklin.**

Please refer to MEPA 03 and the respective response.

DEP 02 **The FEIR should describe and compare the environmental impacts of both the alternative and preferred [pipeline] routes.**

Please see MEPA 10.

DEP 03 **The ENF described the project as impacting 10 acres of land and the creation [of] seven acres of impervious area. The DEIR has presented conflicting information; the Proposed Project will be located on approximately 13 acres within the Property and will create 4.3 acres of impervious area. The FEIR should clarify the correct amount of land alternation and impervious area and any impacts that will come with altering an additional land.**

This change was discussed in Section 1.3 of the DEIR, "Changes to the Project since filing of the ENF", see pages 1-11 and 1-12 of the DEIR. The 2.7-acre reduction in impervious surface results from a decision to finish the yard area inside the 55-foot sound wall with pervious crushed stone (in lieu of asphalt paving as was originally assumed). As Project design efforts advanced, the increase in site size arose primarily from the inclusion of the necessary stormwater retention basin and associated bio-retention area. This explanation is repeated in Section 1.2.2 of this FEIR.

DEP 04 **MassDEP has determined that the [CPA] application is administratively complete, but expects to request additional information during the technical review process. Some of MassDEP's specific questions concern the determination of Best Available Control Technology (BACT) in the permit application. For example, in the BACT determination for carbon monoxide (CO) with natural gas as the fuel, the proposed limit is 5.0 ppmvd. However, Table 5-6 of the permit application identifies multiple facilities that are achieving an emission rate for CO of 4.0 ppmvd.**

Similarly, the BACT determination for volatile organic compounds (VOC) with ultra-low sulfur distillate oil as the fuel is proposed in the permit application as 5.0 ppmvd, but in the DEIR as 4.5 ppmvd. The permit application identifies 4.5 ppmvd as top-case BACT, which should be incorporated into the permit.

Please see Section 4.1 for an explanation of the proposed BACT level for CO. The 4 ppm CO limit noted by DEP is for single fuel (natural gas) turbines. The proposed 5 ppm CO limit is the correct BACT limit for dual fuel turbines.

The proposed improvement in the VOC limit when firing ULSD (from 5 ppm to 4.5 ppm) was described in Section 1.3 of the DEIR. This change was reflected in an updated air permit submittal September 30, 2015.

Exelon motes it has received MassDEP's January 26, 2016 technical comments and will update the air plan approval application as-needed to address these and any subsequent comments.

DEP 05 **In section 4.4 of the permit application, the proponent lists three techniques used to achieve compliance with Lowest Achievable Emission Rate (LAER) standards for NOx emissions. The application does not identify the source of these techniques, and whether other methods of determining LAER are available. If other methods are available, the Proponent should describe the results of alternative determinations of LAER.**

Please refer to Section 4.2 of this FEIR. The comment references Section 4.4 of the permit application which contains a summary of the proposed LAER limits for NOx for the combustion turbines, emergency diesel generators and emergency fire pump engines. Assuming the DEP comment meant to refer to Section 4.1.1, Evaluation of Emission Limiting Techniques and the "three techniques," this would be referring to the three categories of techniques: change in raw materials, process modifications and add-on controls. This list of techniques is provided for information to show how LAER emission limits may be achieved in practice. The source of this information is from the BACT analysis. There are no other methods of achieving the proposed LAER emission limits for NOx.

DEP 06 **Finally, the permit application describes on-site storage of liquefied natural gas (LNG) as infeasible. As a result, the secondary fuel for the Project is oil, with one million gallons of storage required on site, and increased emissions over natural gas. Section 5.3.1 of the permit application generally outlines the basis for the conclusion that LNG as the secondary fuel is infeasible, but MassDEP requests an explanation of the obstacles identified rather than simply a list of reasons.**

Section 4.3 of this FEIR provides further explanation of challenges associated with on-site storage of LNG (as an alternative to ULSD). The source of this information is the Project's recent response to an EFSB Record Request regarding the possibility of using LNG as a backup fuel in lieu of ULSD.

DEP 07 For potential construction-related air impacts, MassDEP requests that the Proponent use construction equipment with engines manufactured to Tier 4 federal emission standards, which are the most stringent emission standards currently available for off-road engines. If a piece of equipment is not available in the Tier 4 configuration, then the Proponent should use construction equipment that has been retrofitted with the best available after-engine emission control technology, such as diesel oxidation catalysts (DOCs) or diesel particulate filters (DPFs), to reduce exhaust emissions. The Proponent should provide a list of engines, their emission, tiers, and, if applicable, the best available control technology installed on each piece in the FEIR.

See Section 4.4.

DEP 08 Although the Proponent describes the alterations associated with the interconnections as temporary, MassDEP notes that clearing and removal of vegetation is likely to change the character of the wetland, even though the area will remain an area subject to protection. For example, restoration by planting shrubs or other vegetation is still an alteration where mature trees have been removed. If possible, the applicant should consider alternatives that would result in fewer impacts to wetland resources such as installing the gas line via subsurface directional drilling at the locations of the wetland crossings.

Please see Sections 1.2.3 and 7.1.3. As noted, the Proponent will endeavor to reduce the currently estimated temporary impacts by limiting the construction work areas. Also, please note that the BVW and IVW areas temporarily impacted by pipeline construction is just off the northwest corner of the existing 135 MW facility are not wooded.

DEP 09 The DEIR describes a general plan for managing stormwater from the 4.3 acres of new impervious surfaces on the site. The Proponent states that the Project will comply with the Massachusetts Stormwater Standards, however, the DEIR does not contain specific information confirming that the stormwater features depicted on the site plans are appropriately sized or sited.

Please see MEPA 29.

DEP 10 The Proponent should investigate the existing soil conditions at the locations of these proposed stormwater BMPs and, if suitable for infiltration, determine whether these soil properties will be adversely impacted during the construction phase of the Project. If so, impacts from the existing driveway should be addressed before construction of the BMPs, and the parking and equipment laydown areas should not be located where the BMPs will ultimately be constructed.

The use of some areas for construction laydown and/or parking, with subsequent reuse for elements of the permanent stormwater system is addressed in Section 7.2 as well as in Technical Appendix D.

DEP 11 **The DEIR discusses the Upper-Middle Charles River Nutrient TMDL but does not provide a numerical estimate of the phosphorus loading reduction for the project. The Proponent should provide this information in the FEIR.**

Please see Section 7.3.

DEP 12 **While the Department believes the Town of Millis can provide the water proposed to be purchased by the Proponent without exceeding the 0.80 mgd authorized in its permit, that additional demand when considered with other future development in Millis will likely contribute to the Town needing to mitigate for future demands. The Proponent and the Town should work to identify existing mitigation activities and new mitigation opportunities. Those mitigation activities may include stormwater recharge work in Millis, and evaluating efforts to exceed the stormwater management requirements for the construction work at the proposed project site in Medway. Other potential mitigation activities may include land conservation and preservation efforts, habitat improvement efforts such as dam or flow barrier removal, or culvert replacements.**

Please see Section 8.2 (discussion beginning on page 8-10) as well as the response to MEPA 33. Also see the January 2016 Supplement to the Kleinfelder Report, which provides a very detailed discussion of this subject.

DEP 13 **Additionally, Millis is required to cease pumping of two of its wells based on a streamflow trigger in the Charles River. A capacity assessment should be performed on Millis' water system that evaluates if Millis can meet peak demands in its own system along with the new connection to the power plant when the shutoff is triggered.**

Please see Section 8.0, as well as the response to MEPA 34.

DEP 14 **The Proponent should continue to evaluate options to assist Medway in resolving issues with its distribution system to allow the Town to be in compliance with the UAW standard. Medway's Residential Gallons Per Capita a Day (RGPCD) also exceeds the standard of 65 gallons/capita/day. In addition to providing funding assistance for energy conservation, the Proponent should also consider providing funding to Medway for water conservation outreach and awareness.**

Please see the response to MEPA 35.

DEP 15 **In addition to the available water evaluation, Millis and Medway will also need to evaluate the feasibility of delivering water to the site that considers hydraulic changes and whether there are any water quality compatibility issues in the public water system. The feasibility study should identify any needed modification to ensure the delivery of drinking water that meets all drinking water quality standards and adequate pressure and the associated costs for any modifications to the public water systems. The FEIR should indicate the status of those evaluations, identify any needed modifications and permit submittals to MassDEP. Modifications to the public water systems' distribution system such as the addition of a new pump station will require a permit from MassDEP (WS32).**

Please see Section 8.0, the draft Kleinfelder Report (Appendix E), and the response to MEPA 37.

DEP 16 **The Proponent should clarify if the combined 950,000 gallons of stored water will be available at all times or if that volume will vary and on what frequency. The Proponent should identify the source of water if due to an emergency, water would be needed to be trucked into the site.**

Please see Section 8.0, the draft Kleinfelder Report (Appendix E), and the response to MEPA 37.

DEP 17 **The DEIR also describes demineralization rinse water that will be discharged, but it does not describe whether the discharge would be to the ground or to the industrial wastewater collection system. The FEIR should explain the conclusion that this rinse water is not wastewater.**

Please see MEPA 39. The Project does not plan to use ground discharge for demineralizer rinse water.

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF
ENERGY AND ENVIRONMENTAL AFFAIRS

DEPARTMENT OF ENERGY RESOURCES

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November 10, 2015
Purvi Patel, MEPA Analyst

Subject: West Medway II Generating Station DEIR – Stationary GHG Sources DOER Comments

The general intent of the DOER review of this submittal is to both ensure that the content submitted conforms to the guidance provided for the application of the MEPA GH Policy and Protocol (the Policy) for this project, and to point out areas and aspects of the design and proposed mitigation as described in the GHG related content that ether require further clarification and/or may present opportunities for further reductions in both energy usage and GHG emissions. Where these opportunities appear to exist, these comments also suggest measures and/or approaches that the DOER puts forward that should be considered for adoption with the goal of achieving further reductions in both energy consumption and source GHG emissions.

In the DOERs comments to the ENF, guidance was provided to the both the content and format for the information to be provided in the DEIR . The guidance related to the establishment of the base case for the prime mover and balance of plant was developed jointly with the MA DEP based on the following main factors:

1) A fossil fueled utility scale power plant consumes larger amounts of fuel per facility, with higher stack exhaust flow rates and products of combustion than any other category of facility.
2) The stack emissions of utility scale power plants are highly regulated and permitted under the jurisdiction of the MA DEP.
3) The overwhelming majority of the expected stack emissions for the as-proposed project will be due to the combustion of fuel by the as proposed combustion gas turbine (CGT) which is the prime mover
4) The as-proposed project stack CO2 (GHG) emissions are included along with the stack emission of pollutants such as NOX and SOX in the determination of what control will be required in order to comply with the maximum allowed emission rates for the various regulated pollutants.
5) There are no established maximum allowable emission rates for CO2.
6) The best available control technology (BACT) measure for CO2 emission is to minimize the fuel consumption per kWh (the Heat Rate) to the point at which is does not result in a raising the emission level of the other regulated pollutants beyond the level at which they can be controlled within the parameters of the BACT protocol.

7) The DEP review is based primarily on the information submitted by the project in the Major Comprehensive Plan Application (MCPA), and is focused on the nominal heat rate of the prime mover and not on the effect on the fuel consumption as a function of the total plant efficiency which includes the parasitic loads, losses, other sources and factors such as pre-cooling of the air supply to the CTG.
8) Due to (7) above, the focus of the DOER's review of per the Policy will be on further mitigation of the as-proposed facility efficiency, including the balance of plant, as based on what was submitted in the MCPA.

Project Description:

The DOER commends the proponent on the generally high level of detail provided.

As stated in the ENF guidance, the focus of this review and of the Policy is to evaluate the projected fuel consumption and related GHG emissions of the base case facility and to what extent the as-proposed facility will reduce the consumption of fuels by direct and indirect stationary sources as directly measured at the mitigated as-proposed facility and not with the estimated GHG emissions displaced from other grid generators or other configurations.
While, the DOER recognizes the relevance and significance of the as-projected reduction in overall ISO-NE grid emissions resulting in the operation of the as-proposed plant that will result in the reduction of emissions from less efficient plants, and while this information is of interest, it does not address the mitigation of the base plant as submitted in the MCPA which is more consistent with how other regulated sources, such as buildings, are quantified per the Policy.

Establishment of the Base Case and As-proposed Case

Due to the highly regulated air permit process related to pollutants including CO2, the application of the Protocol to fossil fueled utility scale power plants is not the same as the application of the Protocol to industrial process facilities (see discussion on page 1). In the comments to ENF the DOER provided guidance, which was reviewed and approved by the DEP, for the application of the Protocol to the establishment of the Base and as-proposed cases.

The base and proposed cases as described in section 5.7, "Identifying Baseline and Proposed Cases" do not conform to the guidance provided and should be revised. Table 5-6 does not conform to the guidelines for the construction of the MEPA base case as provided by the DOER in that the base case combustion gas turbine (CGT) shown, the Trent 60 CGT, is not a GE LMS-100 CGT, the unit submitted for approval in the MCPA. This should be corrected. DOER 01
The response DOER 03, in the Responses to Comments Section, which addresses the guidance provided in the DOER comments to the ENF regarding the establishment of the Base and As-proposed cases, takes no issue with this guidance and instead references Section 5.8 "Comparison of Project Alternatives to Baseline" which is another subject. The DOER recognizes the apparent contradiction between what the inclusions of Power Plants with industrial process systems as is quoted on page 5-8 in Section 5-7. However the guidance on this issue by the DOER was very explicit, and was not questioned in the response to comments. For this reason, the DOER feels it is reasonable to expect that project will comply with the guidance as was provided in the DOER's ENF comments. DOER 02

Quantification of GHG Emissions from Stationary Sources (5.14.3) :

In Table 5-5 "Baseline and Proposed Emissions Summary", it appears that the "Baseline" refers to a plant based on the Trent 60 CTG, as shown in Table 5-6. This should be revised to conform with guidance for the establishment of the base case as provided by the DOER in the comments to the ENF. The baseline should be the facility as submitted in the MCPA. DOER 03

All heat rates and efficiencies should be consistent, that is, expressed either in terms of the lower heating or the higher heating value of the both natural gas and the ULSD, but not mixed. DOER 04

Three scenarios for potential operating hours on both natural gas and ULSD are shown on page 5-23. The selection of the scenario with the least number of operating hours results in GHG emissions that are 81% less than potential emissions as submitted in the MCPA (see table below). In light of this very large disparity, the selection of the operating scenario resulting in the fewest hours of operation as selected for the quantification of GHG emissions of the as-proposed facility needs to be more fully explained with supporting details. Any impact from the closure of the Plymouth nuclear generating station should be factored into the forecasted dispatch schedule and resulting operating hours. DOER 05

Table DOER-1
Projected Emissions as Function of Capacity Factor and Days on ULSD

Capacity Factor & Days on ULSD	Emissions (TPY)	% Reduction from Maximum Case
0.60; 30	695875	
0.43; 30	505000	27%
0.345;15	394000	60%
0.33;10	377000	81%

Mitigation:

Revise Table 5-6 Baseline and Proposed Mitigation Measures: DOER 06
1) The base case to be the plant as submitted in the MCPA.
2) For the Power Island and balance of plant, show the percent improvement in performance and impact on the heat rate for each measure. Show the cumulative reduction in the heat rate.
3) For the building: List the measures and provide the cumulative reductions in the heating and electric EUI.

In order to highlight the scale of the emissions for the as-proposed facility and to emphasize the significance of any and all mitigation opportunities, the DOER has expressed the projected 377,000 tons per year GHG emissions as shown in Table 5-4 in terms of an equivalent amount of new class A office building space based on the energy consumed by direct and indirect stationary sources per unit area per year typical for this class of building. DOER 07

For the purpose of this exercise, the energy consumption and related source GHG emissions for this class of buildings are:

EUI all fuels = 71 kBtu/sf-yr [1]; EUI grid elec. = EUI gas = 35.5 kBtu/sf-yr [2]

lbs CO2/sf-yr = (EUI grid elec./3.412 kBtu/kWh * 0.730 lbs CO2/kWh grid elec.)
+ (EUI gas * 0.117 * 1.09 lbs/kBtu gas [3])
= 10 lbs CO2 /sf-yr

1. Based on DOER data, this is a conservative (high) value for this class of building.
2. Equal partitioning of the gas and electricity consumption is conservative (high) with respect to the GHG emissions.
3. The 1.09 factor is the site to source fuel conversion factor for gas.

Based this, and as developed in the Table below, the projected GHG emissions for the as-proposed plant of 377,000 tons per year, is equivalent to the stationary source GHG emitted by one hundred and fifty-one 500,000 sf office buildings.

Item	Value	
As-proposed annual GHG Emissions	377,000	tons
	754,000,000	lbs
Annual GHG Emissions New Class A Office Space	10	lbs/sf
Equivalent Area of New Class A Office	75,400,000	sf
Equivalent Number of 500,000 sf New Class A Office Buildings	151	
Reduction of GHG emissions expressed in terms of New Class A Office Space per each 1% Reduction in As-proposed Heat Rate.	754,000	sf

For this reason, all opportunities to reduce the heat rate of the as-proposed facility should be thoroughly and diligently evaluated. The method of analysis and findings, in particular the impact on both the heat rate and GHG emissions, should be included in detail. The conclusion of the analysis for a given measure can be either, to adopt in the as-proposed facility, to be designated for further study for possible adoption, or to not adopt. Provide a detailed justification for any measure evaluated with a conclusion to either not adopt, or to designate for further study.

Power Generation Systems and Sources:

Selection of an Efficient CTG (5.8.1)

Table 5-1 on Page 5-10 is provided for the purpose of comparing the nominal heat rates of selected CTG's of a design similar to as-proposed unit. In order to provide a basis of comparison consistent with the heating value for the as-proposed unit as shown on page 5-23, the values in Table 5-1 should be revised based on the higher heating value of the nominal heat rate. DOER 08

Analysis of Alternative Existing Simple Cycle Designs Technology Systems:

Provide the station LHV heat rates for the four plants that were analyzed by proponent that are included in this section. DOER 09

In the paragraph quoted from the GE LMS 100 brochure the claim is made the nominal efficiency that this is at least 10% better than any other CGT in its class, due primarily to the cooling of the combustions air between the low and high pressure sections of the axial compressor which allows the unit to achieve a higher compression ratio with less parasitic shaft power. The DOER agrees that inter section cooling should produce a gain in efficiency, however when compared with the efficiency of the Trent 60, as shown in Table as the basis of comparison, the efficiency GE LMS unit is only 2.1% better, not 10%. This apparent discrepancy should be clarified. DOER 10

The DOER agrees that the LMS100 appears to be a highly efficient rapid start & ramp simple cycle plant. However, this does not eliminate the need to demonstrate that a more efficient rapid start & ramp combined cycle plant could is not a better option for this project.

All of the high temperature flue gas generated by a simple cycle CTG based plant is exhausted directly to the atmosphere without any recovery of the large amount of residual energy contained in the flue gas stream. A combined cycle CTG recovers a large portion of this energy by means of a heat recovery steam generator (HRSG) in which the energy in the flue gas is used to generate high pressure steam which then drives a steam turbine generator (STG). Recovery or flue gas energy allows a CC CTG plant to generate substantially more electricity for the same amount of fuel compared to a simple cycle CGT plant, resulting in a lower heat rate and reduced GHG emissions.

Given the unavoidably large scale of the GHG emissions that will be generated by a fossil fuel fired utility scale power plant, the DOER' s expectation is that the justification for the selection of a simple cycle plant in favor of a combined cycle power plant for any power plant project to be thoroughly and completely documented. The information included in the DEIR and in the testimony of S. Tierney and G. Darling (Appendix I) does not fully meet this expectation. The DOER has the following related comments:

The justifications listed in this section are very general in nature with few specific details. For example, in point number (1) the amount of power needed following a cold start is not specified, nor is the basis for the criterion established. For example, is this a current need that has been documented by the ISO-NE or some other agency? Or, is this solely set by a market. This level of information and detail is missing from all of the material on this subject as submitted in this section and should be provided. DOER 11

Based on points 1 through 4, the DOER concludes that the primary performance related drawbacks to the selection of CC based plant are the limitations on the rate at which a CC plant is capable of ramping up from a cold start as well to ramp up and down fast enough to provide a backstop for renewable generating sources with time varying outputs. In addition, the point is made that a consequence of these limitations would be to reduce the opportunities for dispatching the plant.

The DOER acknowledges these concerns. However, the DOER is also aware of at least one commercially available CC CTG based, the 300 MW Flex-Plant by the Siemens Co., which substantially decouples the operation of the CGT from the steam generation side during the plant cold start and ramp up, which provides for a fast start, fast ramping capability.

Per Siemens the relevant parameters of the plant are:

a) Cold start to 150 MW in ten minutes.
b) Ramping rate from 150 MW to full power (300 MW) is 30 MW per minute
c) Can operate on ULSD
d) Has a LHV heat rate of 6825 Btu/kWh, (with an air cooled condenser, which is the most conservative case) which equates to an efficiency of 50%, which is a 15% improvement in efficiency over the as proposed GE LMS 100 unit.

Given this very significant reduction in the basic heat rate, the proponent should provide a detailed analysis based on the Flex-Plant, or any another commercially available CC plant with a relevant performance which is as good or better, which addresses and re-evaluates the premises and conclusions expressed in points 1 through 4. The analysis should factor the retirement of the Plymouth Nuclear Facility into the dispatch modeling of a Flex-Plant combined cycle option. DOER 12

On page 5-12 the statement is made that "additional mitigation beyond the selection of the GE LMS Turbine is not feasible". Provide a clear definition of the limits of the equipment and systems included in this statement. For example, does "the GE LMS Turbine" include the exhaust breeching and ductwork (including the catalyst section? DOER 13

5.8.4 Pressure Drop Minimization:

Provide information correlating reduction in back pressure at the turbine exit plane with reduction in the heat rate. The base case for the turbine exit plane back pressure is whatever it was based on the configuration as was submitted in the MCPA. The as-proposed would be a description of the measure to reduce this back pressure as well as the amount of reduction in the back pressures, the heat rate and the related GHG emissions. The DOER assumes that that a major portion of the exhaust breeching and catalyst/silencer ductwork will be a project-specific custom design and therefore specifications can be developed for a pressure drop between the turbine exit plane and the exit plane of the exhaust stack that is reduced beyond the base (MCPA case) value. Provide the resulting projected reduction in both the station heat rate and the GHG emissions. If this is infeasible, provide comprehensive supporting details and narrative. DOER 14

5.8.5 Evaporative Cooling:

Provide the details and assumptions in support of the projected impact on the heat rate and GHG emissions including the bin data for operating hours, heat rate, GHG emissions and consumption of water for temperatures between 75 and 100 deg. F in increments of 5 deg. F. DOER 15

5.8.6: Natural Gas Compressors:

The DOER commends the project's adoption of this significant mitigation measure.

5.8.9: Transformers and Electrical Line Losses:

Provide the difference in efficiency between the base, as-proposed for consideration in the section, and the most efficient available GSU transformer in the class to be used at the Medway II plant (e.g. in the GE Prolec line) and quantify the impact on the station heat rate and GHG emissions per kWh transformed for each case. Adopt the most efficient commercially available unit or provide a detailed justification for not doing so. DOER 16

5.8.10: Ammonia Vaporizers:
The DOER commends the project on the identification of this measure and encourages the project to continue working with the ammonia system provider to realize its adoption. Provide the potential for projected reductions of parasitic loss, the station heat rate and GHG emissions. DOER 17

5.8.13: Methane Leaks:
In addition to fugitive emissions, the project should commit to not use natural gas or any other GHG in any blow-down of the project piping. DOER 18

Buildings:

5.9 Building-Related Stationary Sources:
The information in this section and format in which it is presented this section does not conform to the guidance provided by the DOER in the comments made to the ENF. In addition to a narrative, provide a completed table with same format as was provided in the DOER comments to the ENF (see format below). The items listed should include all of the items regulated under the 9th ed. of Mass. State Building Energy Code such as: roof and wall R-Values; LPD; HVAC EERs, etc. The performance related values for the base case should comply with the 9th ed. The as-proposed case should at least comply with the prescriptive portion of the current Stretch Energy Code. DOER 19

Measure/Area	Base	Proposed	% Improvement	Comment
Roof R-value				
Windows				
Etc.				

Heating Fuel & System: Given that it is likely that the as-proposed heating fuel source will be the grid, the GHG emissions from this consumption will be more than 2 times it would be than if the fuel were to be natural gas. GHG emissions due to leakage from gas system installed to code and well maintained will be less than the difference between the source emissions due to the difference between gas and grid electricity fuels. The DOER strongly recommends that the heating fuel be natural gas and that the heating system be based on a highly efficient condensing furnace or boiler. The decision to adopt and electric fuel based heating systems appears to be based primarily on the least-first-cost. DOER 20

On-site Generation:
5.11: Solar PV System:
Given the very large amount of GHG emissions that will be generated by even the most efficient 200 MW power plant, the proponent should also include an evaluation of the feasibility and potential for the inclusion of a more significant amount of solar PV generation that is broadened to include: DOER 21

a) The site and structures of the existing power plant.
b) Coverage of all parking areas with canopies that serve also mounts for PV panels.
c) A full or substantial (> 50%) partial donation of a large (> 250 kW) PV solar system at a town designated off-site location to the terms of any Town/Project agreement , with the understanding that the credit, prorated for the percentage of the proponent's contribution, for the system's GHG reduction would revert to the project.

November 10, 2015
Medway II Generating Station DEIR
DOER Comments

Self Certification (Section 61):

Include at a minimum the following information: DOER 22

1) The average annual consumption of fuel and associated GHG emissions for the as-proposed project from both direct and indirect sources.
2) The reductions in fuel consumption and GHG emissions from the base case achieved by the as submitted as-proposed project should be shown, expressed both in short tons/yr and as a percentage.
3) A list of all significant related mitigation measures included in the as-proposed project.
4) Provide the MEPA office with the project milestone at which, prior to issuance of the For Bid design, the MEPA office will be informed of decisions made regarding any measures designated for further evaluation.

John Ballam
Engineering Manager
CHP Program Manager
MA Dept. of Energy Resources

cc: Arah Schuur
Ian Finlayson

MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES (DOER)

DOER 01 **The base and proposed cases as described in section 5.7, "Identifying Baseline and Proposed Cases" does not conform to the guidance provided and should be revised. Table 5-6 does not conform to the guidelines for the construction of the MEPA base case as provided by the DOER in that the base case combustion gas turbine (CGT) shown, the Trent 60 CGT, is not a GE LMS-100 CGT, the unit submitted for approval in the MCPA. This should be corrected.**

Section 5.2.1 of this FEIR updates the base case combustion turbine as the unit submitted for approval in the MCPA. As discussed with MEPA, MassDEP, and DOER on December 17, 2015, the peaker turbine system is a highly pre-engineered overall package system, and the vast majority of available mitigation is pre-engineered by GE into the system.

DOER 02 **The response DOER 03, in the Responses to Comments Section, which addresses the guidance provided in the DOER comments to the ENF regarding the establishment of the Base and As-proposed cases, takes no issue with this guidance and instead references Section 5.8 "Comparison of Project Alternatives to Baseline" which is another subject. The DOER recognizes the apparent contradiction between what the inclusions of Power Plants with industrial process systems as is quoted on page 5-8 in Section 5-7. However the guidance on this issue by the DOER was very explicit, and was not questioned in the response to comments. For this reason, the DOER feels it is reasonable to expect that project will comply with the guidance as was provided in the DOER's ENF comments.**

Per the response to DOER 01, Section 5.2.1 of this FEIR updates the base case combustion turbine by changing the top-left value in DEIR Table 5-5 to match the top-right value.

DOER 03 **In Table 5-5 "Baseline and Proposed Emissions Summary", it appears that the "Baseline" refers to a plant based on the Trent 60 CTG, as shown in Table 5-6. This should be revised to conform with guidance for the establishment of the base case as provided by the DOER in the comments to the ENF. The baseline should be the facility as submitted in the MCPA.**

Per the response to DOER 01 and DOER 02 above, Section 5.2.1 of this FEIR shows the base case emission rate using the GE LMS100 as-submitted in the MCPA.

DOER 04 **All heat rates and efficiencies should be consistent, that is, expressed either in terms of the lower heating or the higher heating value of the both natural gas and the ULSD, but not mixed.**

The applicant is not aware of any instance in the DEIR where lower heating value (LHV) and higher heating value (HHV) are mixed. The heat rates described in Section 5.0 of this FEIR are labeled and converted to HHV wherever possible and appropriate in the particular context being discussed.

DOER 05 **Three scenarios for potential operating hours on both natural gas and ULSD are shown on page 5-23. The selection of the scenario with the least number of operating hours results in GHG emissions that are 81% less than potential emissions as submitted in the MCPA (see table below). In light of this very large disparity, the selection of the operating scenario resulting in the fewest hours of operation as selected for the quantification of GHG emissions of the as-proposed facility needs to be more fully explained with supporting details.**

MEPA reviews in general, and GHG reviews in particular, focus on expected actual impacts. This contrasts with the MassDEP air permitting process which focuses on potential emissions. Per the table provided in the DOER comments, the expected actual CO2 emissions are 54% lower than proposed maximum potential emissions in the MCPA application (377000/695875), not 81% lower. The selection of the expected actual operating case is described in Section 5.2.2 of this FEIR.

DOER 06 **Revise Table 5-6 Baseline and Proposed Mitigation Measures:**

1) **The base case to be the plant as submitted in the MCPA.**
2) **For the Power Island and balance of plant, show the percent improvement in performance and impact on the heat rate for each measure. Show the cumulative reduction in the heat rate.**
3) **For the building: List the measures and provide the cumulative reductions in the heating and electric EUI.**

The revised base case is shown in Table 5-1, and the other requested items are summarized in Section 5.10.2. The measures to reduce heating and electric energy use are described in Section 5.7.1. The reductions in heating and electric Energy Use Index (EUI) are below:

	Baseline	Proposed	Units
Electricity EUI	88	67	kbtu/sf./year
Heating EUI	35	37	kbtu/sf./year
Total EUI	123	104	kbtu/sf./year

Heating EUI increases only on a site-energy basis, reflecting the change from electric resistive heating to propane heating. Calculation details are in Technical Appendix H.

DOER 07 **In order to illustrate and emphasize the significance of any and all mitigation for a stationary source as large as the as-proposed facility, the DOER has converted the projected as-proposed 377,000 tons per year GHG emissions as shown in Table 5-4 into an equivalent amount of new class A office building space based on the energy consumed by direct and indirect stationary sources per unit area per year typical for this class of building.**

Equivalent Number of 500,000 sf. New Class A Office Buildings	151
Reduction of GHG emissions expressed in terms of New Class A Office Space per each 1% Reduction in As-proposed Heat Rate.	754,000 sf.

For this reason, all opportunities to reduce the heat rate of the as-proposed facility should be thoroughly and diligently evaluated. The method of analysis and findings, in particular the impact on both the heat rate and GHG emissions, should be included in detail. The conclusion of the analysis for a given measure can be either, to adopt in the as-proposed facility, to be designated for further study for possible adoption, or to not adopt. Provide a detailed justification for any measure evaluated with a conclusion to either not adopt, or to designate for further study.

While the DOER calculations have not been reviewed in detail, they accurately reflect the fact that the proposed Project contributes significantly to modernizing the electricity supply for the region. It should be noted that the DOER's calculation compares demand-side (electricity use) and supply side (electricity generation). As described in Section 5.2 of the DEIR, the Medway Project will lead to overall emission reductions in the region's electric system, so the GHG impact of electricity use by existing and new office space will be lower if the Project is approved.

By far the largest opportunity to reduce the heat rate of the as-proposed facility is selection of the combustion turbine. The vast majority of design and operating parameters that can reduce the heat rate are pre-engineering into the turbine package. Other opportunities to reduce the heat rate are reviewed in Section 5.5 and 5.6 of this FEIR, with conclusions summarized in Section 5.10.2 of this FEIR.

DOER 08 **Table 5-1 on Page 5-10 is provided for the purpose of comparing the nominal heat rates of selected CTG's of a design similar to as-proposed unit. In order to provide a basis of comparison consistent with the heating value for the as-proposed unit as shown on page 5-23, the values in Table 5-1 should be revised based on the higher heating value of the nominal heat rate.**

Section 5.7 of the DEIR explained the difference between lower and higher heating value, presented comparable turbine heat rates on an LHV basis, and provided a conversion of the Project heat rate to match for comparison. Section 5.4 of this FEIR updates the table and converts to an HHV basis per DOER's request.

DOER 09 **Provide the station LHV heat rates for the four plants that were analyzed by proponent that are included in this section.**

Note that the heat rates presented in Table 5-4 are on the basis of HHV to avoid further mixing of LHV and HHV terms in the FEIR. The comparison on an LHV basis is summarized below:

Model	*Net Heat Rate on Natural Gas (BTU/kWh LHV) (lower is better)*	*Net Heat Rate firing ULSD (BTU/kWh LHV) (lower is better)*
GE LMS100 PA	8,076	8,161
GE LM6000 PC Sprint	8,673	8,793
Rolls Royce Trent 60 WLE ISI	8,570	8,696
Pratt & Whitney FT4000 Swiftpac 120	8,620	8,833

As stated in Section 5.4 of this FEIR, this comparison is from the initial development support review and do not reflect final design heat rates for the Project. The results show that compared on a consistent basis the proposed GE LMS100 PA turbine is the most efficient.

DOER 10 **In the paragraph quoted from the GE LMS 100 brochure the claim is made the nominal efficiency that this is at least 10% better than any other CGT in its class, due primarily to the cooling of the combustions air between the low and high pressure sections of the axial compressor which allows the unit to achieve a higher compression ratio with less parasitic shaft power. The DOER agrees that inter section cooling should produce a gain in efficiency, however when compared with the efficiency of the Trent 60, as shown in Table as the basis of comparison, the efficiency GE LMS unit is only 2.1% better, not 10%. This apparent discrepancy should be clarified.**

The comparison in the DOER comment is not on a consistent basis. Also, as clarified in Table 5-3 of this FEIR, the DLE w/ISI is not available for this Project because it does not have dual-fuel capability (and for the reasons explained in Section 5.6 of the DEIR dual-fuel capability is a critical Project design need. Based on the engineering analysis summarized in Table 5-4 of this FEIR and in the response to comment DOER 09 above, the proposed performance improvement listed in the GE brochure is based on GE's general analysis, which may have been done on a different basis than Exelon's independent engineering review.

DOER 11 **The justifications listed in this section are very general in nature with no specific details. For example, in point number (1) the amount of power needed following a cold start is not provided, nor is the basis for the criterion established. Is it a documented need, for example by the ISO-NE? Is this purely a market driven decision? Or what?? This level of information and detail is missing from all of the discussion submitted and should be provided.**

Specific minimum standards are described in Section 5.3.1 of this FEIR. Section 1.5.2.1 of the DEIR explained the Forward Capacity Market and how ISO-NE calls for generation. Additional detail is provided in Section 1.1.3 of this FEIR.

DOER 12 **Given this very significant reduction in the basic heat rate, the proponent should provide a detailed analysis based on the Flex-Plant showing addressing and supporting all of points made in items 1 through 4. The analysis should factor the retirement of the Plymouth Nuclear Facility into the dispatch modeling of a Flex-Plant combined cycle option.**

Section 5.3 of this FEIR provides additional comparison to other generation technologies, with Section 5.3.3 addressing the Flex-Plant specifically. Section 5.2.3 of this FEIR addresses the impact of the retirement of the Pilgrim Nuclear Facility. The market is likely to replace this capacity, and the impact of the change in baseload capacity on the Project expected operating hours would be minimal.

DOER 14 **Provide information correlating reduction in back pressure at the turbine exit plane with reduction in the heat rate. The base case for the turbine exit plane back pressure is whatever it was based on the configuration as was submitted in the MCPA. The as- proposed would be a description of the measure to reduce this back pressure as well as the amount of reduction in the back pressures, the heat rate and the related GHG emissions. The DOER assumes that that a major portion of the exhaust breeching and catalyst/silencer ductwork will be a project-specific custom design and therefore specifications can be developed for a pressure drop between the turbine exit plane and the exit plane of the exhaust stack that is reduced beyond the base (MCPA case) value. Provide the resulting projected reduction in both the station heat rate and the GHG emissions. If this is infeasible, provide comprehensive supporting details and narrative.**

Section 5.5.1 provides the requested analysis.

DOER 15 **Evaporative cooling] Provide the details and assumptions in support of the projected impact on the heat rate and GHG emissions including the bin data for operating hours, heat rate, GHG emissions and consumption of water for temperatures between 75 and 100 deg. F in increments of 5 deg. F.**

Section 5.5.2 provides the requested analysis.

DOER 16 **Provide the difference in efficiency between the base, as-proposed for consideration in the section, <u>and the most efficient available GSU transformer</u> in the class to be used at the Medway II plant (e.g. in the GE Prolec line) and quantify the impact on the station heat rate and GHG emissions per kWh transformed for each case. Adopt the most efficient commercially available unit or provide a detailed justification for not doing so.**

Section 5.5.4 provides the requested analysis.

DOER 17 **The DOER commends the project on the identification of this measure and encourages the project to continue working with the ammonia system provider to realize its adoption. Provide the potential for projected reductions of parasitic loss, the station heat rate and GHG emissions.**

Section 5.5.3 provides the requested analysis.

DOER 18 **In addition to fugitive emissions, the project should commit to not use natural gas or any other GHG in any blow-down of the project piping.**

Section 5.10.2 includes this commitment.

DOER 19 **The information in this section and format in which it is presented this section does not conform to the guidance provided by the DOER in the comments made to the ENF. In addition to a narrative, provide a completed table with same format as was provided in the DOER comments to the ENF (see format below). The items listed should include all of the items regulated under the 9th ed. of Mass. State Building Energy Code such as: roof and wall R-Values; LPD; HVAC EERs, etc. The performance related values for the base case should comply with the 9th ed. The as-proposed case should at least comply with the prescriptive portion of the current Stretch Energy Code.**

Measure/Area	Base	Proposed	% Improvement	Comment
Roof R-value				
Windows				
Etc.				

Section 5.7 includes the requested information. Section 5.10.3 includes the commitment for the Project to meet the prescriptive portion of the current Stretch Energy Code.

DOER 20 **GHG emissions due to leakage from gas system installed to code and well maintained will be less than the difference between the source emissions due to the difference between gas and grid electricity fuels. The DOER strongly recommends that the heating fuel be natural gas and that the heating system be based on a highly efficient condensing furnace or boiler. The decision to adopt and electric fuel based heating systems appears to be based primarily on the least-first-cost.**

The decision to adopt electric heating was not based on "least first cost." As stated in Section 5.9 of the DEIR, electric heat was selected because it reduces the complexity of installation, and avoids the need for laterals at a facility where interconnections are already complex and subject to space constraints. Section 5.7.3 of this FEIR reviews alternative heating systems, including obtaining low-pressure natural gas from the local distribution network, obtaining low-pressure natural gas from the onsite high-pressure gas supply, using propane, and using air source heat pumps.

DOER 21 **Given the very large amount of GHG emissions that will be generated by even the most efficient 200 MW power plant, the proponent should also include an evaluation of the feasibility and potential for the inclusion of a more significant amount of solar PV generation that is broadened to include:**

a) **The site and structures of the existing power plant.**

b) **Coverage of all parking areas with canopies that serve also mounts for PV panels.**

c) **A full or substantial (> 50%) partial donation of a large (> 250 kW) PV solar system at a town designated off-site location to the terms of any Town/Project agreement , with the understanding that the credit, prorated for the percentage of the proponent's contribution, for the system's GHG reduction would revert to the project.**

Section 5.8 provides updated on-site solar PV analysis, and Section 5.9 summarizes offsite mitigation steps.

DOER 22 **Self Certification (Section 61): Include at a minimum the following information:**

1) **The average annual consumption of fuel and associated GHG emissions for the as-proposed project from both direct and indirect sources.**

2) **The reductions in fuel consumption and GHG emissions from the base case achieved by the as submitted as-proposed project should be shown, expressed both in short tons/yr and as a percentage.**

3) **A list of all significant related mitigation measures included in the as-proposed project.**

4) **Provide the MEPA office with the project milestone at which, prior to issuance of the For Bid design, the MEPA office will be informed of decisions made regarding any measures designed for further evaluation.**

In addressing items 1) and 2) of the comment above, this information has been presented in the FEIR Table 5-17 with fuel consumption summarized in Technical Appendix H. It is the result of the features requested in item 3) in the comment above and referenced below. The purpose of a Section 61 Finding is for the permitting agency to determine if the Proponent has done everything feasible to avoid, minimize or mitigate GHG emissions. Performance-based values alone do not convey that information. In addition, the information in FEIR Section 11.0 (Sect 61 chapter) is a suggested draft for the permitting agency's use.

In response to item 3) above, refer to FEIR Section 5.10.3 and repeated in Section 11.0 (part 2 of the Sect 61 chapter). However, the list of mitigation measures as the design progresses towards, and into, construction. Permits are issued before construction commences so all of the mitigation will be finalized prior to issuance of any permits. The post-construction self-certification will enforce the EIR commitments or equivalent, allowing the design flexibility necessary since the EIR is developed early in project design.

Items 4) and 5) in the DOER comment are not in accordance with the MEPA Policy. MEPA will be notified as appropriate of any Project changes.

Consistent with the instructions in the MEPA GHG Policy and Protocol and in comment MEPA 25, Section 5.10.4 of this FEIR includes a commitment to provide a self-certification to the MEPA Office at the completion of the Project that will be signed by an appropriate professional (e.g. engineer, architect, transportation planner, general contractor) indicating that all of the GHG mitigation measures, or equivalent measures that are designed to collectively achieve identified reductions in stationary source GHG emission and transportation-related measures, have been incorporated into the Project. Section 11.0 of this FEIR summarizes mitigation commitments, including GHG mitigation commitments, and includes draft Section 61 findings for use by agencies issuing Project permits, including a draft Section 61 finding that the Project will provide the self-certification.

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November 6, 2015

By Hand Delivery and Electronic Mail

Matthew Beaton, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Attn: Purvi Patel, MDEP Analyst

Re: ***West Medway II, EEA No. 15363***
Draft Environmental Impact Report

Secretary Beaton:

Conservation Law Foundation ("CLF") submits the following comments on the Draft Environmental Impact Report for the West Medway II Project (the "Project"), EEA No. 15363 (the DEIR").

As is explained in more detail below the DEIR is inadequate, containing insufficient or improper analysis regarding project alternatives and regarding the project's reasonably foreseeable greenhouse gas ("GHG") emissions and related climate impacts. Accordingly, CLF requests that you require the Proponent file a supplemental DEIR in accordance with 301 C.M.R.11.07 with additional data and analysis to remedy those defects.

The DEIR's Alternatives Analysis Must be Supplemented.

The DEIR does not describe or analyze project alternatives in a manner consistent with, or as required by, 301 C.M.R.11.07(f). The June 19, 2015 Certificate of the Secretary of Energy and Environmental Affairs (the "Secretary") on the Environmental Notification Form for the Project (the "ENF Certificate") directed that the DEIR "should evaluate a No-Build Alternative, Off-Site Alternatives, and the Preferred Alternative" and, in doing so, include "a comparative analysis . . . which clearly identifies differences between *the environmental impacts* associated with each of the alternatives." ENF Certificate at 5. It further directed that the DEIR "should include a discussion of the environmental impacts and benefits of each [Project alternative] and provide a comparison in tabular format. *Id.*

CLF 01
CLF 02

But the DEIR contains no description whatsoever of an Off-Site Alternative, and no comparative analysis in narrative or tabular form of the environmental impacts associated with the Project or any project alternative. As a result, the Secretary should require the submission of a supplemental DEIR in accordance with 301 C.M.R.11.07.

The DEIR's No-Build Alternative Analysis Is Incomplete. The DEIR presents no meaningful description or analysis of a No-Build Alternative, stating only the obvious: that in such a scenario "the generating facility would not be constructed[.]" DEIR at 3-1. But such a description and analysis are both readily available and required by 301 C.M.R.11.07(f)(2) in order to establish a "baseline in relation to which the Project and its alternatives can be described and analyzed and its potential environmental impacts and mitigation measures can be assessed."

At a minimum, a complete and accurate No-Build Alternative must describe the reasonably foreseeable composition, and then analyze the likely performance of, the ISO-NE Southeast Massachusetts/Rhode Island ("SEMA") load zone in the absence of the Project. Such a description would need to model, at a minimum, the more than 97 megawatts of additional generation that also cleared Forward Capacity Auction 9 for the SEMA zone. Importantly, all of that generation is lower variable cost generation—solar, demand response, and energy efficiency[1]—that should dispatch ahead of the Project, with the potential to displace as much or more carbon-emitting generation than the higher-cost Project might.[2] CLF 03

Given the Project proponent's repeated assertion that the Project is "needed . . . [to] ensure electricity reliability in southeast Massachusetts" (DEIR at 3-1; *id*. at 2-1, 2-2), the DEIR's No-Build Alternative must also describe and analyze the reliability of the New England grid, and its SEMA load zone, grid without the Project. Without such analysis no baseline exists "in relation to which the Project and its alternatives can be described and analyzed" regarding reliability. CLF 04

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[1] *See* Exhibit 1 (ISO-NE FCA 9 Results Filing) at Attachment A pp. 25-29 (showing new resources added to the SEMA zone); Exhibit 2 (ISO-NE). Such analysis should also model the FCA 9 addition to the SEMA zone of another 11 megawatts of 10-minute "quick-start" power (comparable to that claimed for the Project) at Emera Energy's Tiverton power plant (ISO facility #1226). CLF 05

[2] Such analysis can be readily provided by a dispatch model similar to that proffered by the Project proponent in support of the DEIR's Section 5.0 GHG analysis. That model, however, is incapable of providing such analysis because it simulates only a "single zone in New England" (*see* page 2 of Attachment ST/PD-4 to Attachment I (Tierney-Darling Testimony) of the DIER) when in reality the ISO-NE grid is a complex, four zone grid with important locational constraints.

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The DEIR's Off-Site Alternatives Analysis Is Incomplete. The DEIR fails to describe or analyze a single Off-Site Alternative to the Project as the ENF Certificate requires. Instead, the DEIR recounts the Project proponent's internal assessment of various site and technical alternatives that it apparently considered and rejected. But the law requires more.

In addition to including "a brief discussion of any alternatives no longer under consideration including the reasons for no longer considering these alternatives," which is all that Section 3.2 of the DEIR can properly be understood to provide, 301 C.M.R.11.07 separately requires that the DEIR include a "description and analysis of . . . all feasible alternatives" to the Project, "including but not limited to those indicated in the Scope." 301 C.M.R.11.07(f)(1), (3). CLF 06

Here that would at least require a full description and analysis of the performance, benefits and environmental impacts of a generating facility located at the Project proponent's 58-acre Everett (Mystic) site (*see* DEIR § 3.2.2.1). The DEIR, however, contains no such analysis. Instead, it (again) only recounts the *conclusions* of the Project proponent's internal evaluation process which resulted in it selecting its Preferred Alternative (*see* DEIR § 3.2.3.4). No data or discussion is included regarding the cost, feasibility, technical performance, or potential environmental impact of an Everett (Mystic) Off-Site Alternative. As a result, the DEIR cannot be understood to provide—as the ENF Certificate (at 5) expressly requires—*any* comparative analysis that identifies differences between the environmental impacts associated with an Everett (Mystic) Off-Site Alternative and those associated with the proposed Project. The DEIR also plainly lacks the "comparison in tabular format" of "the environmental impacts and benefits of each [Project alternative]" required by the Secretary in the ENF Certificate. ENF Certificate at 5.

The DEIR's Assessment of Impact Analysis Is Incomplete. Because the DEIR fails to adequately describe either the No-Project Alternative or any feasible alternative to the proposed Project, it fails to present a viable assessment of impacts as required. Pursuant to 301 C.M.R.11.07, the DEIR must include "[a] detailed description and assessment of the negative and positive potential environmental impacts of the Project *and its alternatives*," and do so "in quantitative terms, to the maximum extent practicable[.]" 301 C.M.R.11.07(h) (emphasis added). Such an assessment also must "include both short-term and long-term impacts for all phases of the Project (e.g., acquisition, development, and operation) and cumulative impacts of the Project[.]" *Id.* CLF 07

But no such quantitative comparison exists in the DEIR. Having failed to adequately describe either the No-Project Alternative or any feasible alternative to the proposed Project, the DEIR presents no description, assessment, or quantification of any potential environmental advantage or disadvantage of any Project alternative, much less the comparative analysis required by 301 C.M.R.11.07(f) and (h).

Moreover, the DEIR fails to properly assess the impact of the proposed Project itself regarding its reasonably foreseeable GHG emissions. In several places, the DEIR suggests that the Project will would lead to a net reduction in regional CO2 emissions during between 2018 and 2030 (DEIR at 3-2; *id*. at 5-2) citing the Tierney/Darling Testimony submitted in Attachment I of the DEIR. But that testimony provides no support for such an assertion. As is indicated in the project Proponent's responses to the Energy Facilities Siting Board (the "EFSB"), the Tierney/Darling Testimony assumes that the proposed Project would run at less than a 6% capacity factor. Exhibit 3 (Exelon Response EFSB-4(1) (indicating average annual capacity factor 2019-2030 of 5.87%)). Nowhere does the DEIR include GHG emissions analysis for operations at the Project's "expected actual" operating level of "33% capacity factor total, 10 days on ULSD"—*over 5 times higher than the level modeled by Tierney/Darling*—which will result in the emission of at least 337,000 tons of CO2 each year between 2018 and at least 2068. *See* DEIR, Attachment E (Greenhouse Gas Technical Appendices) at 1-2.

The DEIR's GHG Analysis Must be Supplemented.

The DEIR's Section 5.0 GHG analysis is inconsistent with the requirements of both the state's GHG Policy[3] and the ENF Certificate. The DEIR sets an inappropriate and incorrect Project baseline and also fails to describe or analyze any meaningful mitigation of the Project's reasonable foreseeable GHG emissions of at least 3,989 tons per day of CO_2 (ENF Certificate at 7) between 2018 and 2068—a total potential emissions impact of about 72 million tons of CO_2.[4] Moreover, the DEIR provides no analysis whatsoever regarding the Project's impacts between 2030 and 2050 and therefore fails to "address the [P]roject within the context of the Global Warming Solutions Act (GSWA)" as the Secretary expressly requires. ENF Certificate at 4. As a result, the Secretary should require the submission of a supplemental DEIR in accordance with 301 C.M.R.11.07.

The DEIR Sets the Wrong Baseline for GHG Analysis. Both the ENF Certificate and the GHG Policy require that the baseline for GHG analysis be the operations and emissions of the proposed Project itself. The ENF Certificate directs that the "DEIR should provide estimates of GHG emissions *of the facility* with [Best Available Control Technology] measures *as the Base Case*. ENF Certificate at 7 (emphasis added). That direction is consistent with the states GHG Policy which similarly requires that a project proponent "establish a project baseline for the industrial component *of the project* . . . without any CLF 08

[3] MEPA Greenhouse Gas Emissions Policy and Protocol, dated May 5, 2010 (the "GHG Policy").

[4] DEIR at 2-22 ("The Project is required to commence commercial operation no later than June 2018. [¶] The physical lifespan of the Project is anticipated to be on the order of 40 to 50 years (or more).").

mitigation measures (sometimes referred to as the "business as usual" scenario)." GHG Policy at 6-7. But the DEIR ignores both of those requirements.

The proposed Project is an electric generating facility composed of two General Electric LMS100 combustion turbine generators. DEIR at 2-12 - 2-13 (defining the "Project" as including the "following major components . . . Two (2) simple-cycle GE LMS100 CTGs . . . The design for the nominal 200 MW Proposed Project is built around two GE LMS100 combustion turbines. . . . The Proposed Project will primarily include two GE LMS100 CTGs"); *accord* Project Environmental Notification Form, dated Apr. 29, 2015, at 4 ("The Proposed Project will include two (2) new state-of-the-art, simple-cycle GE LMS electric combustion turbines (100 MW each) with a combined net nominal output of 200 MW.").

Despite such clear definition of the Project, and its "industrial component"—two 100MW GE LMS100 combustion turbines, the DEIR incorrectly sets as a baseline for its GHG analysis a *different* project with a *different* industrial component, the Trent 60 combustion turbine. DEIR at 5-9 (setting as the analysis baseline a "different new commercially available simple cycle combustion turbine project"); *id*. at 5-10 ("For the baseline case, the Rolls Royce Trent 60 WLE DF w/ISI turbine case is selected.").

This baseline error invalidates the entirety of the DEIR's GHG analysis, requiring its full revision and resubmission as part of a supplemental DEIR. As the GHG Policy makes clear, in order to "satisfy MEPA's requirements to analyze potential environmental impacts of a proposed project," GHG analysis "requires that proponents quantify the majority of potential GHG emissions associated *with the project*." GHG Policy at 4 (emphasis added). Accordingly, the DEIR must include analysis of both "direct" and "indirect" GHG emissions attributable to the proposed project. "With respect to stationary sources, 'Direct Emissions' means the emissions from on-site stationary sources *of the facility itself*," including from a project's "combustion turbines." *Id.* CLF 09

Only such analysis is consistent with the GHG Policy analysis framework in which the proposed Project's emissions are compared against potential mitigation measures and against viable project alternatives. GHG Policy at 3 ("In summary, this is a 3-step process, as further outlined below: (1) identify a project baseline; (2) calculate estimated GHG emissions from the project baseline condition; and (3) calculate estimated emissions reductions based on mitigation measures by comparing project alternatives to the baseline."); *id*. at 10 ("After, (1) identifying the appropriate baseline condition for each aspect of the project, and (2) calculating estimated GHG emissions associated with the baseline condition in accordance with the methodology outlined above, [3] the CLF 10 proponent should calculate and compare GHG emissions associated with the preferred alternative and other mitigation measures.").[5]

The DEIR Fails to Propose or Analyze Any Meaningful GHG Mitigation. The ENF Certificate requires that the DEIR's GHG analysis must "clearly demonstrate consistency with the objectives of MEPA review" which includes documenting "the means by which damage to the environment van be avoided, minimize and mitigated to the maximum extent feasible." ENF Certificate at 7. Similarly, 301 C.M.R.11.07(j) requires that "[t]he EIR shall specify in detail: the measures to be taken by the Proponent or any other Agency or Person to avoid, minimize, and mitigate potential environmental impacts." But the DEIR utterly fails to do so regarding its GHG emissions. CLF 11

Having set an incorrect baseline for GHG analysis, the DEIR purports to offer the proposed Project *itself*—two GE LMS100 turbines—as a mitigation measure. *Compare* DEIR at 2-12 - 2-13 (defining the "Project" as including the "following major components . . . Two (2) simple-cycle GE LMS100 CTGs . . . The design for the nominal 200 MW Proposed Project is built around two GE LMS100 combustion turbines. . . . The Proposed Project will primarily include two GE LMS100 CTGs") *with id.* at 5-24 ("Exelon proposes the following control and mitigation measures for GHG: use of GE LMS100 turbines[.]"); *id.* at 12-9 (same). Similarly, the DEIR incorrectly offers another aspect of the proposed Project—the pre-existing state requirement (310 C.M.R. 7.70) that the Project purchase one Regional Greenhouse Gas Initiative ("RGGI") credit offset each ton of CO_2 it emits in order to operate[6]—as a mitigation for the Project itself. DEIR at 5-24; *id.* at 12-9.

But a proposed project cannot itself be a mitigation measure under Massachusetts law. Mitigation measures are "physical, biological and chemical measures and management techniques designed to limit negative environmental impacts . . . of a Project." 301 C.M.R.11.07(j). Here, the proposed Project—the proper baseline against which mitigation must be proposed and analyzed—consists of two GE LMS100 turbines that may not by law operate without 100% RGGI credit offset. That project, when operating, will emit at least 337,000 tons of CO2 each year between 2018 and at least 2068. DEIR,

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[5] The DEIR sets forth its own three-part analysis framework that is inconsistent with the GHG Policy: "calculate[ing] and compar[ing] the GHG emissions in two cases," a Trent 60-based project ("Case 1") and the proposed Project ("Case 2") before considering "Other Mitigation." DEIR at 5-9.

[6] *Accord* DEIR at 5-2 (Pursuant to 310 C.M.R. 7.70, "CO2 allowances must be purchased at RGGI auctions or secondary markets to account for each ton of CO2 emitted. . . . Under the Massachusetts RGGI Regulations, fossil-fuel fired electric generation plants are required to buy 100% of needed allowances through participation in regional auctions.").

Attachment E (Greenhouse Gas Technical Appendices) at 1-2. And it is that GHG emissions impact that the DEIR must assess and consider mitigation measures to reduce. The GHG Policy "requires that all projects that are subject to an EIR quantify GHG emissions, evaluate measures that could reduce GHG emissions and quantify potential reductions of mitigation measures," and having done so, further requires "that all feasible means and measures to reduce those impacts are adopted." ENF Certificate at 7. CLF 12

Because the DEIR offers no mitigation measure whatsoever that could reduce the GHG emissions of the proposed Project, a supplemental DEIR is required that contains new GHG analysis that comports with the state's GHG Policy.[7] Such supplemental analysis must describe and analyze "all feasible means and measures to reduce" the proposed Projects GHG impacts. ENF Certificate at 7; GHG Policy at 11 (analysis must "document the means by which the proponent plans to avoid, minimize or mitigate Damage to the Environment to the maximum extent feasible"); 301 C.M.R.11.07(k) ("Proposed Section 61 Findings shall specify in detail: "all feasible measures to be taken . . . to avoid Damage to the Environment or, to the extent Damage to the Environment cannot be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable.").

One such technically and commercially feasible mitigation measure that would minimize and mitigate the proposed Project's damage to the environment as a result of its massive lifetime CO_2 emissions profile is an annual declining emissions cap comparable to that outlined in Exhibit 5. Such a mitigation is economically and commercially reasonable: CLF's financial analysis estimated that such a mitigation measure would impose a minimal cost on the Project—about 3-4% between 2031 and 2050 only—while allowing the project Proponent to recover its full investment with a return on capital; and Footprint Power Salem Harbor LLC voluntarily accepted such a scheme during its permitting before the Energy Facilities Siting Board (*see* Final Decision, EFSB 13-01, Feb. 25, 2014). This mitigation measure would reduce lifetime GHG emissions of the Project by over almost 11,000,000 tons of CO_2.[8] Such a mitigation scheme comports with the GHG policy and—importantly—with the Global Warming Solutions Act, which requires reducing carbon emissions "by 80% below 1990 emissions levels by the year 2050," CLF 13

[7] Exhibit 4 demonstrates the type of analysis required to meet the requirements of the GHG Policy's 3-step process—identifying and quantifying the baseline emissions of the proposed project (§ 4.1.1), identifying and analyzing a viable GHG alternative using bio-fuels rather than ULSD (§ 4.1.2), and proposing GHG mitigation measures and emission reductions to reduce the GHG impact of the proposed project (§ 4.1.5).

[8] The declining cap would avoid about 3,581,500 tons of Project CO_2 emissions between 2031 and 2049, and by requiring the Project to fully avoid or offset all emissions from 2050 until 2068, the end of its expected lifespan, would avoid another 7,163,000 tons of Project CO_2 emissions.

conservation law foundation

GHG Policy at 6, which the state has recognized will require 80% to 100% of the state's electricity to be powered by non-fossil fuel generators. Massachusetts Clean Energy and Climate Plan for 2020, at 99, 101.

Conclusion

Because the DEIR contains insufficient or improper analysis regarding project alternatives and regarding the project's reasonably foreseeable GHG emissions and related climate impacts, a supplemental DEIR must be filed in accordance with 301 C.M.R.11.07(f) and (h) with additional data and analysis to remedy those defects as well as, in accordance with 301 C.M.R.11.07(j), a discussion and analysis of the mitigation measures proposed herein.[9]

Sincerely,

David Ismay
Staff Attorney
Conservation Law Foundation

Encl.

cc: Deirdre.Buckley@state.ma.us
Purvi.Patel@state.ma.us

[9] Upon request, CLF will provide the Secretary with expert analysis supporting the technical, commercial, and economic feasibility of its proposed GHG mitigation measure. Such analysis will also be submitted as part of EFSB docket #15-01.

CONSERVATION LAW FOUNDATION (CLF)

CLF 01 **The June 19, 2015 Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form for the Project directed that the DEIR "should evaluate a No-Build Alternative, Off-Site Alternatives, and the Preferred Alternative" and, in doing so, include "a comparative analysis...which clearly identifies differences between *the environmental impacts* associated with each of the alternatives."**

Please see MEPA 04.

CLF 02 **It further directed that the DEIR "should include a discussion of the environmental impacts and benefits of each [Project alternative] and provide a comparison in tabular format.**

Please see MEPA 04.

CLF 03 **At a minimum, a complete and accurate No-Build Alternative must describe the reasonably foreseeable composition, and then analyze the likely performance of, the ISO-NE Southeast Massachusetts/Rhode Island ("SEMA") load zone in the absence of the Project. Such a description would need to model, at a minimum, the more than 97 megawatts of additional generation that also cleared Forward Capacity Auction 9 for the SEMA zone. Importantly, all of that generation is lower variable cost generation—solar, demand response, and energy efficiency—that should dispatch ahead of the Project, with the potential to displace as much or more carbon-emitting generation than the higher-cost Project might.**

Please see the response to CLF 04. Also, if as CLF asserts, the 97 MW of additional generation which cleared FCA #9 are lower variable cost, they would be dispatched ahead of the Proposed Project. In that case, the Project would not run and would not be creating any emissions. However, the Project notes that energy efficiency measures are not "dispatched", once implemented they serve to reduce load whenever the asset is operated (more efficient lighting, more efficient motors, more efficient HVAC systems, etc). Also, solar is an intermittent resource and hence is not available to be dispatched for much of the time (late afternoon/night/early morning, nor on cloudy days, nor at night, nor during other inclement weather events such as heavy snow).

Additional insight on this issue is provided in a recently issued ISO-NE discussion paper entitled "The Importance of a Performance-Based Capacity Market to Ensure Reliability as the Grid Adapts to a Renewable Energy Future" (see technical Appendix D).

Lastly, Exelon notes that nearly all of the dispatch modeling completed for the Project shows that the proposed 200 MW unit is running, it is displacing emissions from older, less efficient units.

CLF 04 **Given the Project proponent's repeated assertion that the Project is "needed…[to] ensure electricity reliability in southeast Massachusetts" (DEIR at 3-1; *id.* At 2-1, 2-2), the DEIR's No-Build Alternative must also describe and analyze the reliability of the New England grid, and its SEMA load zone, grid without the Project. Without such analysis no baseline exists "in relation to which the Project and its alternatives can be described and analyzed" regarding reliability.**

The Project disagrees. As described in the DEIR, ISO-NE is responsible for ensuring that sufficient resources are available to reliably meet New England's electrical power requirements. Based on ISO's forecasts and modeling (including planned retirements), the Forward Capacity Auction process is used to secure additional resources (generation and/or demand response) needed to meet system requirements. In this case, ISO-NE determined that additional resources are needed in the SEMA/RI area. The Proposed Project meets that need and cleared FCA #9 (for 2018-19). This process clearly establishes the need for the Proposed Project.

CLF 05 **Such analysis [see CLF 03] should also model the FCA 9 addition to the SEMA zone of another 11 megawatts of 10-minute "quick-start" power (comparable to that claimed for the Project) at Emera Energy's Tiverton power plant (ISO facility #1226).**

Please see the response to CLF 03.

CLF 06 **In addition to including "a brief discussion of any alternatives no longer under consideration including the reasons for no longer considering these alternatives," which is all that Section 3.2 of the DEIR can properly be understood to provide, 301 C.M.R.11.07 separately requires that the DEIR include a "description and analysis of…all feasible alternatives" to the Project, "including but not limited to those indicated in the Scope."**

See MEPA 04.

CLF 07 **Pursuant to 301 C.M.R.11.07, the DEIR must include "[a] detailed description and assessment of the negative and positive potential environmental impacts of the Project *and its alternatives*," and do so "in quantitative terms, to the maximum extent practicable[.]" 301 C.M.R.11.07(h) (emphasis added). Such an assessment also must "include both short-term and long-term impacts for all phases of the Project (e.g., acquisition, development, and operation) and cumulative impacts of the Project[.]"**

See MEPA 04.

CLF 08 *The DEIR Sets the Wrong Baseline for GHG Analysis*. Both the ENF Certificate and the GHG Policy require that the baseline for GHG analysis be the operations and emissions of the proposed Project itself. The ENF Certificate directs that the "DEIR should provide estimates of GHG emissions *of the facility* with [Best Available Control Technology] measures *as the Base Case*. ENF Certificate at 7 (emphasis added). That direction is consistent with the states GHG Policy which similarly requires that a project proponent "establish a project baseline for the industrial component *of the project*...without any mitigation (sometimes referred to as the "business as usual" scenario)." GHG Policy at 6-7. But the DEIR ignores both of those requirements.

As stated in Section 5.7 of the DEIR, turbine choice has by far the largest impact on GHG emissions of any Project design decision, and including turbine selection in the GHG analysis is necessary to provide a complete analysis of how the Proponent has analyzed all feasible measures to reduce GHG emissions. Section 5.2.1 of this FEIR updates the baseline as requested by comment MEPA 12. No new information is needed to modify the baseline used in the analysis, which involves moving a single number in Table 5-5 of the DEIR.

CLF 09 This baseline error invalidates the entirety of the DEIR's GHG analysis, requiring its full revision and resubmission as part of a supplemental DEIR. As the GHG Policy makes clear, in order to "satisfy MEPA's requirements to analyze potential environmental impacts of a proposed project," GHG analysis "requires that proponents quantify the majority of potential GHG emissions associated *with the project*." GHG Policy at 4 (emphasis added). Accordingly, the DEIR must include analysis of both "direct" and "indirect" GHG emissions attributable to the proposed project. "With respect to stationary sources, 'Direct Emissions' means the emissions from on-site stationary sources *of the facility itself*," including from a project's "combustion turbines."

Contrary to the statement in CLF's comment 09, the baseline used in the DEIR actually did include direct emissions from the on-site stationary sources. Apparently, CLF misconstrues the definition of "project" with respect to the GHG Policy and Protocol. As an example, for a GHG analysis of a proposed hotel, the project is defined as a 200-key hotel, not a hotel with a VariTrane™ brand dual duct Variable Air Volume HVAC system.

CLF 10 Only such analysis is consistent with the GHG Policy analysis framework in which the proposed Project's emissions are compared against potential mitigation measures and against viable project alternatives. GHG Policy at 3 ("In summary, this is a 3-step process, as further outlined below: (1) identify a project baseline; (2) calculate estimated GHG emissions from the project baseline condition; and (3) calculate estimated emissions reductions based on mitigation measures by comparing project alternatives to the baseline."); id. at 10 ("After, (1) identifying the

appropriate baseline condition for each aspect of the project, and (2) calculating estimated GHG emissions associated with the baseline condition in accordance with the methodology outlined above, [3] the proponent should calculate and compare GHG emissions associated with the preferred alternative and other mitigation measures.").

The choice of baseline itself does not determine the ability of the GHG analysis to "demonstrate consistency with the objectives of MEPA review, one of which is to document the means by which the proponent plans to avoid, minimize or mitigate Damage to the Environment to the maximum extent feasible." The baseline choice is simply a hypothetical case used as a point of reference to "compare GHG emissions associated with the preferred alternative and other mitigation measures" and a change in baseline does not affect the results of the comparisons.

CLF 11 **The DEIR Fails to Propose or Analyze Any Meaningful GHG Mitigation. The ENF Certificate requires that the DEIR's GHG analysis must "clearly demonstrate consistency with the objectives of MEPA review" which includes documenting "the means by which damage to the environment van be avoided, minimize and mitigated to the maximum extent feasible." ENF Certificate at 7. Similarly, 301 C.M.R.11.07(j) requires that "[t]he EIR shall specify in detail: the measures to be taken by the Proponent or any other Agency or Person to avoid, minimize, and mitigate potential environmental impacts." But the DEIR utterly fails to do so regarding its GHG emissions.**

CLF's statement is incorrect. The analysis in the DEIR provides a component-by-component review of ways to limit GHG for the project; this is consistent with policy, the ENF certificate, DOER comments, and precedent.

CLF 12 **The GHG Policy "requires that all projects that are subject to an EIR quantify GHG emissions, evaluate measures that could reduce GHG emissions and quantify potential reductions of mitigation measures," and having done so, further requires "that all feasible means and measures to reduce those impacts are adopted." ENF Certificate at 7. Because the DEIR offers no mitigation measure whatsoever that could reduce the GHG emissions of the proposed Project, a supplemental DEIR is required that contains new GHG analysis that comports with the state's GHG Policy.7 Such supplemental analysis must describe and analyze "all feasible means and measures to reduce" the proposed Projects GHG impacts. ENF Certificate at 7; GHG Policy at 11 (analysis must "document the means by which the proponent plans to avoid, minimize or mitigate Damage to the Environment to the maximum extent feasible"); 301 C.M.R.11.07(k) ("Proposed Section 61 Findings shall specify in detail: "all feasible measures to be taken . . . to avoid Damage to the Environment or, to the extent Damage to the Environment cannot be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable.").**

Exelon disagrees with CLF's assertion that a supplemental DEIR is required. The GHG analysis in the DEIR was responsive to the MEPA requirements, the Policy, and the ENF scope, and per normal MEPA review procedures this FEIR provides additional information as described in the DEIR certificate.

CLF 13 **One such technically and *commercially* feasible mitigation measure that would minimize and mitigate the proposed Project's damage to the environment as a result of its massive lifetime CO_2 emissions profile is an annual declining emissions cap comparable to that outlined in Exhibit 5. Such a mitigation is economically and commercially reasonable: CLF's financial analysis estimated that such a mitigation measure would impose a minimal cost on the Project—about 3-4% between 2031 and 2050 only—while allowing the project Proponent to recover its full investment with a return on capital; and Footprint Power Salem Harbor LLC voluntarily accepted such a scheme during its permitting before the Energy Facilities Siting Board (see Final Decision, EFSB 13-01, Feb. 25, 2014). This mitigation measure would reduce lifetime GHG emissions of the Project by over almost 11,000,000 tons of CO_2.[8] Such a mitigation scheme comports with the GHG policy and—importantly—with the Global Warming Solutions Act, which requires reducing carbon emissions "by 80% below 1990 emissions levels by the year 2050," GHG Policy at 6, which the state has recognized will require 80% to 100% of the state's electricity to be powered by non-fossil fuel generators. Massachusetts Clean Energy and Climate Plan for 2020, at 99, 101.**

CLF's analysis does not provide a basis for rendering an opinion as to whether CLF's proposed annual declining GHG emissions cap is commercially feasible for this Project. The reference to the Footprint Power Project is not relevant for understanding the commercial/financial implications of such a cap for a project with an entirely different technological profile and functionality within the regional electric system. Moreover, a decreasing emissions cap, whereby Project operation would be artificially limited over the course of the project life, is not a GHG mitigation measure. Rather, the implications of such a cap that it would artificially limit the output of the plant, and mean that it would not be able to operate in the place of power plants with worse heat rates and higher emissions. Thus, a cap would be counterproductive from a GHG-emission-reduction point of view and amount to a penalty on a single highly-efficient source that would likely only serve to increase GHG emissions overall. If the Project were to be artificially withdrawn from the electric generating market, it is very unlikely that a lower-emitting source would be called to produce. Instead, less-efficient, higher-emitting sources will likely be called upon to operate. Further, by making the Project's quick-start capability unavailable, ISO-NE will be less capable of using intermittent renewable generating sources to reliably generate power, as is more thoroughly described in the ISO-NE Discussion Paper included as Appendix D to this FEIR. Finally, overall grid stability and reliability could be undermined by artificially constraining the grid operator from calling upon the Project's quick-starting and load-following capabilities. Given the electric system's need for quick-start resources to provide ramping capability (an essential reliability service as described by the North American Reliability Corporation in a recent report[1]) and to do so increasingly as electric systems add intermittent resources (such as solar PV projects whose availability to produce power drops off quickly as the sun goes down), an artificial constraint on a fast-ramping resource would mean that that capability would have to be provided by another existing or new resource in order to avoid degrading electric system reliability. At worse, such capability might be to increase reliance on diesel emergency generators to be brought on-line, which would be entirely counter to the objective of reducing GHG emissions in Massachusetts and New England.

Limiting operation (e.g., through a cap on capacity factor and/or GHG emissions at the facility itself) would contradict the goal of reducing the emissions of GHG from the operations of the fleet of power plant in New England which serve electricity consumers in New England. The Commonwealth's Climate Action Plan recognizes that power plants in Massachusetts and in other parts of New England contribute to the carbon intensity of electricity sold to electricity customers in Massachusetts. Because of the Project's high efficiency, it will be dispatched ahead of less-efficient fossil-fueled power plants with higher GHG emissions; thus, its operation will displace output at higher-emitting plants, leading to lower net GHG emissions with output at the Project. It will only be called upon when needed for reliability (e.g., during summer peak periods when electrical demand is highest in New England and when the Project will only be permitted to operate on natural gas, with net emissions reductions in any hour of operation; during winter peak periods when it may only operate up to 720 hours on ULSD, when it will tend to displace output at other existing generating units with higher emissions and with fuel enabling them to operate during periods of high demand for natural gas).

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1 "Ramping Capability: Ramping is using real power control to raise or lower resources over a period of time to maintain load generation balance. Ramping capability is most needed at times of major load shifts, such as morning ramp up, afternoon ramp down, and evening ramp up. In California, ramping needs have emerged as an ongoing issue with integration of large amounts of solar PV. As the typical load curve changes due to integration of off peak electrical loads (e.g., electric vehicles and smart appliances), ramping needs may also change from morning and evening ramps to off peak ramps." Page 2 of NERC's Essential Reliability Service (ESR) Task Force Concept Paper on ERS that Characterizes BPS Reliability, October 2014.

CRWA
Saving the Charles River since 1965

Email and Mail

November 9, 2015

Matthew Beaton, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Attn: Purvi Patel, MEPA Office

Re: Environmental Notification Form, West Medway II, EOEEA No. 15363

Dear Secretary Beaton:

The Charles River Watershed Association (CRWA) submits the following comments on the Draft Environmental Impact Report (DEIR) for the above project. The project, a peaking facility, requires multiple permits.

Stormwater

The proponent does not propose to make any improvements to the five-acre existing plant, which is
mostly paved, for stormwater management. According to the proponent, stormwater "reaching the catch
basins" at the existing plant is channeled to an oil–water separator and "clean water" is then routed to a
stormwater detention pond and "infiltrates to the ground." DEIR 9-14. In the FEIR, the proponent should CRWA
provide a diagram showing the location of the catch basins, provide drainage calculations for this portion 01
of the site, detail about the detention pond and infiltration rates and volume, and the discharge points
for stormwater that does not enter these catch basins. The proponent should explain its statement that CRWA 02
this is "clean" water once it goes through the oil-water separator and its statement that stormwater
"infiltrates" from the detention pond. It should also identify the location and provide detail about the CRWA 03
"emergency discharge culvert" that it asserts "would only be reached in extreme conditions." *Id.*

Your ENF certificate scope at 9, asks the proponent to address how the project will contribute to the
attainment of the Upper-Middle Charles Nutrient Total Maximum Daily Load, which requires a 65%
phosphorus load reduction, the proponent fails to address this in the DEIR. Instead, the proponent
merely states the "Proposed Project is not expected to contribute to the TMDL of the Upper-Middle
Charles River." DEIR at 9-22. The proponent should explain this statement in the FEIR. The Upper-Middle
Charles Nutrient TMDL requires a 65% reduction in phosphorus loading from this land use and site. The CRWA
proponent should c omit to meeting the 65% phosphorus reduction required in the Charles River Nutrient 04
TMDLs for the entire site, which includes the existing plant.

In the ENF the proponent stated that all stormwater will be kept on site. Review of the DEIR shows that this is not the case. We note that stormwater runoff from PDA 1-3 (DP 1-3) will receive no treatment; DP 1 discharges to Center Brook and then to the Charles River; PDA-04A discharges directly to the bordering vegetated wetland to the south of the proposed plant. The proponent should provide the calculations to support its statement that the large infiltration basin will recharge the 100-year storm, including the acreage, runoff coefficient, infiltration design, volume and pore space. With groundwater at 9 feet on the site, the proponent should discuss compliance with MassDEP's requirement that there be two- feet of separation between groundwater and stormwater BMPs. CRWA 05

Lastly, This is a single site in common ownership, which involves "development" and "expansion" on a previously developed site. Under the Stormwater Management Standards (Standards), we believe the area of new imperviousness must fully meet the Standards and the existing imperviousness must meet the standards to the maximum extent practicable.[1] The proponent should be required to discuss how it will meet the Standards for the entire site FEIR, in addition to the Nutrient TMDL. We note that the facility will be subject to EPA's Construction General Permit and the preparation of a Stormwater Polllution Prevention Plan. CRWA 06

Water Demand

The vast majority of water required for the facility is turbine water injection for NOx control. DEIR at 12-12. Based on a study by Kleinfelder, the Town of Medway concluded that it cannot provide water to the facility. The proponent's preferred water source is now the Town of Millis public water supply through an interconnection with the Town of Medway. Kleinfelder will also be performing a water supply feasibility study for Millis with respect to the Town's ability to provide water to the Exelon facility, the

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1 According to the Stormwater Management Standards , *Massachusetts Stormwater Handbook*, vol. 1 at 21-22,

> The portion of a property that is currently undeveloped is not a redevelopment and thus does not fall under Standard 7. To the extent a project includes development of previously undeveloped areas, the project must comply fully with all the Stormwater Management Standards. The following example demonstrates how the Stormwater Management Standards apply to a site that includes both new development and redevelopment.
>
> Suppose a 5-acre site with 2 acres of impervious surfaces including parking, a warehouse, and manufacturing plant, will be redeveloped into a mixed-use development with 3 acres of impervious surfaces. A pollution prevention plan, an erosion and sedimentation control plan and a long-term operation and maintenance plan must be prepared for the entire site in accordance with the applicable provisions of Standards 4 through 6, 8, and 9. All illicit discharges to the stormwater system must be eliminated in accordance with Standard 10. Because there is an additional acre of impervious surface, stormwater runoff from at least one acre of impervious surface must be directed to stormwater best management practices that are designed and constructed in accordance with all the Stormwater Management Standards. The remaining two acres of impervious surfaces included in the project may be treated as a redevelopment. Runoff from that portion of the project may be directed to structural stormwater best management practices that are designed and constructed to meet Standards 2 through 6 only to the maximum extent practicable. New stormwater outfalls must be designed in compliance with Standard 1. Existing outfalls are required to comply with Standard 1 only to the maximum extent practicable. The stormwater management system must also improve existing conditions. Because the site is located in a watershed where surface waters often experience low flow, the proponent can fulfill the requirement to improve existing conditions by maximizing opportunities for infiltration and by minimizing water use by installing a rain barrel or cistern.

environmental impacts and potential offsets, or mitigation. The Millis feasibility study should be included in the FEIR. The water agreement with Millis or any other source should also be included. CRWA 07

We note that Millis' current authorized withdrawal volume is 0.80 mgd, not 0.99 mgd as the proponent asserts. This is because Millis' 2010 Water Management Act (WMA) permit was issued as an interim allocation and required the Town to submit documentation by 2014 to enable the Department of Conservation and Recreation to conduct a Water Needs assessment on which its allocation would be based. This has yet to occur. According to its 2014 Annual Statistical Report, Millis withdrew 0.63 mgd. Proposed new development in Millis is estimated to consume an additional 0.17 mgd.[2] The proponent should provide a list of all anticipated development projects in Millis and the projected water use of each. CRWA 08

Exelon's water use on an annual average is estimated to be 95,000 gpd; however, at full load operating, water demand will be as high as 178,600 gpd. Exelon plans to withdraw 52,000 gpd from an on-site bedrock well with the rest supplied by Millis. The on-site well should be metered; we understand that a water supply agreement with Millis and an agreement with Medway to transport Millis water will include metering to ensure that only the water needed by the project is transported through Medway from Millis.

We note that the two subbasins from which Millis withdraws are 30% and 49% August net depleted, respectively. The Town's wells # 5 and 6, which are streamside wells, are required to shut down when streamflow at the Medway gage falls to 0.21 cfsm in the summer months due to the impacts on streamflow from pumping these wells. Since two of Exelon's highest water use months—July and August, will coincide with the time that the Charles and its tributaries are most stressed and flow is already quire low,[3] the proponent should discuss Millis' ability to provide water during the summer months to the project when Wells # 5 and 6 are shut down. CRWA 09

The proponent should commit to mitigation in the form of stormwater recharge to offset its withdrawal impacts in the subbasins from which Millis withdraws. CRWA 10

If water from Millis' municipal water supply is not found to be feasible, the proponent should provide an in-depth discussion of its alternative source, permitting issues, and if trucking is necessary, the number of estimated truck trips during each month of operation. CRWA 11

Alternatives and Greenhouse Gas Emissions Analyses

CRWA joins CLF's comments on the Alternatives and Greenhouse Gas Emissions analyses.

Given that the use of ultra low sulfur diesel (ULSD) significantly increases the plant's emissions, the proponent should commit to using natural gas only. The proponent has acknowledged that this is possible. It should explain why this is not economically viable for the facility. At an absolute minimum, the proponent should commit to limiting its use of ULSD to no more than 10 days, or 240 hours per year. CRWA 12

Please feel free to call me if you have any questions at 781-788-0007 ext. 234.

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[2] Based on 110 gallon per day per Title 5.

[3] This summer saw some of the lowest flows ever recorded.

Sincerely,

Margaret Van Deusen

Margaret Van Deusen
Deputy Director and General Counsel

cc: (via email)
Deirdre Buckley, MEPA

CHARLES RIVER WATERSHED ASSOCIATION (CRWA)

CRWA 01 **In the FEIR, the proponent should provide a diagram showing the location of the catch basins, provide drainage calculations for this portion of the site, detail about the detention pond and infiltration rates and volume, and the discharge points for stormwater that does not enter these catch basins.**

This comment concerns the 5 acre site for the existing 135 MW Exelon facility, located to the north of the proposed Project. The stormwater collection, treatment and detention/infiltration system for the existing 135 MW power plant is not a part of the proposed Project nor is it being modified in any way to accommodate the proposed Project. Accordingly, it is not a topic for detailed discussion in the FEIR.

Nonetheless, in an effort to be responsive to CWRA's questions, a site drawing which locates the existing detention basin and other features is provided as Figure 8-3. The site drawing was previously included as base mapping in the ORAD presented as Appendix J of the DEIR. A basic description of the existing system is provided in Section 7.2.2. This information is derived from the Spill Prevention, Control and Countermeasure (SPCC) Plan for the West Medway Station; the SPCC Plan was most recently updated in August of 2015.

CRWA 02 **The proponent should explain its statement that this is "clean" water once it goes through the oil-water separator and its statement that stormwater "infiltrates" from the detention pond.**

Please see the response to CRWA 01.

CRWA 03 **It should also identify the location and provide detail about the "emergency discharge culvert" that it asserts "would only be reached in extreme conditions."**

Please see the response to CRWA 01, specifically Figure 7-1.

CRWA 04 **Your ENF certificate scope at 9, asks the proponent to address how the project will contribute to the attainment of the Upper-Middle Charles Nutrient Total Maximum Daily Load, which requires a 65% phosphorus load reduction, the proponent fails to address this in the DEIR. Instead, the proponent merely states the "Proposed Project is not expected to contribute to the TMDL of the Upper-Middle Charles River." DEIR at 9-22. The proponent should explain this statement in the FEIR. The Upper-Middle Charles Nutrient TMDL requires a 65% reduction in phosphorus loading <u>from this land use and site</u>. The proponent should [commit] to meeting the 65% phosphorus reduction required in the Charles River Nutrient TMDLs for the entire site, which includes the existing plant.**

Please see Section 7.3.

CRWA 05 **The proponent should provide the calculations to support its statement that the large infiltration basin will recharge the 100-year storm, including the acreage, runoff coefficient, infiltration design, volume and pore space. With groundwater at 9 feet on the site, the proponent should discuss compliance with MassDEP's requirement that there be two- feet of separation between groundwater and stormwater BMPs.**

The construction stage stormwater system and the permanent stormwater system design have been essentially completed. Please see the Draft Stormwater Management Report prepared by Beals & Thomas, Technical Appendix D.

CRWA 06 **The proponent should be required to discuss how it will meet the Standards for the entire site FEIR, in addition to the Nutrient TMDL. We note that the facility will be subject to EPA's Construction General Permit and the preparation of Stormwater Polllution Prevention Plan.**

The subject of the FEIR is the Project Site, not the entire 94-acre Exelon property, the vast majority of which is not affected in any way by the proposed Project.

The requirement for an EPA National Pollutant Discharge Elimination System ("NPDES") General Permit for Discharges from Construction Activities was noted in Section 1.6 of the DEIR and is now noted in Section 1.5 of the FEIR.

CRWA 07 **The Millis feasibility study should be included in the FEIR. The water agreement with Millis or any other source should also be included.**

The Kleinfelder Report is summarized in Section 8.0; the full report is provided as Technical Appendix E. Exelon and the Town of Millis are continuing to work on the supplemental water agreement.

CRWA 08 **According to its 2014 Annual Statistical Report, Millis withdrew 0.63 mgd. Proposed new development in Millis is estimated to consume an additional 0.17 mgd. The proponent should provide a list of all anticipated development projects in Millis and the projected water use of each.**

This issue is discussed in Section 8.0 based on details included in the Kleinfelder Report.

CRWA 09 **Since two of Exelon's highest water use months—July and August, will coincide with the time that the Charles and its tributaries are most stressed and flow is already quite low, the proponent should discuss Millis' ability to provide water during the summer months to the project when Wells #5 and 6 are shut down.**

Please see the response to MEPA 34.

CRWA 10 **The proponent should commit to mitigation in the form of stormwater recharge to offset its withdrawal impacts in the subbasins from which Millis withdraws.**

Stormwater recharge is discussed in Section 8.2.4.

CRWA 11 **If water from Millis' municipal water supply is not found to be feasible, the proponent should provide an in-depth discussion of its alternative source, permitting issues, and if trucking is necessary, the number of estimated truck trips during each month of operation.**

Based on the Kleinfelder Report, use of Millis water to supplement the onsite well is a viable and workable arrangement. Exelon has, however, identified two emergency backup supplies. Please see Section 8.2.3 for specifics.

CRWA 12 **Given that the use of ultra low sulfur diesel (ULSD) significantly increases the plant's emissions, the proponent should commit to using natural gas only. The proponent has acknowledged that this is possible. It should explain why this is not economically viable for the facility. At an absolute minimum, the proponent should commit to limiting its use of ULSD to no more than 10 days, or 240 hours per year.**

Section 5.6 of the DEIR documents the reasons why ULSD is needed for resource adequacy and electric system operational security. While the Project's expected actual ULSD operating rate is 10 days per year, Exelon must maintain a larger permitted capacity (30 days) so the Project can operate during unusual conditions (such as extended cold periods when natural gas must be reserved for residential heating).

Patel, Purvi (EEA)

From:	Brian Adams [beadams11@verizon.net]
Sent:	Tuesday, October 13, 2015 1:49 PM
To:	Sedor, Kathryn (DPU)
Cc:	Patel, Purvi (EEA)
Subject:	EFSB15-01
Attachments:	Exelon letter and flyer.pdf

ADA 01

Good morning,

I would like to present a letter and flyer that was provided by Exelon Generation to Medway residents.

Some of the interesting items:

Air Quality – Exelon States that there will be no impact on public health, and no visible water or steam emissions. However, based upon the DEIR, there will still be 695,875 tons of $CO2$, 66 tons of NOx, 67.4 tons of CO, 58.2 tons of particulate matter and 12.3 tons of $H2SO4$. These are all known carcinogens.

Water – They continue to state that there will not be any Medway water used, and that they are working with an adjacent town with water available under its permit. However, as of last week there hasn't been any formal agreement with that adjacent town and Exelon even to study the water use. Exelon, in all of its documents filed with the ESFB, continues to state that they will use Millis water.

The town of Medway is having a public forum at the High School on Wednesday 10/21/15 at 7pm. If I could make a suggestion that either you or a designated representative from the Siting Board attend this meeting to listen to the proud citizens Medway discuss this proposed expansion. I believe that it will be very informative, and will help in the decision making process.

We are proud of being in the top 25 suburbs to raise a family in Massachusetts (niche.com). We want to continue on these improvements, and not have it taken away from us.

Thank you for your time and consideration.

Best regards,

Brian E. Adams

Exelon Generation

October 5, 2015

Dear Medway Neighbor,

As you are likely aware, Exelon Generation is planning an expansion of its West Medway peaker facility, which has been quietly generating electricity on Summer Street in Medway for more than 40 years.

To ensure that you have accurate information on the expansion, attached is a brief fact sheet that provides an overview of the project and information on some of the issues on which you may have questions. The fact sheet also tells you how you can get updates and additional facts via our website (www.medwayenergy.com), our *Medway Clean Energy Expansion* Facebook page, and Twitter feed @ExelonGen.

We know that there has been a lot of discussion in the community regarding the expansion. We are committed to providing you with the real facts, continued updates, and the opportunity to have your issues addressed and questions answered.

We look forward to keeping you informed, and to discussing how this expansion will provide reliable energy when you need it, while protecting the environment and the people in Medway and providing benefits to the community.

If you have any questions or comments, please contact our communications manager Kevin Thornton by email at info@medwayenergy.com or phone at 610-765-5354.

Sincerely,

John Hughes

Jack Hughes
New England Operations Manager
Exelon Generation
www.medwayenergy.com

Powering Growth in Medway and New England

Expanding the 45-year old Medway facility will mean cleaner and more efficient energy is available when you need it most.

New England needs efficient energy to meet future power demand, and Medway can help provide it.

To ensure lights, heat and computers stay on during times of high energy demand, Exelon Generation is expanding its existing power generating facility in Medway, which has been quietly providing peak energy for 45 years. The expansion will add two highly efficient, fast starting natural gas turbines. Beginning in 2018, the new units will add up to 200 MW of additional power during periods of high demand on our energy grid.

With the addition of efficient peak energy, Medway is helping power the future of New England.

Medway Expansion

- *Location: Summer Street, Medway*
- *Existing facility operating since 1970*
- *Expanding from three units to five*
- *Expanding on existing property*
- *Clean natural gas as primary fuel*
- *No visible emissions from stacks*
- *Advanced emission controls*
- *Secondary fuel(Ultra Low Sulfur Diesel) cleaner than what many residents use to heat their homes*
- *Meets all state and federal emission and noise regulations*
- *Not visible to most neighbors*
- *Makes Exelon Generation largest taxpayer in Medway*

More Power to You

Everyone needs electricity. With older power plants retiring over the next few years, New England needs additional energy demanded by homes and businesses. Each year the New England Independent System Operator (ISO-NE) holds an auction to ensure the New England power system will have enough resources to meet future electric demand. The Medway expansion was chosen in that auction to help ensure demand during peak times can be met responsibly.

The Medway expansion will be built on the plant's existing 94-acre site, will have no visible emissions, and will include the most up-to-date technology available for peaking plants, including technology to reduce emissions and noise. The expansion will begin generating energy in 2018, and has been designed to minimize impacts on the environment, the local watershed, and the health of the community.*

* For more information see the Draft Environmental Impact Report (DEIR) including a Human Health Risk Assessment which can be viewed on our website

www.medwayenergy.com

Medway Expansion Facts

Air Quality

Equipment to be added for the expansion will feature clean-air technologies that ensure the new units comply with all state and federal emission regulations and that there will be no impact on public health. In addition, there will be no visible emissions from the expansion's stacks including no visible water or steam emissions, even when running on our secondary fuel, Ultra Low Sulfur Diesel,

Water

Estimated average per-day water use for the Medway expansion is 95,000 gallons, and that's only if the expansion runs at its maximum permitted capacity. When the plant runs less, water use will be less. Water, used to control emissions, will come mainly from an on-site well that does not impact the Town of Medway's water supply. For the remainder, Exelon Generation is working with an adjacent town with water available under its state permit. No Town of Medway water will be used.

Sound

Sound mitigation technology will be used on both the existing and new equipment, so when the expansion is running it will be as quiet as before - about the level of sound in a quiet residential living room.

Sight

To meet emissions and noise regulations, the expansion will include a sound wall and taller (160-foot) stacks which are the same height as the tallest existing transmission tower already adjacent to the facility. Because of topography and wooded buffer areas, the sound wall and stacks, like the existing stacks, will not be visible to most neighbors.

Green Support

Peaking plants will always be needed to provide quick backup during times of unexpected, high demand on the energy grid. Because renewables such as solar and wind are not always available, natural gas offers a cleaner and more efficient fuel source than coal. As such, natural gas plays an important role in the transition toward more renewables.

Benefits

Up to 200 jobs during construction. Four to six full-time positions once the plant begins operating. A significant positive impact to the Town of Medway's property tax base, making the Medway facility the largest property taxpayer in the Town. And efficient energy when you need it most.

START with the Facts:

Follow us on Facebook: *Medway Clean Energy Expansion*

Follow us on Twitter: *@ExelonGen*

Visit our website: www.medwayenergy.com

Who We Are

Exelon Generation is a unit of Exelon Corporation, a leading U.S. competitive energy business. Exelon owns and operates one of the nation's cleanest and lowest-cost power generation portfolios which includes a balanced mix of fuel sources across the U.S. including hydro, wind, solar, nuclear, natural gas, and oil.

Exelon Generation

Made in Massachusetts

ADAMS, BRIAN (ADA)

ADA 01 **I would like to present a letter and flyer that was provided by Exelon Generation to Medway residents. ...**

The Proponent notes the thoughts and comments provided in this letter.

Patel, Purvi (EEA)

From: Jeffrey A Cahill [jav276@wildcats.unh.edu]
Sent: Thursday, October 29, 2015 8:42 AM
To: Patel, Purvi (EEA)
Subject: EEA#15363 Medway Power Plant Expansion

CAH 01

Good morning Purvi,

My name is Jeff and I grew up in Medway where the Excelon power plant expansion is being planned to go in. I even went to Medway High School down the road from the power plant; the funny thing is, I didn't even know it existed until I was told about it on a job site two days ago. I now work in the utility industry and definitely see the necessity for more power plants especially in the wake of Massachusetts nuclear plants closing. Medway was a great community to grow up in and I don't see the harm in expanding the plant to keep the region's energy rates low.

Jeff C.

CAHILL, JEFFREY (CAH)

CAH 01 **… I now work in the utility industry and definitely see the necessity for more power plants especially in the wake of Massachusetts nuclear plants closing. Medway was a great community to grow up in and I don't see the harm in expanding the plant to keep the region's energy rates low.**

The Proponent appreciates this statement of support.

Patel, Purvi (EEA)

From:	Sara Houser [housers@gmail.com]
Sent:	Friday, November 06, 2015 4:02 PM
To:	Patel, Purvi (EEA); Buckley, Deirdre (EEA); Beaton, Matthew (EEA)
Subject:	EEA No. 15363

HOU 01

I am writing to urge you to put the environment and well-being of the people this plant will impact ahead of corporate financial greed. The company cares nothing for the communities and people this plant will destroy and displace.

My family and I are residents of Medway. The rural town character, friendly community, and safe environment to raise our children drew us to Medway in 2012. We ended our 1.5 year search when we found our current home—a home that met all of our likes and desires—a home we feel blessed to own. A lot of careful consideration was placed into our decision—close proximity to the fire department—as our son has pulmonary and cardiac issues; safe roads in which to play; and location that would help ease our commute time. The new plant doesn't even compare to current facility that run a maximum of 60 to 80 hours annually.

In the fall of 2014, we received notice from Exelon that they were considering to bid for more energy and were considering building four, 100 megawatt combustion turbines only 1,300 feet from our home. We learned early in 2015 that Exelon was awarded only half of the bid, and throughout the spring months learned about the specifics of the proposed power generation project site. As you can imagine, we were shocked and dismayed to learn that Exelon didn't have any concerns about building such a large facility within a small residential town.

Furthermore, our concerns grew as we dug in to learn more about the proposed project and how it will impact our family and our community. We poured through thousands of pages filed by Exelon and their consultants, which seemed to change on a weekly basis. What we discovered made our hearts sink into our stomachs. Not only does this power plant have very little benefit besides tax revenue to Medway and virtually no benefit to surrounding towns like Franklin Bellingham, Milford, Millis, Hopkinton and Holliston, but it poses a lasting environmental, safety and health risk to the community and more specifically to our youngest son Oliver. He was born with a severe heart defect and spent weeks in the cardiac ICU at Boston Children's Hospital. As a result of his heart condition, he suffers from asthma, is highly susceptible to viruses, and is on environmental and physical restrictions. His health requires a lifetime of medical treatments, hospital visits, and surgeries. In the first year of his life, Oliver underwent two cardiac interventions—the first at birth and again at 4 months. Due to the congenital heart defect, his little heart beats at a rate equivalent to an adult running a road race--except for him, he is sitting still. This combined with his asthma, the additional pollution generated by the proposed plant will complicate his health conditions and accelerate surgical intervention. Intervention that his heart specialists are so strongly trying to delay until he is older and more equipped to handle open heart surgery. Regardless of whether this plant reduces the greater New England air quality, the thousands of tons of air pollution introduced to this community will certainly have an adverse effect on our children, specifically children with congenital heart defects and respiratory issues. The Human Health Risk Assessment on page 1583 of the DEIR states, "...the Project stack air emissions would not be **expected** to contribute to **significant** health risks among potentially affected populations". This conclusion is not acceptable to our family and doesn't provide any reassurance that the introduction of this power plant and the hundreds of thousands of tons of pollution will not impact our children. Even the insignificant is significant to children and more specifically children with health issues.

Hundreds of studies published by medical associations, doctors and even the EPA identify the long-term adverse health effects of exposure to the air pollution this plant will create, and also point out the significant adverse health effects of short-term exposure. As well as levels near or below the current air quality standards for ozone, particulate matter, and nitrogen dioxide. For example, exposure to PM2.5 over a few hours to weeks can trigger cardiovascular disease-related mortality and nonfatal events, and the risks are even greater for children, the elderly and those with recognized or unrecognized cardiovascular or respiratory disease.

Here are just a few of the study found:

- Air pollution below EPA standards linked with higher death rates

- EPA: Provisional Assessment of Recent Studies on Health Effects of Particulate Matter Exposure

- Particulate Matter Air Pollution and Cardiovascular Disease

With all of these documented damaging health effects, we are extremely concerned about the health and wellbeing of our family and the surrounding communities. There are already five power plants within a six mile radius, and the nearest air quality monitoring stations in Worcester and Boston. Do we really need to add another one here? Without a way to monitor the local air quality to determine whether the air quality is safe for Oliver, this will most likely force us to leave our home and community that we carefully selected, have grown to love.

With so many serious concerns, it is difficult to know where to begin. In the company's DEIR filing they state that the "Proponent expects the Proposed Project will operate on average 10 days per year on ULSD." Yet, they continue to seek a permit for 30 days/720 hours per turbine per year. When asked if the proposed new turbines had been operational by December 31, 2013, how many hours the proposed new turbines would have operated on natural gas and on ULSD in 2014, they responded 396 hours on natural gas and 568 hours on ULSD (EFSB response Medway A-2). How can this not raise questions about what the primary fuel source will be and why they are seeking a permit for 5,256 hours/60 percent annually? This comes after their response to EFSB-TPS-8 that states, "Exelon does not believe it is possible for the Project to actually burn more MMBtus of USLD than natural gas in a given year". Other conflicting data like the project dispatch capacity factors through 2030 submitted to the EFSB in EFSB-TPS-4(1) where the annual average was ~6 percent, which differs from the **Capacity Factor and Expected Operating Conditions** in the DEIR where it states "...it is possible that the Proposed Project could be dispatched up to 60% in a given year" and "The very low heat rate of this unit means that it will likely be dispatched by NE-ISO more often than traditional peaking units." What residents in the community supposed to believe? The company is required to stay within "expected" or "projected" hours, so these provide little assurances to the community that this plant will not be running 14 hours a day.

The company also states numerous times that this project has an obligation to ISO-NE to produce power beginning in June, 2018. The company made a choice to bid into the Forward Capacity Market and we should not be held accountable for their decision. The company is trying to paint a picture that this 200 MWs plant is critical to the grid and to the energy needs of Medway. However, in the ISO New England 2015 Regional Electricity Outlook document ISO-NE states that 3,500 MWs of power generation will be coming offline by 2018, but about 9,500 MWs of new generation projects were being proposed as of January 2015, with over 25% situated close to load centers. The fact of the matter is that this power plant is purely a profit opportunity for the company to make up for lost revenue in their nuclear portfolio and is not critical to the sustainability of the grid.

On page 54 of the DEIR the company states, "An on-site well is expected to supply almost 75% of the anticipated average daily demand (see Section 7.2). The remaining water demand for the Project is expected to be met through a water supply agreement with the Town of Millis." However, in the company's response to EFSB-W-33 on September 18, they state that the on-site well is expected to account for 54.5 percent of average daily demand. Water in Medway and the surrounding communities is an overburdened resource. As of November 5, the company does NOT have a water supply agreement with the Town of Millis, and has NOT begun the water feasibility study that will indicate whether Millis can provide the water required. With water being such a critical factor to the operation and emissions control of this plant I can't see how any permitting can occur without evidence of an adequate water supply. (Use of Millis Water Questionable Responses)

In the 2.4.2 Planning section of the DEIR document is suggested that this project is consistent with the Commonwealth's planning for growth as well as with the Town of Medway's Master Plan. In regards to this proposed project I believe this can't be further from the truth. The current site is being used for electric generation, but also a large portion is being used agriculturally and is surrounded by wetlands and tributaries that feed the Charles River. In Medway's Master Plan, is says "The growth Medway experienced in the 1990s and early 2000s has had a direct impact on our natural resources. While this increase in population may enhance and enrich the Cultural Resources of the area, the reverse is true for the Natural Resources. Medway has very little topographical relief and much of the flat, undeveloped land is wetland. There is ever increasing pressure to develop marginal lands. In addition to protecting these sensitive areas, we should protect remaining farm land, open space and the Charles River and its tributaries." In addition here are the Town Goals and Objectives for Historical, Cultural and Natural Resources from the Master Plan.

"Goal 1: Protect natural resources.

... Ensuring a safe and adequate water supply for the future is everyone's responsibility. The natural resources that link us with other communities, water and air in particular, make it important for Medway to work in conjunction with those communities and others to protect such resources from a quality of life aspect. The reduction and prevention of pollution at all levels is a goal that makes sense both from health and budgetary perspectives. Short-term gains in growth and/or tax revenue that produce potential long-term harm to Medway's environment must be avoided."

This proposed power plant is NOT protecting Medway's natural resources. In fact, it will be the largest drawing private well and none of the water being pumped will be used to recharge the basin. The project will impact the surrounding wetlands with the construction of the natural gas pipeline and fuel truck staging areas.

"Goal 2: Protect rural, small town character, and enhance community spirit."

I goes without saying that a power plant does NOT protect rural, small town character. And as for community spirit, the limited communication and lack of community involvement in the process has frustrated a large majority of community.

"Goal 3: Implement sustainable and energy efficiency practices and environmentally sound guidelines.

...Medway should develop a municipal plan for the use of sustainable resources that ***reduces Medway's carbon footprint*** *and maximizes reimbursement or funding offsets from the state and federal governments."*

This duel fossil fueled power plant will introduce up to 700,000 tons of CO_2 annually, and will NOT reduce Medway's carbon footprint

"Goal 5: Protect open space and unique wildlife habitat.

Protected open space is important to Medway's future for many reasons: ***to protect our water sources, to preserve at least some of the remaining wildlife habitat corridors, to protect and enhance Medway's property values, to provide reasonable buffers between commercial/industrial zones and residential zones and to maintain quality of life,*** *and recreational choices for its citizenry. Medway should explore whether specialized natural resource zoning for sensitive areas (water resource corridors) would aid in efforts to protect these sites."*

The current site provides reasonable buffer zones. However, the proposed plant will eliminate the current open space and buffer zones, leaving little to no buffer between the abutting residential properties. Views of 55 foot walls and 165 foot emission stacks will most certainly reduce property values and quality of life for many residents of Medway.

The company had the opportunity to pursue rehabilitation and revitalization of their Everett location by decommissioning older units and replace them with newer natural gas units. However, the Everett site had potential contamination issues that may have required some remediation. One would think that remediation and replacement would have been the preferred option versus new development. In addition, the company has to seek several zoning exemptions from the state because the sheer size and height of the facility is not allowed under the Town's Industrial II by-laws. In the DEIR Table 3-1 in the Finalist Site Comparison, the company indicates that the West Medway location has "No site contamination issues in construction area". However, there is still an open RTN on-site from an 18,000 gallon oil spill in 1977. Based on the alternative site analysis provided, it look as like the selection process was glossed over and Medway was specifically targeted because the lack of air quality monitoring and the ability to pursue the project with limited resident participation. The company makes claims that the community "has been generally accepting of a power facility". However, this is an unfounded statement and if brought to a town wide vote on the matter, the residents would vote "NO" to this proposed project even considering the tax revenue the project would bring to the town. There have been over 140 letters of opposition submitted to the Energy Facility Siting Board so far on this project and the company has only present 3 letters in support.

In regards to potential noise pollution, the town's independent consultant disagrees with the noise modeling results performed by the company. In the town's consultant report in states:

"We note one specific concern about the current sound model. In response to our request to Exelon for information in support of the modeled sound attenuation values for the combustion turbine exhaust system, we were provided vendor data that were substantially less than the modeled attenuation values."

*"In addition, **we have a general concern about the facility strictly meeting the MassDEP noise criteria** (limits increase in broadband sound to 10 dBA over the ambient) in the community at night during expected regular operation. We understand that Epsilon's sound estimates include a 3 dBA margin, which recognizes the inherent uncertainties in modeling, vendor equipment, and final project design and construction. We judge that even with this margin, it would not be surprising for the facility sound to increase the overall sound level in the community by more than 10 dBA at times.*

In conclusion, we have been made aware over and over that the decision to build this plant is completely out of our hands. However, this is hard to except and extremely frustrating when a project of this magnitude will have so much negative impact on your family and community. I urge you to consider the downstream effects this choice may have on families like us and children like Oliver. Although we may not be able to say "No" directly to the construction of this power plant, you do have the power to "Deny" the permit to construct this facility. Thank you for your time and consideration.

Adam & Sara Houser

14 Little Tree Road

Medway, MA

HOUSER, ADAM & SARA (HOU)

HOU 01 **I am writing to urge you to put the environment and well-being of the people this plant will impact ahead of corporate financial greed. …**

The Proponent notes the thoughts and comments provided in this letter.

Patel, Purvi (EEA)

SHE 01

From:	Richard Shepard [richardhshepard@gmail.com]
Sent:	Wednesday, October 14, 2015 7:38 PM
To:	Patel, Purvi (EEA)
Subject:	Proposed Excelon Power Plant Expansion in Medway

Dear Ms. Patel:

I am a Medway resident and I am writing today to express my support and endorsement for the proposed expansion of the Excelon Peaker plant in Medway.

I currently work in the utility industry as a project manager and I have experienced first hand the impact of misinformation and fact bending that occurs with a public proposal. I have read through the proposed plan as well as the arguments and I feel strongly that the plan is sound and is the right choice for Medway. The "not in my back yard" arguments from the opposition just don't make sense.

I live less than 2 miles from the site and have never been aware of the existing facility. In fact, I would venture that the vast majority of residents have no idea that there is a power generating facility on the site. Excelon has been an excellent member of the community for many years and Medway has benefited greatly from the tax revenue.

I strongly urge you to support the plan as well in that it makes sense and as older more intrusive power generation plants are retired, it's necessary to replace the loss of power with highly efficient plants as is proposed in Medway. We rely on electricity every minute of every day. This proposal adds low environmental impact capacity to an ever increasingly stressed power grid and has the added benefit of infusing much needed revenue into our town finances.

Sincerely

Rich Shepard
26 Hooksett Cir.
Medway MA

SHEPARD, RICHARD (SHE)

SHE 01 **I am a Medway resident and I am writing today to express my support and endorsement for the proposed expansion of the Excelon Peaker plant in Medway. …**

The Proponent appreciates this statement of support.

Circulation List

Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, 9th Floor
Boston, MA 02114

Massachusetts Department of Environmental Protection
Commissioner's Office
Attn: MEPA Coordinator
One Winter Street
Boston, MA 02108

Massachusetts Department of Environmental Protection
Central Regional Office
Attn: MEPA Coordinator
8 New Bond Street
Worcester, MA 01606

Massachusetts Department of Environmental Protection
Central Regional Office
Attn: Steve Majkut
8 New Bond Street
Worcester, MA 01606

Massachusetts Department of Energy Resources
Attn: John Ballam
100 Cambridge Street, Suite 1020
Boston, MA 02114

Massachusetts Energy Facilities Siting Board
One South Station, 5th Floor
Boston, MA 02110

Massachusetts Department of Public Safety
State Fire Marshal
1 State Road
Stow, MA 01775

Medway Board of Health/Sewer Department
155 Village Street
Medway, MA 02053

Medway Board of Selectmen
Attn: John Foresto
155 Village Street
Medway, MA 02053

Medway Board of Selectmen
Attn: Maryjane White
155 Village Street
Medway, MA 02053

Medway Board of Selectmen
Attn: Richard D'Innocenzo
155 Village Street
Medway, MA 02053

Medway Board of Selectmen
Attn: Glenn Trindade
155 Village Street
Medway, MA 02053

Medway Board of Selectmen
Attn: Dennis Crowley
155 Village Street
Medway, MA 02053

Medway Conservation Commission
Attn: Bridget Graziano, Agent
155 Village Street
Medway, MA 02053

Medway Fire Department
44 Milford Street
Medway, MA 02053

Medway Inspectional Services Department
Attn: Jack Mee, Building Commissioner
155 Village Street
Medway, MA 02053

Medway Planning and Economic Development Board
155 Village Street
Medway, MA 02053

Medway Town Administrator
Attn: Michael Boynton
155 Village Street
Medway, MA 02053

Medway Water Department/Department of Public Services
Attn: Thomas Holder, Director
155 Village Street
Medway, MA 02053

Medway Zoning Board of Appeals
155 Village Street
Medway, MA 02053

Millis Town Administrator
Attn: Charles Aspinwall
900 Main Street, Room 220
Veterans Memorial Building
Millis, MA 02054

Millis Public Works Department
Attn: James McKay
900 Main Street, Room 204
Veterans Memorial Building
Millis, MA 02054

Conservation Law Foundation
62 Summer Street
Boston, MA 02110

Charles River Watershed Association
190 Park Road
Weston, MA 02493

Bellingham Public Library
100 Blackstone Street
Bellingham, MA 02019

Franklin Public Library
118 Main Street
Franklin, MA 02038

Medway Public Library
26 High Street
Medway, MA 02053

Milford Town Library
80 Spruce Street
Milford, MA 01757

Millis Public Library
961 Main Street
Millis, MA 02054

Brian Adams
beadams11@verizon.net

Jeffrey Cahill
jav276@wildcats.unh.edu

Adam & Sara Houser
housers@gmail.com

Richard Shepard
richardhshepard@gmail.com

Technical Appendix A

Town of Medway Consultant Review

Understanding the Proposed Exelon Expansion

A Review by the Town of Medway

Presentation Overview

- Site History and Present Operation
- Facility & Impacts
  - What is a Peaking Power Plant?
  - Proposed Expansion Project
  - Required Approvals
  - Air Quality - Presented by Air Quality Associates
  - Noise - Presented by Acentech
  - Water - Presented by Kleinfelder Associates
  - Environmental
  - Property Values
  - Traffic
- Financial Benefits
- Next Steps
- Questions and Answers

Site History and Present Operation

- Property is approximately 94 acres
  - Eversource operates 2 substations and a natural gas interconnection are located on the property (approx. 54 acres)
- Existing 135 MW oil-fired facility is sited on 5 acres which has been in operation since 1970
- The 3 peaking units, fueled by oil, were installed by Boston Edison following the 1965 East Coast blackout
- Previously owned and operated by Sithe West Medway Development LLC as a peaker plant

Site History and Present Operation

- Sithe received approval from the Massachusetts Energy Facilities Siting Board (“EFSB”) to construct a **540 MW** facility, but it was never constructed
- Town approved HCA and PILOT Agreements with Sithe at that time
- Exelon purchased the West Medway station in 2002
- With a combined capacity of 135 MW, units operate during periods of peak demand
- The existing units have operated for less than 80 hours on an annual basis over the last 5 years

How did we get here?

- Notified November 2014 of Exelon's interest in expansion
- Met with Town officials mid-winter
- Reviewed existing site and conceptual plans
- Town reviewed process following EFSB filing including meeting with department heads
- Hired independent professional consultants and filed for Intervenor Status following EFSB public hearing in June 2015
- Engaged services of specialized legal team to review Town options
- Commenced negotiations on HCA and PILOT to protect Town interests

Facility & Impacts

What is a Peaking Power Plant? – Glenn Walker

- Peaking power plants, aka peaker plants, are generally run only when there is a high need for electricity during periods of substantial peak energy demand.

- Peaking power plants, using combustion turbines, are typically quick-start and burn natural gas and limited amounts of oil.

- Peaking power plants are used in combination with renewable resources and other more highly utilized power plants to supply a dependable and consistent amount of electricity.

Proposed Expansion Project – Glenn Walker

- Expansion of existing site by adding two additional generating units
  - Highly efficient, fast-starting 200 MW generators & associated structures and systems
  - Run primarily on natural gas with ultra low sulfur diesel (ULSD) oil as a back up
  - Proposed turbines will be equipped with advanced emissions control and are cleaner, quieter and more efficient than existing units
  - Two (2) 160-foot tall stacks

Proposed Expansion Project

- Is required to meet all state and federal emission regulations

- Seeking authorization to operate at a 3yr average capacity factor of 43% (maximum of 3,767 hours); and no more than a maximum of 5,256 hours of operation in a single year on gas (60% capacity)
  - Per the DEIR, Exelon projects to run 10 dys/yr on Ultra Low Sulfur Diesel oil (improvement over initial EFSB petition)

- Shrewsbury Peaker Plant is permitted for up to 1,000 hours/year but only runs an average of 69 hours/year since 2011

Required Approvals – Michael Ernst, Esq.

- Environmental Attorney with Bachelor of Sciences degree

- 30 Years Energy Experience, including
  - Union of Concerned Scientists
  - MASSPIRG Safe Energy Advocate
  - Counsel to Mass. Legislature's Joint Committee on Energy
  - General Counsel, Mass. Department of Public Utilities
  - Director of Regulatory Affairs, Tetra Tech (#1 Wind Consultant in U.S.)

- Former Energy Facilities Siting Board Hearing Officer

Required Approvals

FEDERAL

- U S Army Corps of Engineers: Section 404 General Permit for Wetlands Impacts
- Environmental Protection Agency: National Pollutant Discharge Elimination System ("NPDES") General Permit for Discharges from Construction Activities
- Federal Aviation Administration: FAA Form 7560-1 Notice of Proposed Construction or Alteration for Construction Cranes

STATE

- MA Energy Facilities Siting Board: Approval of Petition to Construct; Zoning Exemptions
- Executive Office of Energy and Environmental Affairs: MEPA Certificate
- Massachusetts Department of Environmental Protection (MassDEP):
  - Major Comprehensive Air Plan Approval
  - Prevention of Significant Deterioration ("PSD") Permit
  - Title V Air Operating Permit
- Department of Public Safety: State Fire Marshal Construction and Use Permits (oil & ammonia tanks)

Required Approvals

LOCAL

- Medway Planning and Economic Development Board: Site Plan Review
- Medway Zoning Board of Appeals: Variances (zoning exemptions filed)
- Medway Conservation Commission:
  - Wetlands Protection Act Order of Conditions
  - Abbreviated Notice of Resource Area Determination ("ANRAD")
- Medway Inspectional Services Department: Building and Demolition Permits
- Medway Water Department: Water Service Permit
- Medway Board of Health/Sewer Department: Sewer Service Permit
- Medway Fire Department:
  - Storage Tank Permit
  - Flammable/Combustible Storage Permit

Required Approvals

Energy Facilities Siting Board

- Certificate of Environmental Compatibility & Public Need
  - Lead State Permitting Agency coordinating other state approvals
  - EFSB Approval Pre-condition to all other state approvals
- Local Zoning Exemptions
  - EFSB May authorize exemptions from local zoning restrictions (e.g. stack height)
- Composite Certificate may Override Local Authorities
  - The Siting Board, upon request, has granted a Certificate in the form of a composite of all individual permits, approvals or authorizations which would otherwise be necessary for the construction and operation of the facility and acts in the place of the other permits.
  - The Cape Wind Decision stated “no agency shall require any approval, consent, permit, certificate or condition for the construction, operation, or maintenance of the project. No agency shall impose or enforce any law, ordinance, by-law, rule or regulation nor take any action nor fail to take any action which could delay or prevent construction, operation, or maintenance of the project.” Cape Wind Associates, LLC, EFSB 07-8 (2009).

MA Energy Facilities Siting Board Options

Siting Board is state agency responsible for managing power plant permitting process

- Project Opposition Considerations
  - If Town refuses to issue required local permits, Exelon will seek Siting Board override of local permits
  - Siting Board has never rejected a Petition to Construct a power plant
- Negotiate Best Mitigation and Compensation Agreement
  - Town submitted 57 questions and requests to Exelon to mitigate impacts in Medway
  - Exelon responded by agreeing to:
    - Oil combustion fee of $1000/hour (First Local Oil Fee in Nation)
    - Reduce oil combustion authorization from 60 days to projected operation of 10 days/year
    - Establish Property Value Fund to reimburse neighbors for property value loss up to $25,000
    - Allow Town expert to help design noise testing protocol and witness noise testing
    - Negotiate offsite screening with neighbors to reduce visual impacts
    - Town participation in development of:
      - Traffic Management Plan
      - Construction Management Plan
      - Community Outreach Plan

Air Quality – Lynne Santos, P.E.

- Independent air quality engineering consultant
- Over 20 years experience with air quality permitting and analyses
- Assisted citizens groups in past (Westford & Billerica)

- Reviewed the air permit application
  - Proposed air pollution controls
  - Air impact analysis
  - Compliance with current regulations and guidelines

- Air Quality Considerations in Permitting Process
  - Local – Particulates and Nitrogen Dioxide
  - Global – Carbon Dioxide: 695,875 tons

Air Quality – Pollution Control

- Best Available Control Technology (BACT)
  - Particulate Matter, Carbon Monoxide, Volatile Organic Compounds, Sulfur Dioxide and Sulfuric Acid Mist
  - Greenhouse Gases (Carbon Dioxide)
- Lowest Achievable Emission Rate (LAER)
  - Nitrogen Oxides
- MassDEP will require Stack emission testing to confirm emission rates
  - Stack testing of emissions is industry standard for power plants and represents best method of monitoring emissions
- Continuous Emissions Monitoring System 24/7 of Nitrogen Oxides and Carbon Monoxide
- Agree that proposed control technology represents BACT/LAER

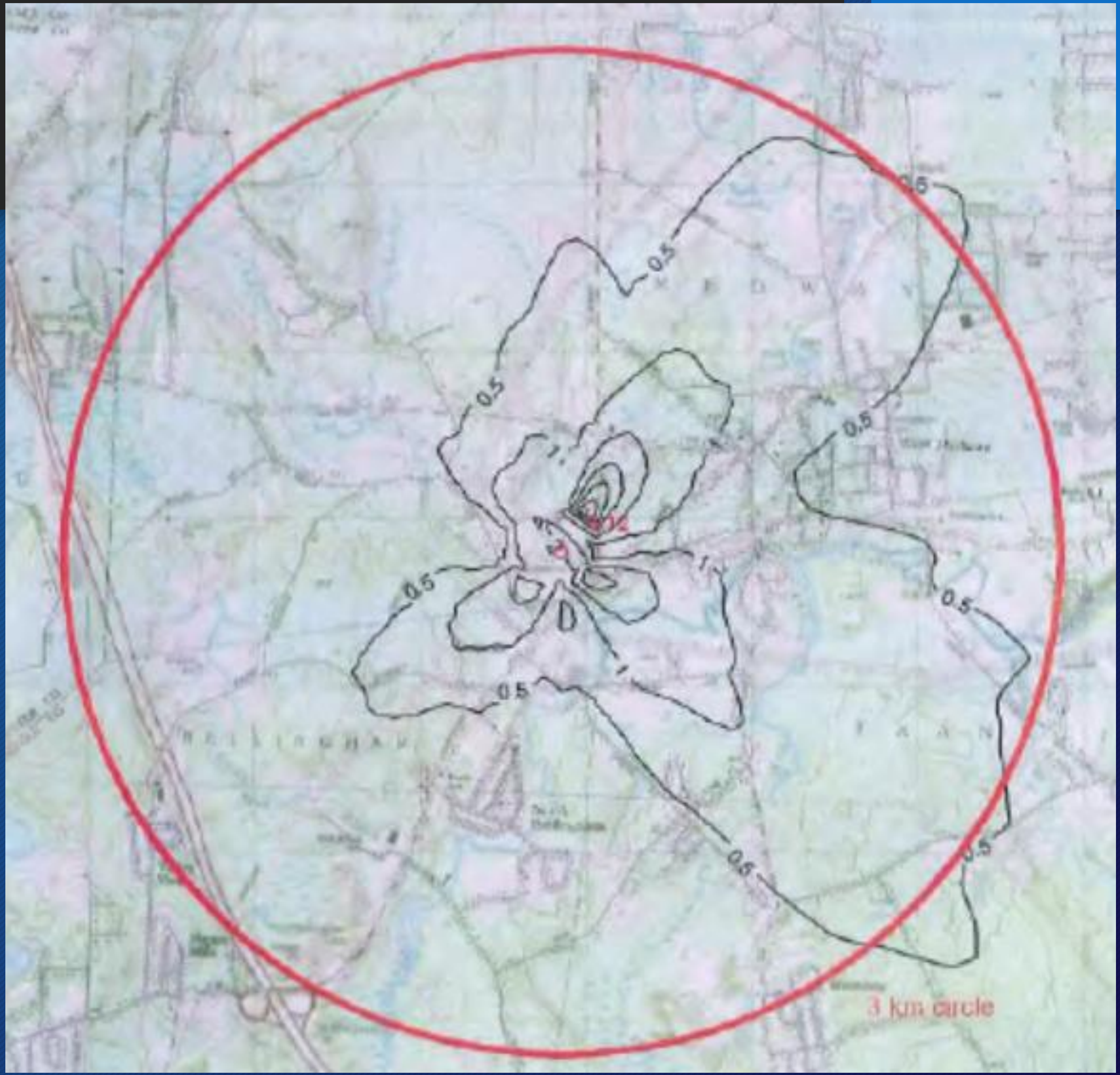
Air Quality – Air Dispersion Modeling

- Primary way to determine impacts and compliance with ambient standards
- US EPA computer-based model used – has been validated against field data
- 5 years of local meteorological data
- Emission rates modeled are the maximum possible 24 hours per day
- All turbines running (except existing turbines shut off at night)
- Existing Background Sources Included (ANP Bellingham, etc.)
- Concentrations calculated at 6,000 locations around Medway and surrounding towns
- Existing monitored background from Worcester added
- Modeling performed in accordance with both US EPA and MassDEP guidelines and shows compliance with standards.

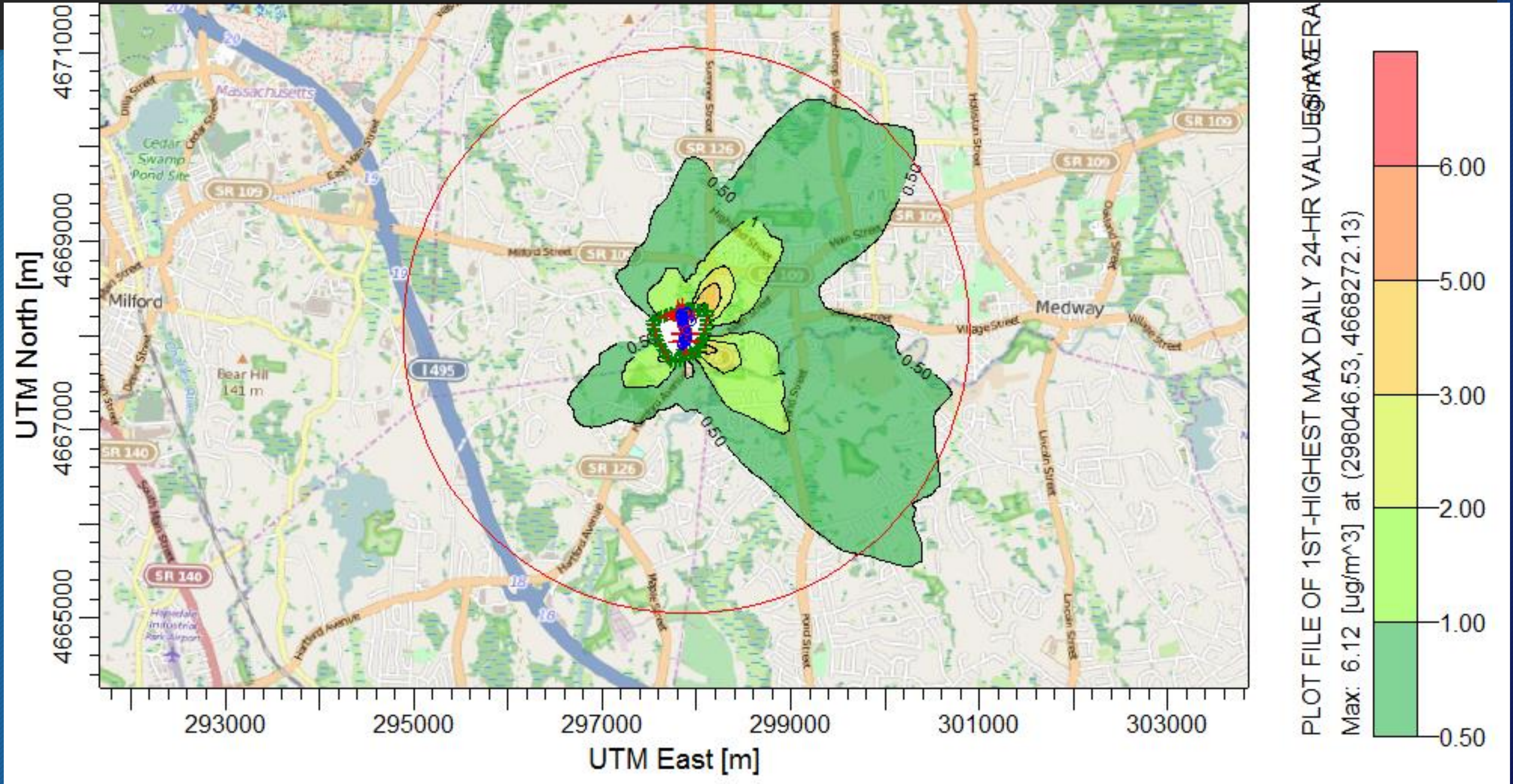
PM2.5 24Hr Concentration ($\mu g/m^3$)

- Background: 20.7
- Standard: 35
- Max modeled: 6.12
- Plot shows max modeled – average of maximum impact day for each of 5 years

- Red circle = 3km scale



Air Quality – 24-hr $PM_{2.5}$ (New Plant Only)



Noise – James Barnes, PE F-INCE USA

- Noise Study reviewed applicable project noise criteria, baseline ambient sound measurements in the community, computer modeling for both the existing equipment and proposed project.
  - 7 study locations were selected around and nearby the site

- Studied comparisons of both existing and estimated proposed new facility sound levels with measured daytime and nighttime ambient background levels.

- Proposed project will incorporate at least $16 million of noise mitigation measures in both the proposed and existing facilities including the purchase of reduced noise equipment, and installation of muffler, lined duct, enclosure, and lagging treatments plus 3 sound wall barriers up to 55 feet tall.

Noise

- Results of the analysis indicate that with substantial mitigation measures, the sound of the proposed new equipment would comply with the applicable noise criteria during both daytime and nighttime hours, and that the combined sound from the existing and new equipment would comply with the applicable noise criteria during daytime hours only (Exelon has agreed not to operate existing and new turbines at night except when directed during an emergency).

- Exelon agrees that Town expert can help design and participate in post-construction noise testing.

- Plant sound will be audible at times in the surrounding neighborhood closest to the facility during plant operation during both daytime and nighttime periods.

Noise

- The noise created by the new turbines will be similar to the existing turbines; Town officials have not received any recent complaints about existing plant noise.

- The new facility sound levels estimated by consultants at the closest residences are only slightly higher than the measured daytime background sound levels and are greater than the nighttime background levels.

- Projected noise levels during the day and night of 45 dBA and 43 dBA are less than the noise created by "light auto traffic" at 100 feet, which is about 50 dBA.

- How noticeable the plant sound will be to a person in the neighborhood will depend on many factors at the time, including the number of units in operation, meteorological conditions (particularly wind direction), ambient sound levels, person’s location (e.g., indoor or outdoor), and person’s activity (e.g., reading, riding bike).

Water – Kirsten Ryan, P.G.

Town retained Kleinfelder to assess Medway's water system capacity and ability to provide 50,000 gallons per day to Exelon from the Town's system:

- Under current State Permit Medway is allowed to pump 920,000 gpd.
- With recent major leak repairs, Medway is currently pumping about 860,000 gpd.
- New developments already planned in Medway will increase demand for water.
- Demand is projected to exceed both Medway's Permit limit and actual pumping ability.

Water

- Medway has water production and treatment challenges that need to be addressed in order to meet future demands:
  - The Oakland Well has high levels of iron and manganese; only pumped when necessary during very high spikes in demand in summer.
  - A treatment plant to remove iron and manganese is needed in order to fully utilize Oakland Well.
  - The Populatic Well originally pumped 600 gallons per minute, now pumps 400 gpm.
  - More water could most likely be pumped from the Populatic Well site by satellite wells.

➢ Medway decided it <u>will not</u> provide water from its wells to Exelon.

➢ Exelon plans to seek water from Millis.

Water

Exelon Water Needs and Sources:

Exelon Water Needs	Gallons Per day
Average daily use, maximum year, 60% capacity	95,206
Typical expected use, 33% capacity	51,900

Exelon Water Sources Proposed	Gallons Per day
Exelon Bedrock Well, 500 ft deep	51,840
Supply from Millis	as needed up to 40,000 (excess demand to be made up by on-site storage tank 450,000 gal)

- **Exelon well will not require state permit**

Water

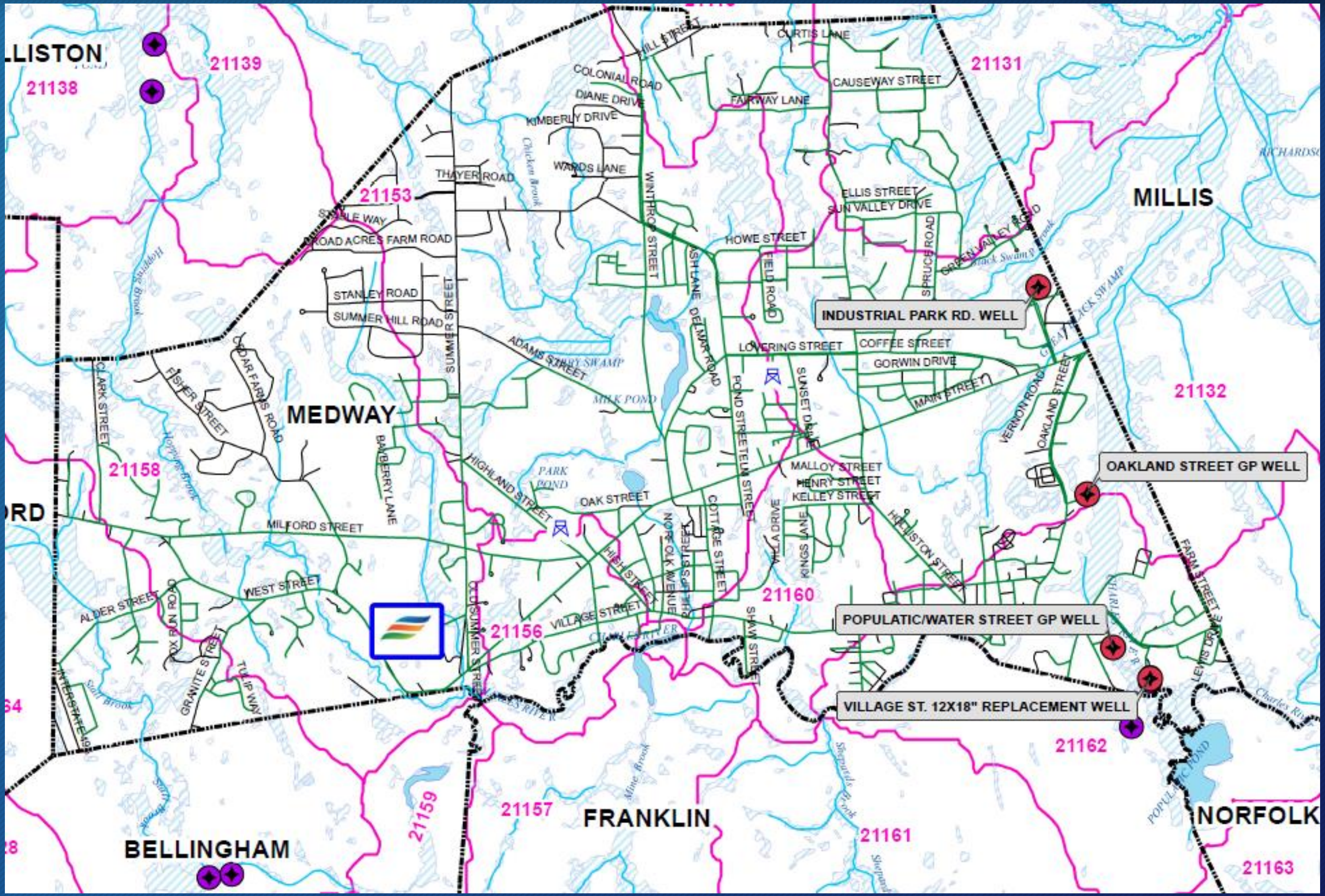
Impacts from 500-ft deep Exelon Bedrock Well?

- Medway Town wells
  - 3 miles east of Exelon
  - Different aquifer system (sand and gravel; 50 to 75 feet deep)
  - ➢ No impact

- Pumping test showed no impacts on monitoring wells within 800 to 1600 feet

- Medway BOH reviewing private well locations with MassDEP
  - ➢ No impacts expected on private wells

Water



MEDWAY
MILLIS
FRANKLIN
BELLINGHAM
NORFOLK
INDUSTRIAL PARK RD. WELL
OAKLAND STREET GP WELL
POPULATIC/WATER STREET GP WELL
VILLAGE ST. 12X18" REPLACEMENT WELL
21131
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21163

Water

Supply From Millis to Exelon

- Millis has capacity under it's Permit to provide water
- Water would be transported via Medway's water mains
- Study about to begin
- Full evaluation of impacts or improvements needed

➢ Initiate discussions with Millis and MassDEP about potential water purchase by Exelon and transfer through Medway.

Exelon will pay for all costs relating to any improvements needed as per Host Community Agreement.

Environmental

- Environmental Monitoring Plan – BOH Oversight
  - Annually in October, Exelon representatives will meet with the Medway Health Agent and safety officials to review environmental and safety performance of the prior 12 month period

- MassDEP maintains a list of sites that have had reportable releases. According to this list, there are four Release Tracking Numbers ("RTNs") associated with the property.
  - Reportable releases were under the ownership of Boston Edison
  - Three of the four RTNs are PERMANENTLY CLOSED
  - The fourth RTN has achieved a Temporary Solution
    - MA DEP receives semi-annual status reports; last report received on 9/29/15

Environmental

- The Town discourages the use of fuel oil.
- In response, Exelon has proposed to limit is use of ULSD fuel oil to no more than 30 days or 720 hours per year (per DEIR, this may reduce to 10 days/240 hours).
- In any such instance (except under certain circumstances), Exelon shall pay to the Town a sum of one thousand dollars ($1,000) per hour of electricity actually generated from oil burning during such operations.
- Any funds received by the Town may be used by the Town for open space, recreation, conservation, and general municipal purposes.
- Exelon will provide to the Town copies of the quarterly and annual reports regarding the burning of fuel oil that Exelon is required to file with DEP, within ten (10) business days of such filings.

Environmental cont'd…

- Decommissioning Plan:
  - Exelon shall decommission and remove the Facility following the end of all use and/or operations at their expense in accordance with all applicable laws and procedures (includes restoration of the Site)
  - Within 30 days of the Commercial Operation Date of the Facility, Exelon will provide to the Town financial assurance in the amount of $2 million dollars for the decommissioning and removal of the facility after all use has permanently ceased
  - Exelon will provide to the Town a copy of its decommissioning plan submitted in connection with permitting or approval of the Project
  - Exelon will provide the Town with at least 180 days written notice prior to any decommissioning of the Plant or the Facility

Property Values

- 55 Homes within 300 feet of Facility

- Exelon has agreed in the Host Community Agreement to establish a fund to reimburse the owner of any residential property near the facility boundary if the property owner can demonstrate a loss of property value due to the new facilities.

- The fund will reimburse owners of residences within 300 feet of the site boundary up to $25,000 if the Board of Assessor's confirms a diminution of property value within 5 years of the commencement of construction.

- ANP Power Plant has a similar fund; one claim made and it was unfounded. No loss of property values ever identified due to plant.

Traffic

- Traffic Management Plan to be approved by Medway Town officials
- All heavy truck traffic to access the Facility via Hartford Avenue to Summer Street.
- Oil truck deliveries will not be scheduled during morning or evening rush hours.
- Per the Host Community Agreement:
  - Exelon will utilize Medway police officers as directed by the Town during construction.
  - Following construction of the Project, Exelon will repair any damage to Summer Street, West Street, and Main Street (portion) caused by construction of the Project.
  - Exelon will coordinate with the Medway and Bellingham Chiefs of Police and Public Works regarding transportation of oversized deliveries.

Financial Benefits

Revenue Summary

- $73 million in property taxes
  (Year 1 = $3.8 million)
- $2.75 million in building permit fees (estimated permit cost)
- $2.2 million in CPA
- $650,000 for a Foam Firefighting Vehicle
- $400,000 for Energy Conservation Awareness ($20K/yr for 20 yrs)
- $300,000 for First Responder Training ($15K/yr for 20yrs)
- $100,000 for a Dry-Chemical Fire Vehicle
- $100,000 for Legal & Technical Services Reimbursement
- $50,000 for Emergency Management Fund
- $28,000 for Water System Study Reimbursement

Estimated total = $79.1 million

Potential Allocation of Revenue

- $1 million/year investment for roads & sidewalks
- Facility Replacement Financing (ex: DPS Facility)
- Debt Reduction & Financial Stability programming
- Possible reduction/elimination of fees (including trash fees)

Potential Allocation of Revenue

- Operations Support & Enhancement:
  - Medway Public Schools
  - Public Safety
  - Parks & Recreation
  - Medway Library
  - Facility Maintenance
  - Open Space Preservation & Maintenance

- Upgrades and enhancements of playground equipment

- Enhancement of Medway capital and infrastructure improvement plan

Next Steps

- Energy Facilities Siting Board
  - Hearings held in December
  - Continuation of Permitting Process through 2^{nd} Quarter of 2016
- Local Permits
  - Filing dates to be determined

Town’s involvement is not done!

We will continue to monitor each and every step of the permitting process for the proposed project to protect the best interests of the community.

Technical Appendix B

(Draft) Pilot Agreement

PAYMENT IN LIEU OF TAXES AGREEMENT

This Payment in Lieu of Taxes Agreement ("PILOT") is made as of the ___ day of [month], 2016, by and between the Town of Medway, a municipal corporation and body politic of the Commonwealth of Massachusetts (the "Town"), and Exelon West Medway II, LLC, a Delaware limited liability company ("Exelon") having offices at 300 Exelon Way, Kennett Square, Pennsylvania 19348, each individually a "Party" and collectively, the "Parties."

WITNESSETH:

WHEREAS, an affiliate of Exelon owns 94± acres of real property located in the Town as depicted on Exhibit A attached hereto and incorporated herein by reference (the "Site");

WHEREAS, an affiliate of Exelon owns existing real and personal property comprised of six pairs of Rolls Royce Avon combustion turbines and associated appurtenances with a total capacity of 173± megawatts ("MW") of energy (the "Existing Facility") on the Site;

WHEREAS, Exelon is developing two new dual fueled generating units capable of producing 200± MW of energy (the "New Facility") on the Site;

WHEREAS, Exelon will be subject to certain local taxes in connection with its ownership of the real and personal property related to the New Facility;

WHEREAS, Exelon and the Town agree that having an accurate projection of their respective property tax expenses and revenues with respect to the New Facility is essential to the development of the New Facility, provides long-term revenue certainty for the Town and is in their mutual best interests;

WHEREAS, G.L. c. 59 §38H authorizes the Town to enter into an agreement for a negotiated payment in lieu of taxes imposed on real and personal property;

WHEREAS, Exelon and the Town acknowledge that a comprehensive agreement for payments in lieu of taxes under the authority of G.L. c. 59, §38H fixing and maintaining mutually acceptable payments based on reasonable and accurate fair cash values for all real and personal property associated with the New Facility for twenty (20) years commencing with commercial operations of the New Facility is appropriate and serves their respective interests; and

WHEREAS, Exelon and the Town have reached this PILOT as a result of good faith negotiations so that Exelon's payments to the Town shall be the equivalent of the property tax obligations which would otherwise be owed to the Town by Exelon during the term of this PILOT based on full and fair cash valuation.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein and other good and valuable consideration, the receipt and sufficiency of which hereby are acknowledged, the Parties do hereby covenant and agree as follows:

1. Property to be Taxed. The real and personal property that comprises the New Facility to be owned by Exelon which shall be taxed subject to the terms of this PILOT is described in Exhibit A attached hereto and incorporated herein by reference as the New Facility. The New Facility also shall include any material additions, improvements, repairs, replacements, modifications or other changes to the New Facility certified pursuant to Section 5 which occur after the execution of this PILOT. This PILOT covers all real and personal property taxes otherwise due for the New Facility but does not affect any payments, other than real and personal property taxes, owed by Exelon to the Town, including, but not limited to, payments due under the Host Community Agreement between the Town and Exelon dated as of October __, 2015 (the "HCA"), vehicle excise taxes, and amounts for customary services provided by the Town to Exelon and the New Facility such as water and sewer services.

The Existing Facility and the remainder of the Site will continue to be assessed and taxed pursuant to G.L. c. 59 and is not subject to this PILOT. Moreover, nothing contained in this PILOT, including, without limitation, any exhibits thereto, shall relieve Exelon, its agents or assigns, nor any other entity leasing or otherwise occupying existing Exelon properties in the Town from any payment obligations for any real or personal property related to the Existing Facility or on any property otherwise owned by Exelon, including, without limitation, all equipment and utilities appurtenant thereto and thereon. Items currently being assessed by the Town and/or the Commonwealth of Massachusetts and subject to real and/or personal property tax obligations shall continue to be subject to the same assessment and payment mechanisms in effect as of October 14, 2015 (as the same may be amended).

2. Term. This PILOT shall govern the taxation of the New Facility for twenty (20) years commencing in the year the New Facility commences commercial operations. During the construction period and prior to Commercial Operation Date, no payments will be required with respect to the work in progress. "Commercial Operation Date" or "COD" shall mean the date of initial commercial operation of the New Facility. Regular property tax payments will continue to be due on the Existing Facility.

For the purposes of this PILOT, each fiscal year shall begin on July 1 and shall end on June 30 of the following calendar year. By way of example, fiscal year 2016 means July 1, 2015 - June 30, 2016.

The initial payment hereunder shall be due in full within thirty (30) days of the sooner of the issuance of a Certificate of Occupancy for the New Facility by the Town's Building Commissioner or December 31, 2017. Thereafter, payments shall be made on a quarterly basis.

This PILOT may sooner terminate pursuant to Sections 7 and 13. Upon termination, the Town shall assess the New Facility in the normal course pursuant to G.L. c. 59.

After July 1 of the eighteenth (18th) year of this PILOT, but on or before June of the following year, the Town may notify Exelon if it desires to terminate this PILOT effective on June 30, 2038. In the event the Town exercises its rights under this Section, the Parties shall negotiate in good faith in an effort to agree upon a successor agreement to take effect at the conclusion of the twenty (20) year term. In the event the Parties are unable to reach agreement on a successor agreement, the New Facility shall be taxed on an *ad valorem* basis pursuant to G.L. c. 59.

3. PILOT Payments. The Parties agree that the respective PILOT Payments ("PILOT Payments") shall be the amounts listed below for each of the years included in the term of this PILOT in lieu of paying any other real or personal property taxes with respect to the New Facility.

YEAR	QUARTER	NEW PLANT PILOT VALUE	PILOT PAYMENT ANNUAL TOTAL	QUARTERLY PILOT PAYMENT AMOUNTS	CPA PAYMENT AMOUNT (3% of PILOT Payment) (Due September 1 Annually)
1	1	$210,000,000.00	$3,830,400.00		$114,912.00
2		$208,950,000.00	$3,811,248.00		$114,337.44
	1			$952,812.00	
	2			$952,812.00	
	3			$952,812.00	
	4			$952,812.00	
3		$207,905,250.00	$3,792,191.76		$113,765.75
	1			$948,047.94	
	2			$948,047.94	
	3			$948,047.94	
	4			$948,047.94	
4		$206,865,723.75	$3,773,230.80		$113,196.92
	1			$943,307.70	
	2			$943,307.70	
	3			$943,307.70	
	4			$943,307.70	
5		$205,831,395.13	$3,754,364.65		$112,630.94
	1			$938,591.16	
	2			$938,591.16	
	3			$938,591.16	
	4			$938,591.16	
6		$204,802,238.16	$3,735,592.82		$112,067.78
	1			$933,898.21	
	2			$933,898.21	
	3			$933,898.21	
	4			$933,898.21	
7		$203,778,226.96	$3,716,914.86		$111,507.45
	1			$929,228.71	
	2			$929,228.71	
	3			$929,228.71	
	4			$929,228.71	
8		$202,759,335.83	$3,698,330.29		$110,949.91
	1			$924,582.57	
	2			$924,582.57	
	3			$924,582.57	
	4			$924,582.57	
9		$201,745,539.15	$3,679,838.63		$110,395.16
	1			$919,959.66	
	2			$919,959.66	
	3			$919,959.66	
	4			$919,959.66	
10		$200,736,811.46	$3,661,439.44		$109,843.18
	1			$915,359.86	
	2			$915,359.86	
	3			$915,359.86	
	4			$915,359.86	
11		$199,733,127.40	$3,643,132.24		$109,293.97
	1			$910,783.06	
	2			$910,783.06	
	3			$910,783.06	
	4			$910,783.06	

12		**$198,734,461.76**	**$3,624,916.58**		**$108,747.50**
	1			**$906,229.15**	
	2			**$906,229.15**	
	3			**$906,229.15**	
	4			**$906,229.15**	
13		**$197,740,789.45**	**$3,606,792.00**		**$108,203.76**
	1			**$901,698.00**	
	2			**$901,698.00**	
	3			**$901,698.00**	
	4			**$901,698.00**	
14		**$196,752,085.50**	**$3,588,758.04**		**$107,662.74**
	1			**$897,189.51**	
	2			**$897,189.51**	
	3			**$897,189.51**	
	4			**$897,189.51**	
15		**$195,768,325.08**	**$3,570,814.25**		**$107,124.43**
	1			**$892,703.56**	
	2			**$892,703.56**	
	3			**$892,703.56**	
	4			**$892,703.56**	
16		**$194,789,483.45**	**$3,552,960.18**		**$106,588.81**
	1			**$888,240.04**	
	2			**$888,240.04**	
	3			**$888,240.04**	
	4			**$888,240.04**	
17		**$193,815,536.03**	**$3,535,195.38**		**$106,055.86**
	1			**$883,798.84**	
	2			**$883,798.84**	
	3			**$883,798.84**	
	4			**$883,798.84**	
18		**$192,846,458.35**	**$3,517,519.40**		**$105,525.58**
	1			**$879,379.85**	
	2			**$879,379.85**	
	3			**$879,379.85**	
	4			**$879,379.85**	
19		**$191,882,226.06**	**$3,499,931.80**		**$104,997.95**
	1			**$874,982.95**	
	2			**$874,982.95**	
	3			**$874,982.95**	
	4			**$874,982.95**	
20		**$190,922,814.93**	**$3,482,432.14**		**$104,472.96**
	1			**$870,608.04**	
	2			**$870,608.04**	
	3			**$870,608.04**	
	4			**$870,608.04**	
			$73,076,003.27		$2,192,280.10

Sum of PILOT and CPA Payments $75,268,283.37

Such amounts shall be paid on a quarterly basis and shall be delivered to Town of Medway Collector of Taxes, 155 Village Street, Medway, MA 02053. Such amounts shall be paid each year in accordance with the following schedule: 1st quarter due August 1st; 2nd quarter due November 1st; 3rd quarter due February 1st; 4th quarter due May 1st. Should any due date fall on a weekend or holiday, payment shall be due the first business day following such date.

4. Community Preservation Act Payments. The Parties agree that in addition to the PILOT Payments provided for herein, the Town shall be entitled to receive an additional PILOT Payment of three percent (3%) of each PILOT Payment in order to compensate the Town for Community Preservation Act payments it is entitled to receive under the Town bylaws and Massachusetts law. Such payment shall be paid annually on or before September 1st.

5. Certifications. Exelon shall send a certification to the Town within ten (10) days of the Commercial Operation Date notifying the Town of such date. Thereafter, Exelon shall submit to the Town no later than the March 1st preceding the beginning of each fiscal year covered by this PILOT an annual certification which describes any material additions, improvements, repairs, replacements, modifications, retirements or other changes that have occurred since the final completion of the New Facility or since Exelon's last annual certification, as applicable, in accordance with G.L. c. 59, §29. In each annual certification, Exelon shall designate a representative who is available to answer any questions that the Town may have regarding the information that was provided in such annual certification.

6. Adjustments. If, during the term of this PILOT, (i) the New Facility is physically unable to operate for a period of eighteen (18) consecutive months following COD due to casualty or *Force Majeure* as defined below; (ii) there is any regulatory or legal proceeding or government investigation that results in an unfavorable judgment, order, decree, stipulation or injunction that prevents Exelon from constructing or operating the New Facility; or (iii) the New Facility is taken out of service permanently, Exelon may elect to terminate this PILOT.

In the event that the annual certification submitted in accordance with Section 5 of this PILOT indicates that there have been material capital improvements to the New Facility that materially increase its nameplate capacity above 200 MW, then, within thirty (30) days of receipt of each annual certification, the Town's Principal Assessor and Exelon shall agree upon a revised future payment schedule for the New Facility reflecting a *pro rata* increase in such payments. The revised PILOT Payment schedule shall take effect for the subsequent fiscal year. In the event that the parties are unable to agree upon a revised payment schedule within such thirty (30) day period, the Parties shall resolve the dispute in accordance with Section 22 below. In the event that the dispute resolution process set forth in Section 22 is initiated, the Town shall have a limited right to audit and inspect Exelon's records during the informal negotiation stage of the process, as and to the extent provided in G.L. c. 59. The scope of such audits shall be limited to reviewing information that is reasonably necessary to ascertain the accuracy of the information provided or omitted on Exelon's most recent annual certification. Such examinations shall be made upon not less than seven (7) days' prior notice during normal business hours at the New Facility and in such manner as to not unreasonably interfere with Exelon's normal business activities. If such records are not kept at the New Facility, Exelon shall deliver (at its sole expense) copies of such records to the office of the Town's Principal Assessor. Any information provided to the Town as part of an audit shall be treated as confidential. In the event the Town requests documents or information that Exelon determines is proprietary, upon request by Exelon, the Parties will enter into a commercially reasonable confidentiality agreement in order to limit disclosure of such information.

In the event that the Town shall vote pursuant to G.L. c. 59, §21C *et seq*. to increase local property taxes for the purpose of a general override, a debt exclusion override or a capital exclusion override, the amounts due under this PILOT shall be adjusted upward proportionally to the same extent as the percentage to value increases born by taxpayers in the Town. This increase(s) shall continue for the duration of the term approved by the Town.

For the purpose of this PILOT, *Force Majeure* shall means any cause not within the reasonable control of Exelon which precludes it from carrying out, in whole or in part, its obligations under this PILOT, including, but not limited to, Acts of God; winds; hurricanes; tornadoes; extreme weather; fires; epidemics; landslides; earthquakes; floods; other natural catastrophes; strikes; lock-outs or other industrial disturbances; acts of public enemies; acts, failures to act or orders of any kind of any governmental authority acting in its regulatory or judicial capacity; insurrections; military action; war, whether or not it is declared; sabotage; riots; civil disturbances or explosions. Nothing in this provision is intended to excuse Exelon from performing due to any governmental act, failure to act, or order, where it was reasonably within Exelon's power to prevent such act, failure to act, or order. Notwithstanding anything in the PILOT to the contrary, *Force Majeure* shall not mean:

(a) Customary inclement weather (in contrast to extreme weather) affecting construction, operation, or decommissioning of the New Facility.

(b) Unavailability of equipment, repairs or parts for the New Facility, except to the extent due to a qualifying event of *Force Majeure* (whether such event affects Exelon directly or any supplier, manufacturer, shipper or warehouseman).

(c) Any nonpayment under this PILOT.

(d) Economic hardship of Exelon.

7. <u>Failure to Make Timely Payments; Right to Cure</u>. In accordance with G.L. c. 59, §57, the Town may assess penalties for late payments of PILOT Payments due under the provisions of this PILOT. The Town expressly reserves all rights available to it respecting the collection of such PILOT Payments. In the event a payment is not timely received by the Town, the Town shall issue a notice of default to Exelon and Exelon shall have thirty (30) days (the "Cure Period"; the Cure Period is not intended to modify the timing or amount of any penalties or interest that accrue under G.L. c. 59, §57, which shall be in addition to the penalty set forth below) from receipt of such notice within which to cure such default. If Exelon fails to timely cure the default, then within thirty (30) days after the end of the Cure Period, and at its sole option, the Town may declare this PILOT null and void, and the New Facility shall be taxed on an *ad valorem* basis pursuant to G.L. c. 59. In addition, in the event of payment default that is uncured at the end of the Cure Period and that is not the subject of a good faith dispute, Exelon shall pay a late fee of one thousand dollars ($1,000) per day for each day that any payment under

this PILOT is due, provided, however, that no more than twenty-five thousand dollars ($25,000) shall be due and owing for each instance of late payment or nonpayment. Interest shall also accrue on all late payments in accordance with G.L. c. 59, §57.

8. Mutual Benefits. The Parties acknowledge that this PILOT is the result of good faith negotiations between the Parties and extensive efforts to determine the fair cash value of the New Facility and is fair and beneficial to them because it resolves all issues regarding taxation of the New Facility, avoiding substantial litigation cost and uncertainty. The Town acknowledges that this PILOT is beneficial to it because it will result in steady, predictable, and reasonable PILOT Payments from the New Facility. Exelon acknowledges that this PILOT is beneficial to it because it provides predictability and certainty with respect to taxation of the New Facility.

9. HCA. The obligations under this PILOT are completely severable from the obligations of the Parties under the HCA. A default under this PILOT shall not be considered a default under the HCA. A default under the HCA shall not be considered a default under this PILOT.

10. No Precedent. This PILOT is entered into in good faith to resolve future disputes and to achieve predictability and economic stability for both Parties by establishing a schedule of PILOT Payments based on reasonable, accurate, and reliable fair cash values for the New Facility. Accordingly, Exelon and the Town agree that neither Party shall seek to use the PILOT Payments agreed to under this PILOT in any future proceedings regarding the value of the New Facility in the Town (except for disputes related to this PILOT) or in any other proceeding regarding the value of any other Exelon property, including the Existing Facility.

11. Advice of Counsel. The Parties have entered into this PILOT only after full and due consideration thereof and with the advice of their counsel and of their independent consultants.

12. Conditions Precedent. The obligations of the Parties under this PILOT are conditioned on (i) approval of this PILOT by the Town acting by Town Meeting; (ii) the Town promptly submitting this PILOT to the Massachusetts Department of Revenue ("DOR") and DOR approving this PILOT in writing within thirty (30) days of receipt; and (iii) the achievement of the Commercial Operation Date. In the event that DOR objects to this PILOT, this PILOT shall become null and void and of no further effect unless otherwise agreed by the Parties in writing.

13. Change in Law.

(a) Exelon and the Town hereby stipulate and agree that no portion of this PILOT shall be enforceable, and the PILOT shall terminate if a court of competent jurisdiction or a Massachusetts State agency having applicable jurisdiction has determined or declared any material portion of this PILOT to be illegal, void, or unenforceable, such determination or declaration materially alters the economic benefits and burdens of the Parties, and such determination or declaration is not subject to further appeal by either Party.

(b) Exelon and the Town hereby stipulate and agree that no portion of this PILOT shall be enforceable, and the PILOT shall terminate if the Massachusetts General Court abolishes an *ad valorem* tax on property used for the production of electricity.

(c) In the event that the Massachusetts General Court enacts another means of taxation or assessment in addition to *ad valorem* taxation applicable to the New Facility during the term of the PILOT, the PILOT Payments due under the PILOT shall be reduced each year by the amount of such taxes or assessments actually paid by Exelon.

14. Renegotiation Obligations. Exelon and the Town agree that in the event this PILOT terminates pursuant to the provisions of Section 13 of this PILOT, and that such event does not occur through the direct fault of either Party, that the Parties will in good faith attempt to negotiate a new agreement which will seek to accomplish and implement the objectives and purposes of this PILOT for the same term as is addressed by this PILOT.

15. Exelon's Representations and Warranties. Exelon hereby makes the following representations and warranties to the Town:

(a) Exelon West Medway II, LLC, is a Delaware limited liability company, validly existing and in good standing under the laws of the state of Delaware and each has the full power and authority to carry on its business as it is now being conducted.

(b) This PILOT constitutes the legal, valid and binding obligation of Exelon enforceable in accordance with its terms, except to the extent that the enforceability may be limited by applicable bankruptcy, insolvency or other laws affecting other enforcement of creditors' rights generally or by general equitable principles. Exelon has taken all necessary action to authorize and approve the execution and delivery of this PILOT.

(c) To the best of Exelon's knowledge, none of the documents or information furnished by or on behalf of Exelon to the Town in connection with negotiation and execution of this PILOT contains any untrue statement of a material fact or omits to state any material fact required to be stated therein or necessary to make the statements contained herein or therein, in the light of the circumstances in which they were made, not misleading.

(d) The person executing this PILOT on behalf of Exelon has the full power and authority to bind it to each and every provision of this PILOT.

16. Town's Representations and Warranties. The Town hereby makes the following representations and warranties to Exelon:

(a) The Town is a municipal corporation and body politic of the Commonwealth of Massachusetts.

(b) Subject to satisfaction of the conditions precedent in Section 12, this PILOT constitutes the legal, valid and binding obligation of the Town enforceable in accordance with its terms. The Town will take all necessary action to authorize and approve the execution and delivery of this PILOT.

(c) The person executing this PILOT on behalf of the Town has the full power and authority to bind it to each and every provision of this PILOT.

17. Notices. All notices, demands, requests, consents or other communications required or permitted to be given or made under the PILOT shall be in writing and addressed to the following:

If to the Town:

Michael E. Boynton
Town Administrator
Medway Town Hall
155 Village Street
Medway, MA 02053
(508) 533-3200 (phone)
mboynton@townofmedway.org

with a copy to:

Barbara J. Saint Andre, Esq.
Petrini & Associates, P.C.
372 Union Avenue
Framingham, MA 01702
(508) 665-4310 (phone)
BSaintandre@petrinilaw.com

If to Exelon:

Jack Hughes
Exelon West Medway II, LLC
9 Summer Street
Medway, MA 02053
jack.hughes@exeloncorp.com
508-533-3919

with a copy to:

Todd D. Cutler, Esq.
Associate General Counsel
Exelon West Medway II, LLC
300 Exelon Way, Suite 340
Kennett Square, PA 19348
todd.cutler@exeloncorp.com
610.765.5602

Notices hereunder shall be deemed properly served: (a) by hand delivery, on the day and at the time on which delivered to the intended recipient at the address set forth in the PILOT; (b) if sent by mail, on the third business day after the day on which deposited in the United States certified or registered mail, postage prepaid, return receipt requested, addressed to the intended recipient at its address set forth in the PILOT; or (c) if by Federal Express or other reputable express mail service, on the next business day after delivery to such express mail service, addressed to the intended recipient at its address set forth in the PILOT. Notices may also be transmitted by electronic mail, provided that any notice transmitted solely by electronic mail which is not confirmed as received by the receiving Party shall be followed up by personal delivery or overnight delivery within forty-eight (48) hours. Either Party may change its address and contact person for the purposes of this Section by giving notice thereof in the manner required herein.

18. Entire and Complete Agreement; Binding Effect. This PILOT, along with the Exhibit(s) attached (or to be attached) hereto constitute the entire and complete agreement of the parties with respect to the subject matter hereof, exclusive of all prior understandings, arrangements and commitments, all of which, whether oral or written, having been merged herein, except for contemporaneous or subsequent written understandings, arrangements, or commitments signed by the parties intended to be bound thereby. This PILOT shall bind and inure to the benefit of the Parties to this PILOT and any successor or assignee acquiring an interest hereunder.

19. Survival. Termination of this PILOT for any reason shall not relieve Exelon of any obligation accrued or accruing prior to such termination, including, but not limited to, the obligations to make payments due on or before such termination as set forth in Sections 3 and 4.

20. Other Documents. Each Party promises and agrees to execute and deliver any instruments and to perform any acts which may be necessary or reasonably requested by the other Party in order to give full effect to this PILOT.

21. Governing Law. This PILOT and the rights and duties of the Parties hereunder shall be governed by and shall be construed, enforced and performed in accordance with the laws of the Commonwealth of Massachusetts without regard to principles of conflicts of law.

22. Dispute Resolution. Unless otherwise expressly provided for in this PILOT, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under this PILOT between the Town and Exelon. The Town and Exelon agree to use their respective best efforts to resolve any dispute(s) that may arise regarding this PILOT.

Any dispute that arises under or with respect to this PILOT that cannot be resolved in the daily management and implementation of this PILOT shall in the first instance be the subject of informal negotiations between representatives of Exelon and the Town Administrator of Medway, as the case may be, who shall use their respective best efforts to resolve such dispute. The period for informal negotiations shall not exceed thirty (30) days from the time the dispute arises, unless it is modified by written agreement of the Parties involved in the dispute. The dispute shall be considered to have arisen when one Party sends the other Party a written notice of dispute.

In the event that the Parties cannot resolve a dispute by informal negotiations under the preceding paragraph of this Section, the Parties agree to submit the dispute to mediation. Within fourteen (14) days following the expiration of the time period for informal negotiations, the Parties shall propose and agree upon a neutral and otherwise qualified mediator. In the event that the Parties fail to agree upon a mediator, the Parties shall request the American Arbitration Association to appoint a mediator. The period for mediation shall commence upon the appointment of the mediator and shall not exceed sixty (60) days, unless such time period is modified by written agreement of the Parties. The decision to continue mediation shall be in the sole discretion of each Party. The Parties will bear their own costs of the mediation.

In the event that the Parties cannot resolve a dispute by informal negotiations or mediation, venue for judicial enforcement shall be Norfolk County Superior Court, Dedham, Massachusetts. Notwithstanding the foregoing, injunctive relief may be sought without resorting to alternative dispute resolution to prevent irreparable harm that would be caused by a breach of this PILOT. In any such judicial action, the “Prevailing Party” shall be entitled to payment from the opposing party of its reasonable costs and fees, including but not limited to attorneys’ fees, arising from the civil action. As used herein, the phrase “Prevailing Party” shall mean the party who, in the reasonable discretion of the finder of fact, most substantially prevails in its claims or defenses in the civil action.

23. Confidentiality. The Parties understand that the Town is subject to, among other laws, the Massachusetts Public Records Act, G.L. c. 66, §10 and G.L. c. 4, §7, cl. 26, pursuant to which all documents and records made or received by the Town shall, absent an exemption or law to the contrary, constitute a public record subject to disclosure. To the extent not inconsistent with the Town’s duty set forth in the preceding sentence, if either Party or its representatives provides to the other Party or its representatives confidential information, including business plans, strategies, financial information, proprietary, patented, licensed, copyrighted or trademarked information, and/or technical information regarding the design, operation and maintenance of the facility or of a Party’s business (“Confidential Information”), the receiving Party shall protect the Confidential Information from disclosure to third parties with the same degree of care accorded its own confidential and proprietary information, but in any event not less than a commercially reasonable degree of care, and refrain from using such Confidential Information except in the negotiation and performance of this PILOT.

Notwithstanding any other provision herein, neither Party shall be required to hold confidential any information that: (i) becomes publicly available other than through the receiving Party; (ii) is required to be disclosed by a governmental authority, under all applicable laws or pursuant to a validly issued subpoena, but a receiving Party subject to any such requirement shall promptly notify the disclosing Party of such requirement; (iii) is independently developed by the receiving Party; or (iv) becomes available to the receiving Party without restriction from a third party under no obligation of confidentiality.

24. Amendments. This PILOT may only be amended or modified by a written amendment to the PILOT signed by both Parties hereto.

25. Severability. If any section, phrase or portion of the PILOT is, for any reason, held or adjudged to be invalid, illegal or unenforceable by any court of competent jurisdiction, such section, phrase, or portion so adjudged will be deemed separate, severable and independent and the remainder of the PILOT will be and remain in full force and effect and will not be invalidated or rendered illegal or unenforceable or otherwise affected by such adjudication, provided the basic purpose of the PILOT and the benefits to the Parties are not substantially impaired.

26. Headings and Captions. The headings and captions appearing in this PILOT are intended for reference only, and are not to be considered in construing the PILOT.

27. Counterparts; Scanned Copies. This PILOT may be executed in counterparts, each of which shall be deemed an original and all of which shall constitute one and the same instrument. The Parties agree that a scanned or electronically reproduced copy or image of this PILOT bearing the signatures of the Parties hereto shall be deemed an original and may be introduced or submitted in any action or proceeding as competent evidence of the execution, terms and existence of this PILOT notwithstanding the failure or inability to produce or tender an original, executed counterpart of this PILOT and without the requirement that the unavailability of such original, executed counterpart of this PILOT first be proven.

28. Waiver. No waiver by either Party hereto of any one or more defaults by the other Party in the performance of any provision of the PILOT shall operate or be construed as a waiver of any future default, whether of like or different character. No failure on the part of either Party hereto to complain of any action or non-action on the part of the other Party, no matter how long the same may continue, shall be deemed to be a waiver of any right hereunder by the Party so failing. A waiver of any of the provisions of the PILOT shall only be effective if made in writing and signed by the Party who is making such waiver.

29. Joint Workproduct. This PILOT shall be considered the workproduct of both Parties hereto, and, therefore, no rule of strict construction shall be applied against either Party.

30. Successors and Assigns. This PILOT shall be binding upon Exelon, the Town and each of their affiliates, parents, successors and permitted assigns and inure to the benefit of and be enforceable by Exelon, the Town and each of their affiliates, parents, successors and permitted assigns.

31. No Joint Venture. Nothing herein contained shall be deemed to constitute either Party a partner, agent or legal representative of the other Party or to create a joint venture, partnership, agency or any relationship between the Parties. The obligations of the Parties are

individual and not collective in nature.

32. Further Assurances. From time to time and at any time at and after the execution of the PILOT, each Party shall execute, acknowledge and deliver such documents and assurances, reasonably requested by the other and shall take any other action consistent with the terms of the PILOT that may be reasonably requested by the other for the purpose of effecting or confirming any of the transactions contemplated by the PILOT.

33. Good Faith. All rights, duties and obligations established by this PILOT shall be exercised in good faith and in a commercially reasonable manner.

34. No Limitation of Regulatory Authority. The Parties acknowledge that nothing in this PILOT shall be deemed to be an agreement by the Town to issue or cause the issuance of any permit or approval, or to limit or otherwise affect the ability of the Town or the Commonwealth of Massachusetts to fulfill its regulatory mandate or execute its regulatory powers consistent with all applicable laws.

Executed under seal as of the date first above-written.

TOWN OF MEDWAY

By: ________________________________
Name: ______________________________
Title: ______________________________

EXELON WEST MEDWAY II, LLC

By: ________________________________
Name: ______________________________
Title: ______________________________

AS TO FORM:

____
________________________, Town Counsel

EXHIBIT A

Description of New Facility

As used herein, the term “New Facility” shall include all of the following real and personal property:

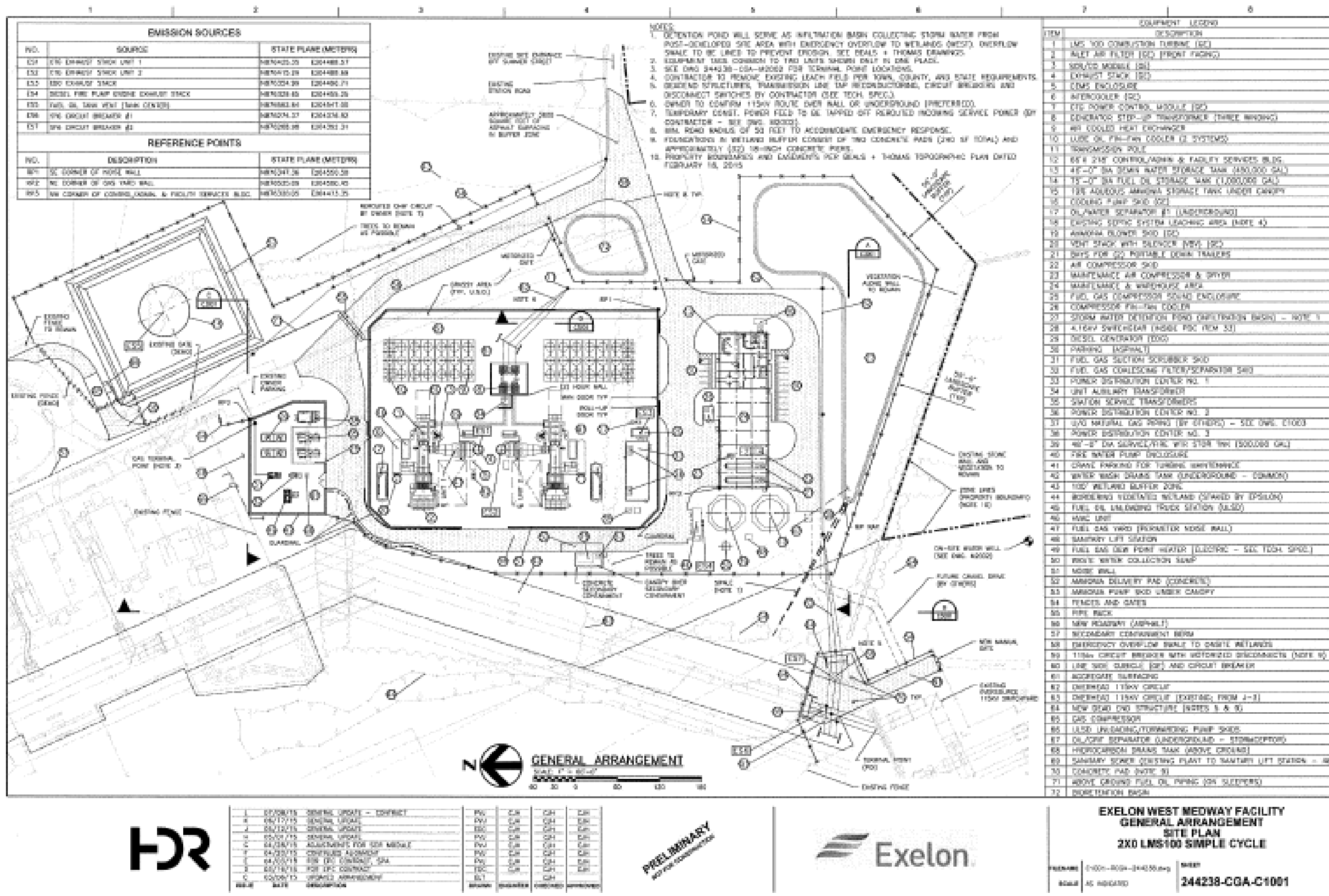
The New Facility will be located on approximately thirteen (13) acres (“Facility Site”) within the Site consisting of Medway Assessors’ Map Parcel numbers 56-005, 66-010, 66-012 and 66-013. The Facility will include two (2) GE LMS100, simple-cycle peaking electric combustion turbines (100 megawatts each) with a combined net nominal electrical output of 200 megawatts (“MW”).

The New Facility will include the following major components and structures:

- Two (2) simple-cycle GE LMS100 combustion turbine generators (“CTGs”);
- Pollution control equipment including Selective Catalytic Reduction (“SCR”) and carbon monoxide (CO) oxidation catalysts in modules downstream of each CTG;
- Two (2) 160-foot tall stacks;
- Noise walls including a 55-foot high noise wall surrounding the entire power island including air cooled heat exchangers and a localized 20-foot property-line noise barrier;
- Natural gas compressors;
- Aboveground storage tanks for ULSD, service/fire water, demineralized water and aqueous ammonia, including unloading areas;
- Transformers and electrical interconnection facilities;
- Combined building for control room, administrative and facility services, maintenance and warehouse area, water treatment area, and associated systems;
- 450 kilowatt (“kW”) emergency diesel generator;
- 147 kW emergency diesel fire pump engine;
- Gas pipeline interconnection; and
- Stormwater management system.

Please see the attached General Arrangement Plan depicting components of the New Facility.

Natural Gas for the proposed New Facility will be delivered via an interconnection to the existing Algonquin Gas Transmission Company (“AGT”) pipeline located to the northwest of the Facility Site. The new pipeline will be permitted and constructed by Exelon. Additionally, the New Facility will connect to the existing Eversource 115 kV switchyard located on the Site.



West Medway II Medway, Massachusetts

Epsilon

Figure 2-1

Site Plan and General Arrangement

Technical Appendix C

Host Community Agreement

HOST COMMUNITY AGREEMENT

This HOST COMMUNITY AGREEMENT (the "Agreement"), made and entered into as of this 13th day of October, 2015 (the "Effective Date"), by and between the Town of Medway, a municipal corporation and body politic of the Commonwealth of Massachusetts ("Medway" or the "Town") having its offices at 155 Village Street, Medway, Massachusetts 02053, and Exelon West Medway II, LLC, a Delaware limited liability company ("Exelon" or "Owner"), having offices at 300 Exelon Way, Kennett Square, Pennsylvania 19348. The Town and Exelon may be referred to herein individually as a "Party" and collectively as the "Parties."

RECITALS

WHEREAS, Medway is host community to the 94-acre West Medway Generating Station site (the "Site") on Summer Street in Medway, owned by Exelon and having a total nominal capacity of 135 megawatts ("MW") (the "Plant");

WHEREAS, Exelon has proposed to construct a new fast-starting peaking facility (the "Facility"), with two electric combustion turbines (100 MW each) with a combined net nominal electrical output of 200 MW located on a portion of the Site, as shown on Exhibit A (the "Project");

WHEREAS, Exelon has petitioned the Massachusetts Energy Facilities Siting Board (the "EFSB") for approval to construct the Project, and the EFSB has docketed the proceeding as EFSB 15-1/DPU 15-25 (the "Proceeding");

WHEREAS, Exelon has applied for or will apply for all necessary permits and approvals for the Project;

WHEREAS, Medway's technical consultants, officials, staff and legal counsel have extensively analyzed the Project and concluded that, subject to the agreements contained herein, and Exelon's strict adherence to all applicable federal, state and local permits, laws and regulations, the net result of the Project's construction and operation is consistent with preservation of the human and natural environment and will protect the interests of the Town;

WHEREAS, Medway intends, through this Agreement and through all legal powers and remedies available to it, to protect the best interests of its residents, businesses, and its corporate organization at all times to ensure that the Project is safe, efficient, and beneficial for the Medway community;

WHEREAS, Exelon is willing to make environmental, public health and public safety payments or other investments, undertake protective or mitigation measures and certain non-monetary public health and public safety measures, as set forth herein;

WHEREAS, Exelon and Medway desire to have this Agreement submitted to the EFSB and incorporated into the final decision issued by the EFSB in the Proceeding;

NOW THEREFORE, in consideration of the mutual promises and covenants of each to the other contained herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Medway and Exelon do hereby covenant and agree, as follows:

1. Recitals.

The Parties ratify, confirm and incorporate herein the above Recitals.

2. Cooperation Between Exelon and Medway.

Exelon and Medway have entered into this Agreement to foster a cooperative working relationship with respect to the Project and the Facility. Both parties agree to work constructively and in good faith with the other to promote their mutual interests and further agree to cooperate to the maximum extent consistent with their respective activities and responsibilities. The rights, duties and obligations of the Parties hereunder shall be exercised in good faith and in a commercially reasonable manner.

3. Term.

This Agreement shall commence on the date hereof and, except as otherwise provided herein, shall end on the last day of the calendar year in which Exelon last generates electricity at the Facility (the "Term"). This Agreement shall remain in full force and effect regardless of the standing and status of any other agreement and remains enforceable in full by the Parties hereto. The provisions of this Agreement that shall expressly survive termination of this Agreement are set forth in Section 26.

4. Permitting.

Exelon shall be responsible for applying for all applicable and required local permits, and shall be responsible for the payment of all permitting and inspection fees in effect at the time of application for each. Exelon shall not restrict and instead shall facilitate on-site inspections required for determining compliance with any applicable permit or approval by the appropriate Medway official during construction of the Project or operations of the Facility.

5. Independent Agreement.

It is acknowledged and agreed that this Agreement, in part and in its entirety, is and shall remain separate and distinct from any other agreements made between the Owner and the Town relative to this Project, including any tax agreement entered into between Exelon, the Medway Board of Selectmen regarding the tax valuation of the Facility, after completion of the Project. This tax agreement shall be referred to herein as the "PILOT."

6. Amount and Term of Payments.

The payments made pursuant to this Agreement shall be independent of, and are in no way dependent upon, payments to be made to the Town pursuant to the PILOT.

A. Emergency Preparedness Funds

1. Exelon shall pay to the Town each year of the Term of this Agreement the sum of fifteen thousand dollars ($15,000) for the purpose of providing fire, emergency management services, police and first responder training on responses to the Facility and adjoining parcels. The first such payment shall be due in the year in which construction of the Facility commences, on or before the date that is the later of occur of (i) thirty (30) days after the commencement of construction of the Facility and (ii) September 30th of such year; in subsequent years, such payment shall be due on or before September 30th of each year.

2. As mitigation for all fuel oil currently stored at the Plant and proposed to be stored at the Facility, Exelon shall pay to the Town the sum of six hundred and fifty thousand dollars ($650,000) for the purchase, acquisition, and equipping of a foam and structural firefighting appliance vehicle as well as the training of personnel thereon. The specific design of this vehicle shall be the responsibility of the Medway Fire Chief or his designee(s). The payment of this sum shall occur not more than sixty (60) days following the commencement of construction. In no event shall any quantity of fuel oil be stored in the Facility's new storage tank prior to delivery of the new firefighting vehicle to the Town.

3. Exelon shall provide the Town with funds to purchase a dry-chemical firefighting vehicle (such payment not to exceed one hundred thousand dollars ($100,000)), not more than thirty (30) days after the Effective Date.

4. Exelon will provide the Town with fifty thousand dollars ($50,000), not more than thirty (30) days after the Effective Date, to assist with emergency management and preparedness.

B. Environmental and Technical Review Fund

Exelon shall pay to the Town the sum of one hundred thousand dollars ($100,000) for the Town to retain independent legal, environmental, noise, and other technical consultants necessary for the Town to review all Project proposals and permit applications. This amount shall be paid to the Town not more than thirty (30) days following the Effective Date. This amount shall be independent of any fees paid to any board or commission of the Town in connection with an application for a permit or approval filed by Exelon in connection with the Project.

C. Water Analysis Fund

Exelon shall pay to the Town twenty-eight thousand dollars ($28,000) to conduct a water analysis of the Project not more than thirty (30) days after the Effective Date. The Parties also hereby acknowledge Exelon's prior payment of the sum of forty thousand dollars ($40,000) to the Town in 2014 to assist the Town in finding unaccounted-for water.

D. Property Value Security Fund

In order to provide security in the event that a party that is the owner of a residential property located within three hundred (300) feet of the boundaries of the Site prior to the date that the EFSB approves construction of the Project (an "Abutter") experiences a material reduction in the value of their home directly attributable to the Facility and can reasonably demonstrate such reduction, Exelon shall compensate such Abutter in the amount of the diminution in property value, up to a maximum of twenty-five thousand dollars ($25,000) per property. In the event that an Abutter wishes to make a claim for such compensation, it must file a claim with the Board of Assessors within five (5) years of the date of commencement of construction of the Project. The Town shall provide Exelon written notice of such claim, and Exelon and the Town shall provide the Abutter with a list of three appraisers that are mutually acceptable to the Town and Exelon. The Abutter shall select one appraiser from that list. The Abutter and Exelon shall each pay half of the cost of such independent third-party appraiser. If the appraiser's findings confirm that the Abutter has experienced an economic loss due to a material reduction in the value of their home directly attributable to the Facility, Exelon shall refund the Abutter's cost of the appraisal and shall compensate such Abutter in the amount of the diminution in property value, up to a maximum of twenty-five thousand dollars ($25,000). On or prior to the commencement of construction of the Project, a) Exelon shall establish an escrow account (the "Security Account") with a national banking institution, and shall maintain such account until the later to occur of (i) the date that is five (5) years after the commencement of construction of the Project and (ii) that date on which the last properly-filed claim under this Section has been resolved; and b) shall initially deposit $50,000 into the Security Account. Funds in the Security Account shall be used by Exelon to compensate Abutters in accordance with this Section. In the event that, at the end of any month during the term of the Security Account as set forth above, the balance of funds in the Security Account is less than $50,000, Exelon shall, on or before the 15th day of the subsequent month, deposit sufficient additional funds into the Security Account so as to restore the balance to not less than $50,000.

For the purposes of this subsection, in the event that more than one party owns an interest in such a property, all such owners with respect to a property shall collectively, and not individually, be deemed one Abutter.

E. Decommissioning

Exelon shall decommission and remove the Facility following the end of all use and/or operations of the Facility, at Exelon's sole cost and expense, in accordance with All Applicable Laws, in accordance with Good Industry Practice and in a safe and environmentally controlled process to manage long-term safety, security, and maintenance of facilities, including, without limitation, the potential dismantlement and sale of equipment and restoration of the Site. Within thirty (30) days of the date of initial commercial operation of the Facility (the "Commercial Operation Date" or "COD"), Exelon shall deliver to the Town a parental guaranty from Exelon Generation Company, LLC, in a form reasonably acceptable to the Town, in the amount of two million dollars ($2,000,000) to provide financial assurance for the decommissioning and removal of the Facility after all use of the Facility has permanently ceased. Exelon shall provide the Town a copy of any decommissioning plan it files with any Governmental Authority in connection with the permitting or approval of the Project. Exelon shall provide the Town with at least 180 days prior written notice of the decommissioning of the Plant or the Facility. This Section 6(E) shall survive the termination of this Agreement until all obligations hereunder have been fully discharged.

For purposes of this Section and this Agreement, the term "All Applicable Laws" shall mean any present and future law, act, rule, requirement, order, bylaw, ordinance, regulation, judgment, decree, or injunction of or by any Governmental Authority, ordinary or extraordinary, foreseen or unforeseen, and all licenses, permits, tariffs, and other governmental consents, which may at any time be applicable to a Party's rights and obligations hereunder, including, without limitation, the construction, operation, ownership, maintenance, repair, decommissioning and removal of the Facility. Exelon shall ensure that any subcontractors hired to perform construction of the Project shall be required to comply with All Applicable Laws and shall be adequately insured. For purposes of this Section and this Agreement, "Good Industry Practice" shall mean the practices, methods and acts (including, but not limited to, the practices, methods and acts engaged in or approved by a significant portion of the electric generation industry in the construction, operation and maintenance of generating plants similar in size and technology to the Facility) that, at a particular time, in the exercise of reasonable judgment in light of the facts known or that should have been known at the time a decision was made, would have been expected to accomplish the desired result in a manner consistent with law, regulation, reliability, safety, environmental protection, economy and expedition. Good Industry Practice is not intended to be limited to consideration of the best or any one practice, method or act, to the exclusion of all others, but rather, is intended to require the consideration of a spectrum of possible practices, methods or acts. For purposes of this Section and this Agreement, "Governmental Authority" shall mean the United States of America, the Commonwealth of Massachusetts, and any political or municipal subdivision thereof, and any agency, department, commission, board, bureau, independent electric system operator, or instrumentality of any of them, or any court or tribunal.

F. <u>Energy Conservation Awareness Fund</u>

Medway intends to implement an energy conservation awareness program. Exelon hereby agrees to work with the Town to support and sponsor such program. On or before September 30th of each year of this Agreement following the commencement of construction of the Facility, Exelon shall contribute an annual sum of twenty thousand dollars ($20,000) to the Town. The Parties acknowledge and agree that such funds may be utilized by the Medway Public Schools, the Medway Energy Committee, and the Town, for purposes related to energy conservation awareness, including, but not limited to, public awareness and education, energy efficiency expenses and programs, energy grants and support for Medway's activities as a "Green Community" approved by the Massachusetts Department of Energy Resources.

7. Facilitation of the Project.

Medway agrees to take all reasonable measures with respect to which it has legal capacity to facilitate and expedite the review of all local permits and approvals necessary to accomplish the Project and to act at all times during such review within its legal capacity. This Section is not intended to and shall not be construed to imply that the Board of Selectmen has the authority to direct the outcome of any application submitted to any independent, local permit-issuing authority nor that the Board of Selectmen has the independent or concurrent authority to issue any permits or other such approvals for the Project or the Facility.

8. Compliance with Laws.

Exelon shall ensure that the construction of the Facility and all of its operations related thereto shall conform to and comply with All Applicable Laws. In addition, Exelon and any subcontractor hired to construct the Project shall do so in accordance with Good Industry Practice.

9. Project Scheduling.

Prior to Exelon conducting any construction or construction-preparation activities, Exelon shall provide the Town with a written timetable setting forth the pre-construction, construction and completion schedule. The Parties agree to coordinate, to the greatest extent reasonably possible, construction activities for the Project. The Parties further agree to coordinate, to the extent possible, construction for the Project in concert with other road construction projects that are scheduled by the Town. Exelon shall provide notice to the Town of any material changes to the pre-construction, construction and/or completion schedule and, in case, of any delay of three (3) months or more in such schedule(s).

10. Air Quality.

Exelon shall meet all air emissions requirements imposed with respect to the Facility under its plan approvals, operating permits and licenses and under All Applicable Laws. Exelon shall comply with All Applicable Laws concerning the safe transportation, handling, use, and storage of aqueous ammonia.

Exelon shall install and maintain in-stack continuous emissions monitors ("CEMs") in compliance with the requirements of the Massachusetts Department of Environmental Protection ("DEP") and the United States Environmental Protection Agency ("EPA"). In the unlikely event that there is a lapse in compliance with any air emissions requirement, Exelon shall provide to the Board of Health of the Town copies of (i) any excess emissions reports or reports of deviations which Exelon files with either DEP or EPA, and (ii) any notice of violation or notices of non-compliance received from DEP or EPA, within ten (10) business days of filing or receipt, as applicable.

11. Water and Sewer.

A. Exelon shall be responsible for providing sufficient water to the Facility to ensure proper environmental and air quality controls are in place. It is agreed that no burden shall be placed upon the Town municipal water system in connection with Exelon's provision of water to the Project and/or Facility. The Town will cooperate with Exelon in Exelon's efforts to consider the means by which the Town's piping infrastructure may be interconnected with that of surrounding municipalities to secure alternative water supply sources for the provision of water to the Facility. Exelon shall be solely responsible for all costs associated with any system design and engineering, infrastructure upgrades, remediation for any affected town infrastructure including roads and sidewalks, or purchase of additional equipment necessary (for the Town's system or otherwise) to utilize an alternative water supply source.

Exelon shall assume responsibility for any and all costs associated with delivery of water to the Facility, including, but not limited to, interconnections (including with an adjoining community), metering, pumping, regulators, backflow systems, storage, hydrants, piping, and related equipment, designs, and legal and technical services. Further, Exelon shall be responsible for payment to the Town for any water used in excess of the metered amounts authorized as part of any interconnection agreement.

Exelon shall assume responsibility for any interconnections needed to serve the Facility and costs associated with such interconnections.

B. The Town's sanitary sewer service to Exelon during construction of the Project and operations of the Facility will solely be utilized for sanitary and facilities maintenance purposes and shall not exceed five thousand (5,000) gallons per day. Exelon shall comply with all regulations imposed by the Charles River Pollution Control District in connection therewith. Under no circumstance shall any water that has come in contact with the combustion turbines be discharged into the Town's sanitary sewer system.

C. Before initiating new withdrawals or increasing groundwater withdrawals at the Facility, Exelon shall submit to the Town copies of all submissions required of Exelon pursuant to the provisions of G.L. c. 21G and 310 C.M.R. §36.00, including, but not limited to, the following: (i) application for permit; (ii) annual statements of withdrawal; (iii) filings for five-year permit reviews; (iv) permit renewal applications; and (v) permit amendment applications. Exelon shall submit copies of the foregoing to the Town at the time these submissions are due to DEP.

12. Noise and Visual.

A. Exelon shall prepare a construction management plan (the "Construction Management Plan") to the Town as set forth herein. Exelon's activities related to construction of the Facility that generate significant noise levels shall be limited to the hours between 8:00 am and 4.00 pm Monday through Friday and Saturday between 9:00 am and 3:00 pm, except as otherwise approved by the Town.

B. Exelon shall use commercially reasonable efforts through final design and construction of the Facility to shield abutting properties from increases in noise and visual impacts. Exelon shall include all of the proposed noise and visual mitigation measures in the Facility construction contracts into the Construction Management Plan. Exelon shall accomplish this in part through plantings, berm development, and/or fencing. Exelon shall establish a noise testing protocol in the Town with DEP and the Town's designated representative, and shall use best efforts to respond to complaints received by the Town about noise from construction of the Project and/or operations of the Facility and Exelon shall undertake any and all commercially reasonable actions to address such complaints.

C. Exelon shall meet all noise limitations imposed with respect to the Facility under its operating permits, licenses and municipal permits under All Applicable Laws. Exelon shall perform noise testing as required by its operating permits and shall promptly forward the results of any required testing directly to the Town's designated representative. The Town's designated representative may witness the operation noise measurement(s). Exelon shall limit nighttime noise levels such that the combined operation of the Plant and the Facility turbines does not exceed 10 dBA above nighttime ambient levels (except when required by ISO-NE to dispatch the unit as a result of a local or regional system contingency (e.g., VAR Control or transmission reliability) or Security Constrained Unit Commitment (as such terms are defined by ISO-NE) or in case of actual gas curtailment) and comply with all applicable laws of the Commonwealth of Massachusetts and applicable by-laws of the Town, including, but not limited to, Section 7.3 (Environmental Standards) of the Zoning By-law.

D. Exelon will work with the Town to establish a visual mitigation plan to address the reasonable visual concerns of neighbors, including mitigating the visual effects of the sound buffering wall and will enhance all visual screening in existence at the Plant in accordance with All Applicable Laws.

E. Exelon will ensure that all lighting, landscaping, building and site design(s), and signage will be configured in accordance with All Applicable Laws.

F. Exelon shall cooperate with the Town and provide assistance when requested in the Town's efforts to review the noise testing and other environmental reports for the Project and Facility submitted by Exelon to a Governmental Authority.

13. Traffic Impacts.

A. Exelon agrees to develop a traffic management plan with Medway Town officials ("Traffic Management Plan") as set forth herein. All construction and operations-related heavy truck traffic shall only access the Facility via Hartford Avenue in Bellingham to Summer Street in Medway, unless otherwise identified in the Traffic Management Plan which shall be subject to the approval of the Town's Chief of Police. Oil truck deliveries will not be scheduled during morning or evening rush hours. Exelon hereby agrees to utilize Medway police details as may be required or directed by the Town during construction and operation of the Facility to ensure the safety of the surrounding area at Summer Street. During construction, any deviations from this Traffic Management Plan must be submitted for approval to the Medway Chief of Police for his approval, not to be unreasonably withheld. Exelon's use of such details in connection with construction or operation of the Facility or upon local public ways shall be subject to the rules and requirements of the Medway Chief of Police.

B. All design, construction management and operations plans related to the Facility shall comply with all applicable building, plumbing, electrical, gas, and fire safety codes of the Town and All Applicable Laws. The Medway Fire Chief shall be consulted in the development of all plans as they relate to fire safety and emergency medical requirements and his suggestions shall be incorporated into the design and operations plans for the Facility as appropriate. The Town shall include reference to the Facility and its operations as necessary in its emergency management procedures.

C. Exelon shall, following construction of the Project (but in no event later than six (6) months following completion of the construction), repair any damage to Summer Street and West Street in Medway and Main Street from the Bellingham town line to Summer Street in Medway caused by construction of the Project. Such repair shall be completed in accordance with commonly accepted standards of road construction and condition.

D. Exelon hereby agrees to coordinate with the Medway and Bellingham Chiefs of Police, the Medway Director of Public Services and the Bellingham Director of Public Works in advance of any transportation of oversized and/or overweight loads in connection with construction or operation of the Facility. If any such official, in his/her sole discretion, determines that a weight study is required prior to such transportation, Exelon shall conduct the requested study at its sole cost and expense.

14. Health and Safety.

A. Exelon hereby acknowledges that the use of fuel oil at the Facility as a power generation source/fuel is discouraged by the Town. The Town hereby acknowledges that conditions may exist where natural gas supplies are interrupted and/or not feasible and Exelon may choose to use fuel oil for limited periods of operations. Exelon will use commercially reasonable efforts to minimize the use of fuel oil and any such use of fuel oil shall comply with the requirements included in the EFSB approval for the Facility. In any such instance (except when required by ISO-NE to dispatch the unit as a result of a local or regional system contingency (e.g., VAR Control or transmission reliability) or Security Constrained Unit Commitment (as such terms are defined by ISO-NE) or in case of actual gas curtailment), Exelon shall pay to the Town a sum of five dollars ($5.00) per megawatt hour ("MWh") of electricity actually generated from oil burning during such operations. Any funds received by the Town pursuant to this Section may be used by the Town for open space, recreation, conservation, and general municipal purposes. Exelon shall provide to the Town copies of the quarterly and annual reports regarding the burning of fuel oil that Exelon is required to file with DEP, within ten (10) business days of such filings.

B. For such time as Exelon is the owner of the proposed Project and/or the Facility, Exelon shall provide and maintain an Exelon employee or employees as a point of contact for the Town ("Exelon Representative(s)"). The Exelon Representative(s) shall be knowledgeable of the Project and Facility and be in a position of authority to assist the Town with construction, operation, emergency response and decommissioning questions. Upon the Effective Date, Exelon shall provide the Town the contact information (name, address, telephone and email address) of the Exelon Representative(s) and promptly update the Town in the event of a change in the Exelon Representative(s). Upon reasonable request, the Exelon Representative(s) shall provide Medway safety inspectors with access to the Facility to ensure the operations at the Facility adhere to All Applicable Laws and the terms and conditions of this Agreement. The Exelon Representative(s) shall also provide access, after a reasonable notification period of at least twenty-four (24) hours, to Medway officials for emergency response training and Exelon representatives shall also participate in such emergency response training at a mutually acceptable time.

C. Exelon shall maintain its environmental management systems at the Facility with the aim of maintaining environmental compliance, fostering appropriate environmental practices, and demonstrating good environmental performance. In such regard, Exelon shall consider in good faith and to the extent reasonable, implement modified environmental management systems which are consistent with the provisions of the International Organization for Standardization Standard ISO 14001, Environmental Management Systems and American Society for Testing and Materials Publication 14004_96, ANSI/ISO Environmental Management Systems. Annually in the month of the October, Exelon representatives shall meet with the Town Health Agent and safety officials reporting on environmental and safety performance in the prior twelve (12) month period.

15. Use of Local Labor.

Exelon agrees to use commercially reasonable efforts to hire local labor in connection with the construction of the Facility.

16. Local Purchasing.

Exelon agrees to use commercially reasonable efforts to purchase goods and services necessary for the construction of the Facility from local vendors.

17. Community Updates.

A. Exelon agrees to provide promptly to the Town copies of material filings and other information submitted or received in connection with such proceedings before any Governmental Authority related to the Project (other than filings in the Proceeding).

B. Once construction commences, Exelon shall establish a community outreach plan with Medway officials that will provide for timely public dissemination of information regarding construction schedule, work hours, etc. ("Community Outreach Plan"). Exelon will keep Medway reasonably apprised of progress in constructing the Project and shall identify and describe, as promptly as practicable, any significant construction issue which might be reasonably expected to affect the interests of Medway, including, without limitation, matters that may reasonably be expected to affect the interests of the Town and provide advance notice of any need to conduct construction activities after the standard construction day shift set forth in Section 12(A) of this Agreement. Exelon shall provide construction program management ("Construction Program Management") schedules to the Town on a monthly basis.

C. Exelon shall periodically (but at least once every six (6) months or upon reasonable request of the Medway Board of Selectmen) during pre-construction and construction activities provide public reports to Medway at meetings of the Board of Selectmen, describing its progress in obtaining necessary permits and the status of construction of the Project, and, matters that may reasonably be expected to affect the Town's interests, describing major issues which may have arisen and responding to questions from Town officials and/or the public.

18. Insurance and Indemnification.

A. Exelon shall at all times maintain insurance coverage as required and appropriate for the Plant and the Facility, including insurance for claims arising out of injury to persons or property, relative to either sudden and accidental occurrences or non-sudden and accidental occurrences, resulting from construction and operation of the Facility. Exelon shall maintain or cause to be maintained insurance against such risks and for such amounts as are customarily insured against by businesses of like size and type. Exelon may satisfy all or a portion of these insurance requirements through self-insurance.

B. Exelon shall indemnify, defend and hold harmless the Town and its officers, employees, agents and representatives ("Town Indemnified Parties") from and against any and all costs, claims, liabilities, damages, expenses (including reasonable attorneys' fees), causes of action or suits or judgments by third parties, incurred by, on behalf of or involving any one of the foregoing parties to the extent arising, directly or indirectly, from or in connection with (i) any material breach by Exelon of its obligations, covenants, representations or warranties contained in this Agreement, (ii) Exelon's act or omission that constitutes a violation of All Applicable Laws, or (iii) any other claims arising out of the construction or operation of the Facility in which both Exelon and the Town are named as defendants provided that a) the Town has not materially breached any obligation, covenant, representation or warranty contained in this Agreement or taken any act or omission that constitutes a violation of All Applicable Laws and b) the defenses available to Exelon against such claims are similar to those available to the Town.

C. If a Town Indemnified Party seeks indemnification pursuant to this Section, the Town shall notify Exelon of the existence of a claim, or potential claim as soon as practicable after learning of such claim, or potential claim, describing with reasonable particularity the circumstances giving rise to such claim. Exelon shall be required to reimburse the Town for any documented reasonable costs associated with a claim for indemnification by a Town Indemnified Party within sixty (60) days of the Town's submission of its documented costs to Exelon. Upon written acknowledgment by Exelon that it will assume the defense and indemnification of a claim from a Town Indemnified Party, Exelon may assert any defenses which are or would otherwise be available to the Town Indemnified Party. Exelon shall have full control of such defense and proceedings, including the selection of counsel and any settlement of the proceedings.

D. Notwithstanding any provision contained herein, the provisions of this Section shall survive the termination or expiration of this Agreement for a period of three (3) years with respect to any claims which occurred or arose prior to such termination or expiration.

19. Representations and Warranties.

A. Town Representations and Warranties. As of the Effective Date, the Town represents and warrants to Exelon:

1. The Town is a municipality in the Commonwealth of Massachusetts with full legal right, power and authority to enter into and to fully and timely perform its obligations under this Agreement;

2. The execution of the Agreement has been duly authorized, and each person executing the Agreement on behalf of the Town has full authority to do so and to fully bind the Town; and

3. The Town knows of no pending or threatened action, suit, proceeding, inquiry, or investigation before or by any judicial court or administrative or law enforcement agency against or affecting the Town or its properties wherein any unfavorable decision, ruling, or finding would materially and adversely affect the validity or enforceability of the Agreement or the Town's ability to carry out its obligations under the Agreement.

B. Exelon Representations and Warranties. As of the Effective Date, Exelon represents and warrants to the Town:

1. Exelon has full legal capacity to enter into this Agreement;

2. The execution of the Agreement has been duly authorized, and each person executing the Agreement on behalf of Exelon has full authority to do so and to fully bind Exelon; and

3. Other than the Proceeding, Exelon knows of no pending or threatened action, suit, proceeding, inquiry, or investigation before or by any judicial court or administrative or law enforcement agency against or affecting Exelon or its properties wherein any unfavorable decision, ruling, or finding would materially and adversely affect the validity or enforceability of the Agreement or Exelon's ability to carry out its obligations under the Agreement.

20. Events of Default; Remedies; Limitation of Liability.

A. Events of Default by Exelon. The following shall each constitute an event of default by Exelon ("Exelon Event of Default"):

1. Exelon breaches any non-monetary material obligation under the

Agreement, and fails to cure such breach within thirty (30) days after notification by the Town of the breach and such failure is not proximately caused by a Town Event of Default as set forth in Section 20(B), below;

2. Exelon fails to make any payment due under this Agreement within thirty (30) days of such due date;

3. If any material representation or warranty made by Exelon in this Agreement proves to have been misleading or false in any material respect when made and Exelon does not cure the underlying facts so as to make such representation or warranty correct and not misleading within fifteen (15) days of written notice from the Town;

4. Exelon (i) admits in writing its inability to pay its debts generally as they become due; (ii) files a petition or answer seeking reorganization or arrangement under the federal bankruptcy laws or any other applicable law or statute of the United States of America or any state, district or territory thereof; (iii) makes an assignment for the benefit of creditors; (iv) consents to the appointment of a receiver of the whole or any substantial part of its assets; (v) has a petition in bankruptcy filed against it, and such petition is not dismissed within ninety (90) days after the filing thereof; (vi) a court of competent jurisdiction enters an order, judgment, or decree appointing a receiver of the whole or any substantial part of Exelon's assets, and such order, judgment or decree is not vacated or set aside or stayed within ninety (90) days from the date of entry thereof; or (vii) under the provisions of any other law for the relief or aid of debtors, any court of competent jurisdiction shall assume custody or control of the whole or any substantial part of Exelon's assets and such custody or control is not terminated or stayed within ninety (90) days from the date of assumption of such custody or control; or

5. Exelon consolidates or amalgamates with, or merges with or into, or transfers all or substantially all of its assets to, another entity, and the resulting, surviving or transferee entity fails to assume, effective immediately upon the effectiveness of such consolidation, amalgamation, merger or transfer, each and all of the obligations of Exelon under this Agreement.

B. Events of Default by Town. It shall constitute an event of default by the Town ("Town Event of Default") if the Town breaches any non-monetary material obligation under the Agreement, and fails to cure such breach within thirty (30) days after notification by Exelon of the breach.

C. Remedies; Limitations.

1. In the event of an Exelon Event of Default pursuant to Section 20(A)(2) of this Agreement, the Town, subject to any limitations under All Applicable Laws, shall add to any amount due and owing a fourteen percent (14%) interest charge per year, prorated for the length of such Exelon Event of Default.

2. In the event of an Exelon Event of Default pursuant to Section 20(A)(1), including, but not limited to, Exelon's failure to comply with All Applicable Laws, Exelon shall pay to the Town a daily fine of five thousand dollars ($5,000) for each day in which such Exelon Event of Default remains uncured.

3. The Parties confirm that the express remedies and measure of damages provided in this Agreement satisfy the essential purposes hereof. For breach of any provision for which an express remedy or measure of damages is provided, such express remedy or measure of damages will be the sole and exclusive remedy, the obligor's liability will be limited as set forth in such provision and all other remedies or damages at law or in equity are waived. If no remedy or measure of damages is expressly provided herein, the Parties reserve and shall have all rights and remedies available to them at law or in equity with respect to the performance or non-performance of the other Party hereto under this Agreement.

21. NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY, INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES OF ANY CHARACTER, RESULTING FROM, ARISING OUT OF, IN CONNECTION WITH OR IN ANY WAY INCIDENT TO ANY ACT OR OMISSION OF EITHER PARTY RELATED TO THE PROVISIONS OF THIS AGREEMENT, IRRESPECTIVE OF WHETHER CLAIMS OR ACTIONS FOR SUCH DAMAGES ARE BASED UPON CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY AT LAW OR EQUITY.

22. <u>Assignment</u>.

Exelon agrees that this Agreement shall be binding upon and inure to the benefit of successor owners and operators of the Facility. Exelon further agrees that it will not sell, lease or otherwise dispose of the Facility (each a "Transfer") to any person or entity ("a Transferee") unless (i) Exelon reasonably believes such person or entity has the resources and ability to operate the Facility in accordance with All Applicable Laws and in accordance with this Agreement and (ii) at the time of such Transfer, Exelon obtains a written agreement of the Transferee to be bound by this Agreement. Any assignment by Exelon in connection with any financing, or to any entity controlling, controlled by, or under common control with Exelon shall not be considered a Transfer. As soon as practicable after such Transfer, Exelon shall give notice thereof to the Town and identify the Transferee, along with a statement that after due diligence, Exelon reasonably believes that the conditions of this Section 22 are fulfilled with respect to such Transferee.

23. <u>Termination</u>.

This Agreement shall not be subject to termination, except for the following events of termination:

(a) By mutual agreement of the Town and Exelon;

(b) By Exelon in the event that it abandons the Project prior to the commencement of construction or there is any regulatory or legal proceeding or government investigation that results in an unfavorable judgment, order, decree, stipulation or injunction that prevents Exelon from constructing or operating the Project; or

(c) By the Town in the event of 1) an incurable Exelon Event of Default pursuant to Section 20(A)(3), (4) or (5) or 2) an Exelon Event of Default pursuant to any other provision of this Agreement which is not cured within eighteen (18) months of the date of the Event of Default and which failure to earlier cure is due to an event of *Force Majeure* as set forth below.

For the purposes of this Agreement, "*Force Majeure*" means any cause not within the reasonable control of Exelon which precludes it from carrying out, in whole or in part, its obligations under this Agreement, including, but not limited to, Acts of God; winds; hurricanes; tornadoes; extreme weather; fires; epidemics; landslides; earthquakes; floods; other natural catastrophes; strikes; lock-outs or other industrial disturbances; acts of public enemies; acts, failures to act or orders of any kind of any Governmental Authority acting in its regulatory or judicial capacity; insurrections; military action; war, whether or not it is declared; sabotage; riots; civil disturbances or explosions. Nothing in this provision is intended to excuse Exelon from performing due to any governmental act, failure to act, or order, where it was reasonably within Exelon's power to prevent such act, failure to act, or order. Notwithstanding anything in the Agreement to the contrary, *Force Majeure* shall not mean:

(a) Customary inclement weather (in contrast to extreme weather) affecting construction, operation, or decommissioning of the Project.

(b) Unavailability of equipment, repairs or parts for the Project, except to the extent due to a qualifying event of *Force Majeure* (whether such event affects Exelon directly or any supplier, manufacturer, shipper or warehouseman).

(c) Any nonpayment under this Agreement.

(d) Economic hardship of Exelon.

24. Notices.

All notices, demands, requests, consents or other communications required or permitted to be given or made under the Agreement shall be in writing and addressed to the following:

If to Medway:

Michael E. Boynton
Town Administrator
Medway Town Hall
155 Village Street
Medway, MA 02053
(508) 533-3264 (phone)

with a copy to:

Barbara J. Saint Andre, Esq.
Petrini & Associates, P.C.
372 Union Avenue
Framingham, MA 01702
(508) 665-4310 (phone)
BSaintandre@petrinilaw.com

If to Exelon:

Jack Hughes
Exelon West Medway II, LLC
9 Summer Street
Medway, MA 02053
508-533-3919 (phone)
jack.hughes@exeloncorp.com

with a copy to:

Todd D. Cutler, Esq.
Associate General Counsel
Exelon West Medway II, LLC
300 Exelon Way, Suite 340
Kennett Square, PA 19348
(610) 765-5602 (phone)
todd.cutler@exeloncorp.com

Notices hereunder shall be deemed properly served: (a) by hand delivery, on the day and at the time on which delivered to the intended recipient at the address set forth in the Agreement; (b) if sent by mail, on the third business day after the day on which deposited in the United States certified or registered mail, postage prepaid, return receipt requested, addressed to the intended recipient at its address set forth in the Agreement; or (c) if by Federal Express or other reputable express mail service, on the next business day after delivery to such express mail service, addressed to the intended recipient at its address set forth in the Agreement. Notices may also be transmitted by electronic mail, provided that any notice transmitted solely by electronic mail which is not confirmed as received by the receiving Party shall be followed up by personal delivery or overnight delivery within forty-eight (48) hours. Either Party may change its address and contact person for the purposes of this Section by giving notice thereof in the manner required herein.

25. Entire and Complete Agreement; Binding Effect.

This Agreement, along with the Exhibit(s) attached (or to be attached) hereto, constitutes the entire and complete agreement of the Parties with respect to the subject matter hereof, exclusive of all prior understandings, arrangements and commitments, all of which, whether oral or written, having been merged herein, except for contemporaneous or subsequent written understandings, arrangements, or commitments signed by the parties intended to be bound thereby. This Agreement shall bind and inure to the benefit of the Parties to this Agreement and any successor or assignee acquiring an interest hereunder.

26. Survival.

Termination of this Agreement for any reason shall not relieve Exelon of any obligation accrued or accruing prior to such termination, including, but not limited to, the obligations set forth in Sections 6(A)(2); 6(B); 6(D); 6(E); 6(F); and 18(D).

27. Other Documents.

Each Party promises and agrees to execute and deliver any instruments and to perform any acts which may be necessary or reasonably requested by the other party in order to give full effect to this Agreement.

28. Governing Law.

This Agreement and the rights and duties of the Parties hereunder shall be governed by and shall be construed, enforced and performed in accordance with the laws of the Commonwealth of Massachusetts without regard to principles of conflicts of law.

29. Dispute Resolution.

Unless otherwise expressly provided for in this Agreement, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under this Agreement between the Town and Exelon. The Town and Exelon agree to use their respective best efforts to resolve any dispute(s) that may arise regarding this Agreement.

Any dispute that arises under or with respect to this Agreement that cannot be resolved in the daily management and implementation of this Agreement shall in the first instance be the subject of informal negotiations between management personnel from Exelon and the Town Administrator of Medway, as the case may be, who shall use their respective best efforts to resolve such dispute. The period for informal negotiations shall not exceed thirty (30) days from the time the dispute arises, unless it is modified by written agreement of the Parties. The dispute shall be considered to have arisen when one Party sends the other Party a written notice of dispute.

In the event that the Parties cannot resolve a dispute by informal negotiations under the preceding paragraph of this Section, the Parties agree to submit the dispute to mediation. Within fourteen (14) days following the expiration of the time period for informal negotiations, the Parties shall propose and agree upon a neutral and otherwise qualified mediator. In the event that the Parties fail to agree upon a mediator, the Parties shall request the American Arbitration Association to appoint a mediator. The period for mediation shall commence upon the appointment of the mediator and shall not exceed sixty (60) days, unless such time period is modified by written agreement of the Parties involved in the dispute. The decision to continue mediation shall be in the sole discretion of each Party. The Parties will bear their own costs of the mediation.

In the event that the Parties cannot resolve a dispute by informal negotiations or mediation, venue for judicial enforcement shall be Norfolk County Superior Court, Dedham, Massachusetts. Notwithstanding the foregoing, injunctive relief may be sought without resorting to alternative dispute resolution to prevent irreparable harm that would be caused by a breach of this Agreement. In any such judicial action, the "Prevailing Party" shall be entitled to payment from the opposing party of its reasonable costs and fees, including but not limited to attorneys' fees, arising from the civil action. As used herein, the phrase "Prevailing Party" shall mean the party who, in the reasonable discretion of the finder of fact, most substantially prevails in its claims or defenses in the civil action.

30. Confidentiality.

The Parties understand that the Town is subject to, among other laws, the Massachusetts Public Records Act, G.L. c. 66, §10 and G.L. c. 4, §7, cl. 26, pursuant to which all documents and records made or received by the Town shall, absent an exemption or law to the contrary, constitute a public record subject to disclosure. To the extent not inconsistent with the Town's duty set forth in the preceding sentence, if either Party or its representatives provides to the other Party or its representatives confidential information, including business plans, strategies, financial information, proprietary, patented, licensed, copyrighted or trademarked information, and/or technical information regarding the design, operation and maintenance of the Project or of a Party's business ("Confidential Information"), the receiving Party shall protect the Confidential Information from disclosure to third parties with the same degree of care accorded its own confidential and proprietary information, but in any event not less than a commercially reasonable degree of care, and refrain from using such Confidential Information except in the negotiation and performance of this Agreement. Notwithstanding any other provision herein, neither Party shall be required to hold confidential any information that: (i) becomes publicly available other than through the receiving Party; (ii) is required to be disclosed by a Governmental Authority, under All Applicable Laws or pursuant to a validly issued subpoena, but a receiving Party subject to any such requirement shall promptly notify the disclosing Party of such requirement; (iii) is independently developed by the receiving Party; or (iv) becomes available to the receiving Party without restriction from a third party under no obligation of confidentiality.

31. Amendments.

This Agreement may only be amended or modified by a written amendment to the Agreement signed by both Parties hereto.

32. Severability.

If any section, phrase or portion of the Agreement is, for any reason, held or adjudged to be invalid, illegal or unenforceable by any court of competent jurisdiction, such section, phrase, or portion so adjudged will be deemed separate, severable and independent and the remainder of the Agreement will be and remain in full force and effect and will not be invalidated or rendered illegal or unenforceable or otherwise affected by such adjudication, provided the basic purpose of the Agreement and the benefits to the Parties are not substantially impaired.

33. Headings and Captions.

The headings and captions appearing in this Agreement are intended for reference only, and are not to be considered in construing the Agreement.

34. Counterparts; Scanned Copies.

This Agreement may be executed in counterparts, each of which shall be deemed an original and all of which shall constitute one and the same instrument. The Parties agree that a scanned or electronically reproduced copy or image of this Agreement bearing the signatures of the Parties hereto shall be deemed an original and may be introduced or submitted in any action or proceeding as competent evidence of the execution, terms and existence of this Agreement notwithstanding the failure or inability to produce or tender an original, executed counterpart of this Agreement and without the requirement that the unavailability of such original, executed counterpart of this Agreement first be proven.

35. Waiver.

No waiver by either Party hereto of any one or more defaults by the other Party in the performance of any provision of the Agreement shall operate or be construed as a waiver of any future default, whether of like or different character. No failure on the part of either Party hereto to complain of any action or non-action on the part of the other Party, no matter how long the same may continue, shall be deemed to be a waiver of any right hereunder by the Party so failing. A waiver of any of the provisions of the Agreement shall only be effective if made in writing and signed by the Party who is making such waiver.

36. Joint Workproduct.

This Agreement shall be considered the workproduct of both Parties hereto, and, therefore, no rule of strict construction shall be applied against either Party.

37. Successors and Assigns.

This Agreement shall be binding upon Exelon, Medway and each of their affiliates, parents, successors and permitted assigns and inure to the benefit of and be enforceable by Exelon, Medway and each of their affiliates, parents, successors and permitted assigns.

38. No Joint Venture.

Nothing herein contained shall be deemed to constitute either Party a partner, agent or legal representative of the other Party or to create a joint venture, partnership, agency or any relationship between the Parties. The obligations of the Parties are individual and not collective in nature.

39. Further Assurances.

From time to time and at any time at and after the execution of the Agreement, each Party shall execute, acknowledge and deliver such documents and assurances, reasonably requested by the other and shall take any other action consistent with the terms of the Agreement that may be reasonably requested by the other for the purpose of effecting or confirming any of the transactions contemplated by the Agreement.

40. No Limitation of Regulatory Authority.

The Parties acknowledge that nothing in this Agreement shall be deemed to be an agreement by Medway to issue or cause the issuance of any permit or approval, or to limit or otherwise affect the ability of Medway or the Commonwealth of Massachusetts to fulfill its regulatory mandate or execute its regulatory powers consistent with All Applicable Laws.

[*Signature Page to Follow*]

IN WITNESS WHEREOF, Medway has caused this Agreement to be executed and has caused its seal to be attached to this Agreement on the 19 day of October, 2015.

ATTEST:

By: ______________________

MICHAEL E. BOYNTON
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
January 6, 2017

TOWN OF MEDWAY

By: ______________________ Chairman
[Name, Title]

By: ______________________ Vice Chairman
[Name, Title]

By: ______________________
[Name, Title]

By: ______________________ Clerk
[Name, Title]

By: ______________________ Selectman
[Name, Title]

IN WITNESS WHEREOF, Exelon has caused this Agreement to be executed in its name by its duly authorized officer on the 14th day of October, 2015.

ATTEST:

By: ______________________

EXELON WEST MEDWAY II, LLC

By: ______________________
James J. Carty, Vice President

EXHIBIT A

PROJECT LOCATION

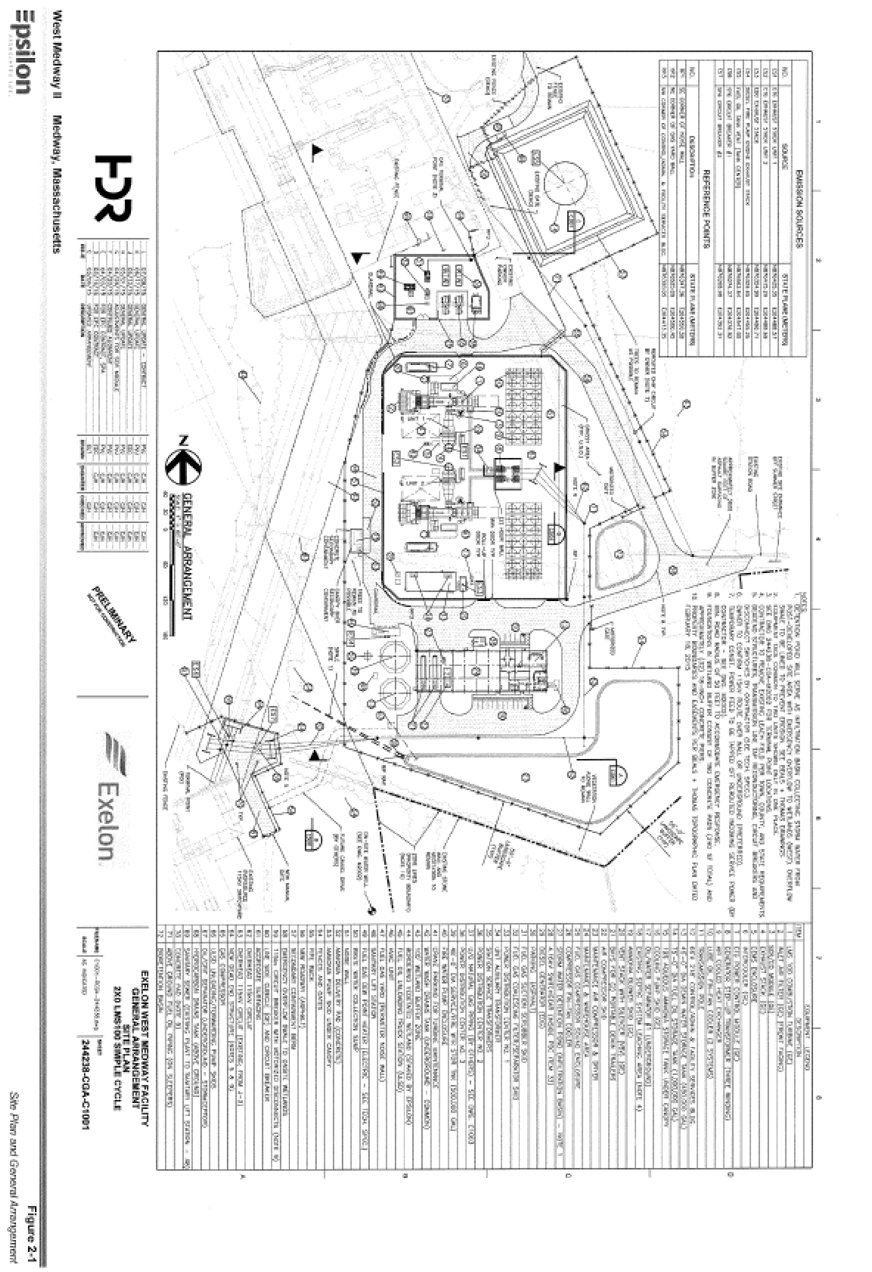


Figure 2-1
Site Plan and General Arrangement

LIST OF SCHEDULES / REPORTS TO BE PROVIDED TO THE TOWN PURSUANT TO THE AGREEMENT*

Schedule 6(E)	Decommissioning Plan
Schedule 9	Pre-construction, construction and completion schedule
Schedule 10	Excess Emission Reports; Reports of Deviations
Schedule 11(C)	Copies of all submissions required pursuant to G.L. c. 21G and 310 C.M.R. §36.00
Schedule 12(A)	Construction Management Plan
Schedule 12(D)	Visual Mitigation Plan
Schedule 13(A)	Traffic Management Plan
Schedule 13(B)	Fire Safety and Emergency Medical Requirements as they relate to Design and Operation plans
Schedule 14(A)	Quarterly and annual report (re: burning of fuel oil)
Schedule 17(A)	Material filings in connection with proceedings before any Governmental Authority
Schedule 17(B)(1)	Community Outreach Plan
Schedule 17(B)(2)	Construction Program Management Schedules
Schedule 17(C)	Public Progress Reports

*Schedules are numbered according to the Sections (and/or Subsections) of the Agreement in which they first appear.

Technical Appendix D

(Draft) Stormwater Management Report

STORMWATER MANAGEMENT REPORT

West Medway II

9 Summer Street
Medway, Massachusetts

Prepared for:
Exelon West Medway, LLC and
Exelon West Medway II, LLC
300 Exelon Way
Kennett Square, PA 19348

Presented by:

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

January 15, 2016

Calculated by: **Elizabeth Clark, PE**

Checked by: **Jeff Murphy, PE**

Approved by:

____

Eric Las, PE

TABLE OF CONTENTS

LIST OF APPENDICES

1.0 INTRODUCTION

The proposed project includes a stormwater management system designed to mitigate potential impacts the proposed project could have on the existing watershed. Stormwater controls have been proposed to control peak runoff rates, provide water quality, promote groundwater recharge and sediment removal. The proposed system has been designed to comply with:

- The 2008 Massachusetts Department of Environmental Protection (DEP) Stormwater Management Handbook,
- The Massachusetts Wetland Protection Act (310 CMR 10.00),
- The Town of Medway General By-Laws of the Town Article XXVI Stormwater Management,
- The Town of Medway Planning Board Rules and Regulations Chapter 200 – Submission and Review of Site Plans, and
- Rules and Regulations of the Town of Medway Conservation Commission.

The pre- and post-development hydrologic conditions were modeled using HydroCAD™ version 10.00 to demonstrate that post-development stormwater runoff rates will be less than or equal to the pre-development rates. Watershed maps with soil types as well as detailed analysis of the model results are also included. The following table summarizes the peak runoff rates for the pre- and post-development conditions.

Table 1: Pre- & Post-development Peak Runoff Rate Comparison, units are in cubic feet per second (cfs).

Storm Event	2 Year		10 Year		25 Year		100 Year	
	Pre	Post	*Pre*	Post	*Pre*	Post	*Pre*	Post
Design Point 1 Center Brook	*0.01*	0.01	*0.20*	0.17	*0.83*	0.76	*3.17*	2.88
Design Point 2 Summer Street Abutters	*0.01*	0.00	*0.16*	0.02	*0.39*	0.11	*1.26*	0.47
Design Point 3 West Street Abutters	*0.01*	0.01	*0.25*	0.22	*0.93*	0.54	*3.60*	1.55
Design Point 4 On-Site BVW	*0.00*	0.00	*0.03*	0.02	*0.08*	0.07	*0.65*	0.56

2.0 PRE-DEVELOPMENT CONDITIONS

2.1 Site Conditions

The proposed facility is sited on a 94-acre property that is generally bordered on the north by land abutting Route 109 / Milford Street, on the east by Route 126 / Summer Street and on the south and west by West Street (the Subject Property). The adjacent properties consist predominately of forest, residential uses, and limited commercial uses.

The Subject Property is currently developed and contains the nominal 135 Mega-Watt West Medway Generating Station peaking facility (Existing Facility) on approximately five (5) fully-fenced acres. In addition, NSTAR Electric Company d/b/a Eversource Energy ("Eversource") operates a 345 kilovolt ("kV") switchyard, a 115 kV switchyard, and transmission lines, which are located on approximately 54 acres of the Subject Property, immediately west of the existing and proposed Facility. The remainder of the overall 94-acre parcel is largely vegetated and undeveloped. The portion of the Subject Property that the proposed project is sited on (the Facility Site) is currently vegetated, primarily by mowed grass fields separated by hedgerows.

The eastern portion of the Subject Property contains a section of Center Brook and associated bordering vegetated wetlands. The southwestern corner and the northern boundary of the Subject Property also contain bordering vegetated wetlands.

The Existing Facility drains to a series of catch basins and trench drains that convey runoff to a 22,000 gallon oil water separator for treatment. From the oil water separator runoff is conveyed to an existing detention basin located to the west of the existing facility. The detention basin was designed with a multi-stage outlet and retains flows up to the 100-year design storm. The outlet control structure conveys runoff a 24-inch culvert that daylights to the bordering vegetated wetland located to the southwest of the Existing Facility.

The Facility Site is located on the hydrologic divide between two tributary streams in the upper reaches of the Charles River watershed. Runoff from the Facility Site drains to the east to Center Brook and to the west toward Hopping Brook. South of the Subject Property, Hopping Brook and Center Brook merge and drain into the Charles River. To ensure the proposed development will not cause flooding on abutting properties the hydrologic analysis considered four primary locations: Center Brook, Summer Street Abutters, West Street Abutters, and On-site BVW. These design points have been named correspondingly in the hydrologic analyses. The Existing Facility is upgradient from the Facility Site. Runoff from the Facility Site does not enter the existing detention basin and will not impact the stormwater management system for the Existing Facility.

The site does not contain, nor is it tributary to any Critical Areas.

2.2 Existing Topography

The topography of the site slopes gently from north to south. The property slopes from elevation 210 along the northern property line to elevation 195 along the southern property line.

2.3 Soil Description

The Natural Resources Conservation Service (NRCS) lists the on-site soils predominately as Merrimac Fine Sandy Loam Soil, a very deep, gently sloping, and somewhat excessively drained soil. Typically, this soil is located in broad areas on plains and on terraces that commonly follow major stream valleys. NRCS classifies this type of soil as hydrologic class A soil.

The developed portions of the site also consist of Udorthents, Sandy Soils. These soils consist of areas where the original soils have been removed for use as roadfill, concrete aggregate, or landfill. The original soils were typically excessively drained to well drained and on glacial outwash plains, terraces, kames, and eskers. Typically, Udorthents, sandy, are the remaining substratum material from Canton, Hinckley, Merrimac, and Windsor soils, after the upper 4 to 40 feet of the soil material was removed. Most areas are stratified sand and gravel to a depth of 60 inches or more, In many areas stones and boulders 10 inches to 10 feet in diameter are scattered randomly on the surface or are in piles. NRCS classifies this type of soil as hydrologic class A soil.

The eastern boarder of the site, along Summer Street, consists of Scarboro and Birdsall Soils. These are deep, nearly level, very poorly drained soils in low, flat areas and in depressions on glacial outwash plains and terraces. Some areas are mostly Scarboro soils, some are mostly Birdsall soils, and some areas consist of both soil. NRCS classifies this type of soil as hydrologic class A/D soils. The hydrologic model assumes the wetland areas area hydrologic soil class D and the remaining areas are hydrologic soil class A.

A subsurface investigation performed by GEI Consultants, Inc between November 10 and 14, 2014, and between September 10, and 18, 2015 found that the Facility Site generally consists of medium dense to dense glacial stream deposits overlying very dense glacial till over bedrock. The glacial stream deposits consist of sand, silty sand, sand and gravel, and silt. Groundwater was measured in four groundwater wells and found to be about 10 to 16 feet below existing grade.

A *Competent Soils Individual* conducted a site visit on 05/15/2015 to verify the NRCS classification. The presence of gravelly sand and loamy sand deposits was confirmed by the test pits performed inside the proposed infiltrative BMPs. The sand and gravel deposits were underlain by fine sandy loam which appeared to be acting as a restrictive soil layer. Depth to this fine grained layer varied, but generally became shallower further to the west. Test pit locations have been shown in the soil logs included in Appendix A.

Groundwater was not observed in the test pits conducted in the vicinity of the proposed stormwater BMPs, and redoxomorphic features were not observed in the test pits. Moist soils with faint rust bands were observed in some test pits within the proposed infiltration basin.

2.4 Regional Watershed

The Subject Property is located within the Charles River watershed, which has an area of approximately 310+ square miles. The proposed project is a very small portion of the total watershed area. Ultimately, the Charles River drains to Boston Harbor.

The project is tributary to the Upper Charles River. The Massachusetts Department of Environmental Protection has issued two Total Maximum Daily Loads (TMDLs) for this portion of the Charles River. The first is a *Final Pathogen TMDL for the Charles River Watershed*, dated January 2007. This TMDL address bacterial and other fecal-related pollution, which are largely caused by the improper management of human wastes, barnyard animals, pet feces and agricultural applications. The proposed project will connect to the municipal sewer and will not cause further pathogen impairment of the Charles River. In accordance with the recommendations of *Mitigations Measures to Address Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts*, prepared for USEPA New England Region 1 stormwater infiltration has been maximized on-site to reduce the overall stormwater discharge from the site, which in turn reduces the probability of pathogens discharging from the site. Additionally a Long Term Pollution Prevention Plan and Long Term Operation and Maintenance Plan has been developed for the site outlining source control measures and will ensure that the stormwater management system continues to operate as designed.

The second TMDL released for this portion of the Charles River is: *Total Maximum Daily Load for Nutrients in the Upper/ Middle Charles River*, *Massachusetts*, dated May 2011. The pollutant of concern for this TMDL is phosphorus. The Draft MA MS4 General Permit released by the Environmental Protection Agency on September 30, 2014 requires that the Town of Medway reduce the their total phosphorus discharge from stormwater by 32%. The proposed stormwater management system maximizes on-site stormwater infiltration, which is an effective way to mitigate phosphorus in stormwater runoff. Calculations demonstrating the total phosphorus removal achieved by the stormwater management system are provided in Appendix F.

Hopping Brook is listed in the Massachusetts Year 2014 Integrated List of Waters as Category 2 water, which means it has been found to be unimpaired for some uses, specifically aquatic life and aesthetics. It has not been assessed for primary or secondary contact recreation, or fish consumption. No TMDLs have been assigned to this water body.

Center Brook, to the east of the Subject Property, has not been assessed by the Massachusetts Integrated List of Waters program, and does not have a TMDL or impairment assigned to it.

The proposed project will not cause further impairment to Hopping Brook or the unnamed brook to the east of the site. The proposed stormwater management system will be designed in accordance with the 2008 MA DEP Stormwater Handbook, and applicable location regulations and will provide adequate water quality treatment, total suspended solids removal, and groundwater recharge.

2.5 Hydrologic Analysis

Sub-catchment areas were delineated based on existing runoff patterns and topographic information. This information is shown on the *Pre-Development Conditions Hydrologic Areas Map* included in Appendix B. Summaries of each area with respect to Curve Number and Time of Concentration calculations can be found in the model results also in Appendix B.

3.0 POST-DEVELOPMENT CONDITIONS

3.1 Design Strategy

During the design phase of the site layout, consideration was given to conserving environmentally sensitive features and minimizing impact on the existing hydrology. To achieve this, extensive grading was avoided and the site was designed to match the existing terrain where feasible. Minimizing earthwork helps to maintain the existing drainage patterns to the maximum extent practicable under post-development conditions. On-site resource areas, such as the Bordering Vegetated Wetlands along the perimeter of the Subject Property, were excluded from the development to the maximum extent. Through careful site planning the proposed impervious surfaces have been minimized, reducing the impact the project may have on the existing watershed. Large portions of the Power Block, Fuel Gas Yard and Switchyard are proposed to be constructed of gravel. Additionally the impervious areas associated with the roadways and parking area were minimized to the maximum extent to still comply with local bylaw requirements and provided vehicular safety.

A stormwater management system has been designed to provide treatment for stormwater runoff associated with the proposed impervious surfaces on site. All stormwater BMPs were designed to treat a minimum of the first 1.0 inch of runoff generated by the on-site impervious areas. Proprietary stormwater treatment systems were designed to treat the runoff rate associated with the water quality volume in accordance with the requirements of the DEP Stormwater Handbook. Stormwater BMP sizing worksheets and water quality sizing calculations are included in Appendix E of this report. To mitigate increased stormwater flow rates associated with the proposed impervious area, two infiltration basins and two bioretention areas have been proposed.

3.2 Hydrologic Analysis

The established design points used in the pre-development conditions analysis were used in the post-development analysis for direct comparison. The tributary areas and flow paths were modified to reflect post-development conditions. See Appendix C for the *Post- Development Conditions Hydrologic Areas Map*. Summaries of each area with respect to Curve Number and Time of Concentration calculations can be found in the model results in Appendix C.

3.3 Stormwater Management Controls Sizing

Infiltration Basin 1

Infiltration Basin 1 has been proposed in the southern portion of the site. The basin will capture and infiltrate the majority of the runoff from the site and has been designed to infiltrate runoff associated with the 100-year storm event. The Basin was sized using the Simple Dynamic Method, as described in Chapter 3 of the Massachusetts Stormwater Handbook, using a Rawl's exfiltration rate of 0.52 inches per hour. This Rawl's rate was conservatively utilized to account for the variability of soil texture found in the footprint of the proposed Basin. Gravely course sands were observed in TP-3. In TP-4, 5, 6 and 7, gravelly sandy deposits underlain by a very fine grained sandy loam were observed. Gravely course sands underlain by a silty fine grained sandy loam were observed.

In the event that the basin storage is exceeded, overflow will be directed west to the Bordering Vegetated Wetlands via a swale.

The basin has been designed to meet the required recharge volume, and will fully dewater within 72 hours. Runoff will be treated by a proprietary water quality structure or a bioretention area prior to discharging to the infiltration basin.

Redoxomorphic features or groundwater were not observed within the footprint of the proposed basin. Based on the observation of moist soil in TP-4, groundwater was assumed to be at elevation 192.0. A mounding analysis has indicated that the proposed basin can dewater within 72-hours.

Infiltration Basin 2
Infiltration Basin 2 is located southwest of the proposed water tanks. It is designed to collect and infiltrate runoff from the proposed water tanks and surrounding area, and will infiltrate runoff associated with the 100-year storm. Runoff from the roofs of the proposed water tanks is assumed to be clean and does not require pretreatment prior to infiltration. The basin was sized using the Simple Dynamic Method, as described in Chapter 3 of the Massachusetts Stormwater Handbook, using a Rawl's exfiltration rate of 0.52 inches per hour. This conservative infiltration rate was utilized due to the observation of a pocket of siltier fine sandy loam on the east side of TP-9.

Redoxomorphic features were observed approximately 70-inches below existing grade at the location of infiltration basin 2. The basin bottom has been designed so that it more than 4-feet above the estimated seasonal high groundwater. The basin has been designed to fully dewater within 72 hours.

Rain Garden 1
A biortention area/ rain garden has been proposed east of the proposed access drive near the existing fuel storage containment area. Runoff from the newly paved area will be directed to the rain garden for water quality treatment and infiltration. Pretreatment will be provided by a gravel diaphragm, which is followed by a grass filter strip. Overflow from the rain garden will be directed to the bordering vegetated wetlands.

The rain garden was sized using the Simple Dynamic Method, as described in Chapter 3 of the Massachusetts Stormwater Handbook, using a Rawl's exfiltration rate of 2.41 inches per hour. The rain garden has been sited so that the bottom of the system is a minimum of 2-feet above estimated seasonal high groundwater. It has been designed so that it will fully dewater within 72 hours.

Rain garden 2
A biortention area/ rain garden has been proposed in the landscaped area between the northern of the Power Block between the sound wall and the access driveway. Runoff from portions of the access driveway and the Fuel Gas Yard will be directed to the rain garden for water quality treatment and infiltration. Pretreatment will be provided by a combination of BMPs. Stormwater from the impervious areas will be directed either to a water quality inlet, grass or a gravel diaphragm, which is followed by a grass filter strip. Overflow from the rain garden will be directed to Infiltration Basin 1 via a catch basin located in the rain garden.

The rain garden was sized using the Simple Dynamic Method, as described in Chapter 3 of the Massachusetts Stormwater Handbook, using a Rawl's exfiltration rate of 2.41 inches per hour. The rain garden has been sited so that the bottom of the system is a minimum of 2-feet above estimated seasonal high groundwater. It has been designed so that it will fully dewater within 72 hours.

3.4 Hydraulic Calculations

In compliance with Town of Medway Site Plan requirements, the proposed storm drain system will be designed based on the 25-year storm event using the Rational Formula.

3.5 Compliance with DEP Stormwater Management Standards

The proposed stormwater management system was designed in compliance with the ten (10) DEP Stormwater Management Standards. The following summary provides key information related to the proposed stormwater management system, its design elements, and mitigation measures for potential impacts.

STANDARD 1: **No new stormwater conveyance (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.**

There will be no direct discharge of untreated stormwater to nearby wetlands or waters of the Commonwealth. Runoff from all impervious areas of the site will be conveyed to stormwater management controls for infiltration, water quality treatment, and runoff rate attenuation prior to discharge to adjacent wetlands.

STANDARD 2: **Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.**

The stormwater management design will control post-development peak discharge rates for the 2-, 10-, 25-, and 100-year, 24-hour storms so as to maintain pre-development peak discharge rates. Refer to Section 1.0 Introduction for a summary of the peak runoff rates.

STANDARD 3: **Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater management practices and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil types. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.**

The stormwater management system includes infiltration basins and rain gardens that will effectively recharge groundwater on-site. Infiltration BMPs were sized using the static method based on the required recharge volume for the post-development site. As a result, annual recharge from the post-development site will approximate the annual recharge from the site under pre-development conditions. See Appendix E for stormwater BMP design worksheets and Groundwater Recharge Calculation.

STANDARD 4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

The proposed project will meet the water quality requirements of Standard 4 using several on-site treatment trains that achieve 80% TSS removal. Refer to Appendix E for the TSS removal worksheets. Structural BMPs designed for water quality treatment, including the deep sump hooded catch basins, water quality treatment systems, and rain gardens were sized to capture and treat the flow rate associated with the first 1.0-inch of runoff from proposed impervious surfaces. All proposed stormwater management BMPs will be operated and maintained to ensure continued water quality treatment of runoff. The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards. The Manual outlines source control and pollution prevention measures and maintenance requirements of stormwater best management practices (BMPs) associated with the proposed development.

STANDARD 5: For land uses with higher potential pollutant loads (LUHPPLs), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

The proposed fuel containment area is classified as a LUHPPL as it includes the storage of petroleum products. This area has been designed to provide full containment in the event of a spill or tank failure. The berm is proposed to be lined with an impervious core, preventing contamination from seeping into the ground. Stormwater for this area will be directed to a sump within the containment area, which will have a drain pipe with a gate valve left in the closed position. The gate valve will only be opened once maintenance personnel have confirmed that no sheen is present. Stormwater from this area will be directed to a water quality inlet for pretreatment prior to discharging to Rain Garden 2. This system has been designed to treat the first 1.0-inch of runoff as stipulated in the Stormwater Management Handbook.

STANDARD 6: **Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resource Waters, shellfish beds, swimming beaches, coldwater fisheries and recharge areas for public water supplies.**

There are no stormwater discharges to critical areas associated with this project.

STANDARD 7: **Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.**

The proposed project is new development, and therefore this standard does not apply.

STANDARD 8: **A plan to control construction-related impacts during erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.**

A draft Stormwater Pollution Prevention Plan (SWPPP) has been developed to comply with Section 3 of the NPDES Construction General Permit for Stormwater Discharges. Prior to commencing construction the SWPPP will be finalized and coverage for the project under the EPA's Construction General Permit will be obtained; therefore the requirements of Standard 8 are fulfilled.

STANDARD 9: **A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.**

The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards. The Manual outlines source control and pollution prevention measures and maintenance requirements of the stormwater best management practices (BMPs) associated with the proposed development.

STANDARD 10: All illicit discharges to the stormwater management system are prohibited.

There will be no illicit discharges to the proposed stormwater management system associated with the proposed project. An Illicit Discharge Compliance Statement is provided on the following page.

3.6 Illicit Discharge Compliance Statement

An illicit discharge is any discharge to a municipal separate storm sewer that is not comprised entirely of stormwater, discharges from fire-fighting activities, and certain non-designated non-stormwater discharges.

To the best of my knowledge, no detectable illicit discharge exists on site. The site plans included with this report detail the storm sewers that convey stormwater on the site and demonstrate that these systems do not include the entry of an illicit discharge. A Site Owner's Manual is also included, which contains the Long Term Pollution Plan that outlines measures to prevent future illicit discharges. As the Site Owner, I will ultimately be responsible for implementing the Long Term Pollution Prevention Plan.

Signature: ____

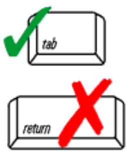
Owner's Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☒ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): ______________________________

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

  ☐ is within the Zone II or Interim Wellhead Protection Area

  ☐ is near or to other critical areas

  ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

  ☒ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☒ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☒ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☒ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

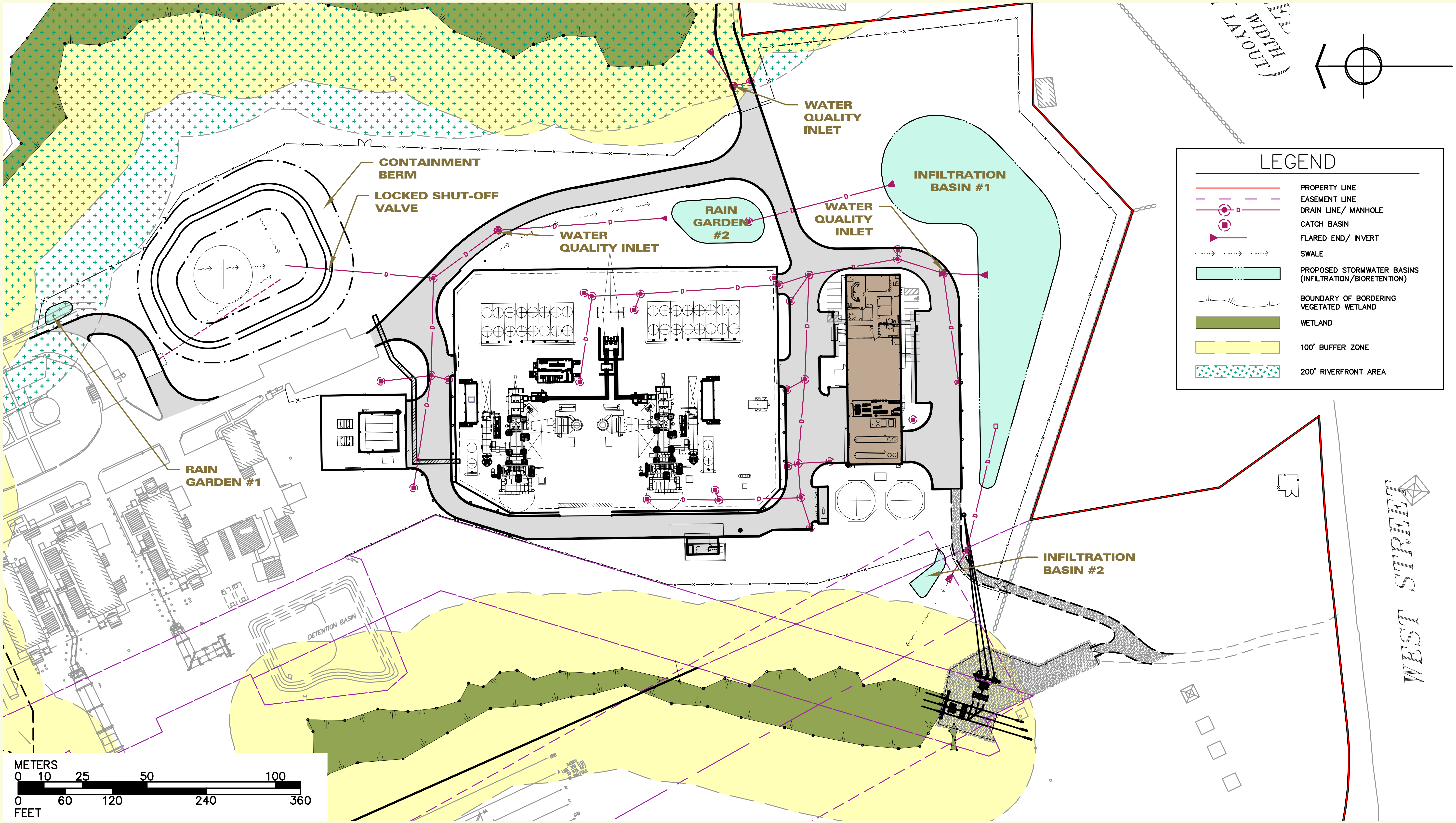
☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Figures

Figure 1: Site Plan

West Medway II

Medway, Massachusetts



BEALS + THOMAS
Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

B+T Drawing No. 142210P037A-001 Date: 01/15/2016 Scale: 1" = 120'

Stormwater Management System Exhibit

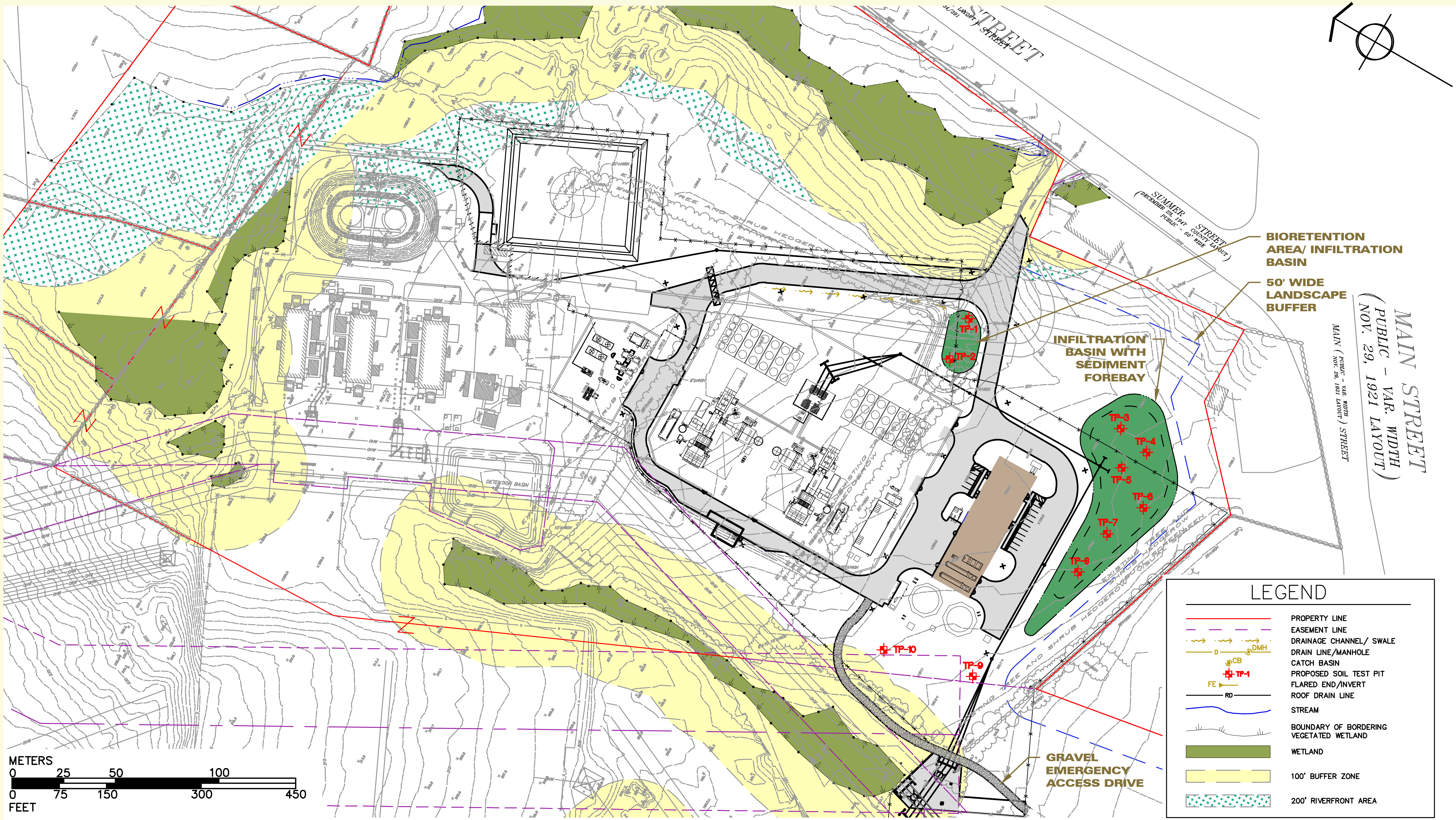
Figure
1.0

Appendices

Appendix A
Soil Data

West Medway II

Medway, Massachusetts



BEALS + THOMAS
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B+T Drawing No. 142210P020A-001 Date: 05/01/2015 Scale: 1" = 150'

Proposed Soil Test Pit Location Plan

Figure 1

BEALS + THOMAS
Soil Test Pit Log

1422.10 – Medway, MA

Deep Observation Hole Number: TP-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-7	A_p	10 YR 3/4	-	-	-	sandy loam	20-25%	< 5%	massive	friable	
7-16	B_w	10 YR 4/6	-	-	-	fine sandy loam	20-25%	< 5%	massive	friable	
16-106	C	10 YR 5/4	-	-	-	gravelly sandy loam	20-25%	< 5%	single grain	very friable	

Additional Notes:

Encountered large cobbles and boulders beginning at 72".

GW was not observed. Redoxomorphic features were not observed.

BEALS + THOMAS
Soil Test Pit Log

1422.10 – Medway, MA

Deep Observation Hole Number: TP-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A_p	10 YR 3/4	-	-	-	sandy loam	15-20%	< 5%	massive	friable	
12-18	B_w	10 YR 4/6	-	-	-	fine sandy loam	20-25%	< 5%	massive	friable	
18-98	C	10 YR 5/4	-	-	-	gravelly sandy loam	20-25%	5-10%	single grain	very friable	

Additional Notes:
Some cobbles and stones encountered during excavation of the C-horizon below 48".

No redoxomorphic features were observed. No GW was observed.

BEALS + THOMAS

Soil Test Pit Log

1422.10 – Medway, MA

Deep Observation Hole Number: TP-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	A_p	10 YR 3/4	-	-	-	sandy loam	10-15%	<5%	massive	friable	
10-18	B_w	10 YR 4/6	-	-	-	fine sandy loam	10-15%	<5%	massive	friable	
18-78	C1	10 YR 5/4	-	-	-	gravelly coarse sand	20-25%	5-10%	single grain	very friable	
78-108	C2	10 YR 5/4	-	-	-	very gravelly coarse sand	25-30%	5-10%	single grain	very friable	
108-126	C3	10 YR 5/4	-	-	-	gravelly coarse sand	20-25%	5-10%	single grain	very friable	

Additional Notes:

Lens of very gravelly coarse sand encountered at approximately 78".

No redoxomorphic features were observed.

GW was not observed.

BEALS + THOMAS
Soil Test Pit Log

1422.10 – Medway, MA

Deep Observation Hole Number: TP-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-9	A_p	10 YR 3/4	-	-	-	sandy loam	10-15%	<5%	massive	friable	
9-13	B_w	10 YR 4/6	-	-	-	fine sandy loam	10-15%	<5%	massive	friable	
13-78	C1	10 YR 5/4	-	-	-	gravelly coarse sand	20-25%	5-10%	single grain	very friable	
78-141	C2	10 YR 5/2	-	-	-	very fine sandy loam	<5%	<5%	massive	friable	

Additional Notes:

Change in soil texture at approximately 78" in C2 horizon. Very fine grained sandy loam, moist and deposited in thin layers.

Contained silty component, rust lines observed between some of the soil layers, formed flat angular pieces upon excavation.

Redoxomorphic features not apparent throughout the test pit. GW was not observed but soil was very moist.

BEALS + THOMAS
Soil Test Pit Log

Deep Observation Hole Number: TP-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	A_p	10 YR 3/4	-	-	-	sandy loam	10-15%	< 5%	massive	friable	
10-21	B_w	10 YR 4/6	-	-	-	very sandy loam	10-15%	< 5%	massive	friable	
21-88	C1	10 YR 5/4	-	-	-	gravelly coarse sand	20-25%	< 5%	single grain	very friable	
88-135	C2	10 YR 5/2	-	-	-	very fine sandy loam	< 5%	< 5%	massive	friable	

Additional Notes:
Change in texture at approximately 88" to very fine sandy loam. Moist with faint bands of rust observed.

No GW observed but soil moist at bottom of test pit.

Excavated C2 soil formed flat angular pieces with friable consistence.

BEALS + THOMAS
Soil Test Pit Log

1422.10 – Medway, MA

Deep Observation Hole Number: TP-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-9	A_p	10 YR 3/4	-	-	-	sandy loam	5-10%	< 5%	massive	friable	
9-15	B_w	10 YR 4/6	-	-	-	fine sandy loam	5-10%	< 5%	massive	friable	
15-37	C1	10 YR 5/4	-	-	-	gravelly coarse sand	20-25%	< 5%	single grain	very friable	
37-125	C2	10 YR 5/2	-	-	-	fine sandy loam	10-15%	< 5%	massive	friable	

Additional Notes:
Similar to TP-4 and 5; gravelly, sandy deposits underlain by fine sandy loam. Did not observe redoxomorphic features.

GW was not observed but soil at bottom of test pit very moist.

Excavated C2 soil formed flat angular pieces with friable consistence.

BEALS + THOMAS
Soil Test Pit Log

1422.10 – Medway, MA

Deep Observation Hole Number: TP-7

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-9	A_p	10 YR 3/4	-	-	-	sandy loam	5-10%	<5%	massive	friable	
9-18	B_w	10 YR 4/6	-	-	-	fine sandy loam	5-10%	<5%	massive	friable	
18-40	C1	10 YR 5/4	-	-	-	gravelly coarse sand	20-25%	<5%	single grain	friable	
40-129	C2	10 YR 5/2	-	-	-	fine sandy loam	<5%	<5%	massive	friable	

Additional Notes:

Gravelly, sandy deposits underlain by fine sandy loam, similar to TP-4 through 6.

Soil was moist at bottom of pit but GW was not observed. Redoxomorphic features were not observed.

Excavated C2 soil formed flat angular pieces with friable consistence.

BEALS + THOMAS
Soil Test Pit Log

1422.10 – Medway, MA

Deep Observation Hole Number: TP-8

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A_p	10 YR 3/4	-	-	-	sandy loam	5-10%	< 5%	massive	friable	
8-14	B_w	10 YR 4/6	-	-	-	fine sandy loam	15-20%	< 5%	massive	friable	
14-43	C1	10 YR 5/4	-	-	-	gravelly coarse sand	20-25%	< 5%	single grain	very friable	
43-132	C2	10 YR 5/2	-	-	-	very fine sandy loam	< 5%	< 5%	massive	friable	

Additional Notes:
Siltier fine grained sandy loam observed at the bottom portion of C2. No uniform evidence of redoxomorphic features although rust lines were observed between layers of soil deposits at textural boundaries.
GW not observed. Excavated C2 soil formed flat angular pieces with friable consistence.

BEALS + THOMAS
Soil Test Pit Log

1422.10 – Medway, MA

Deep Observation Hole Number: TP-9

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-9	Ap	10 YR 3/4	-	-	-	sandy loam	5-10%	< 5%	massive	friable	
9-15	Bw	10 YR 4/6	-	-	-	gravelly fine sandy loam	10-15%	5-10%	massive	friable	
15-43	C1	10 YR 5/4	-	-	-	gravelly sandy loam	20-25%	5-10%	massive	very friable	
43-118	C2	10 YR 5/2	70"	7.5 YR 5/8	5%	gravelly fine sandy loam	20-25%	5-10%	massive	very friable	

Additional Notes:

Observed pocket of silty fine sandy loam on east side of test pit with rust colors and blotchy pattern, however not observed throughout the test pit. Spotty areas of redoxomorphic features observed in C2.

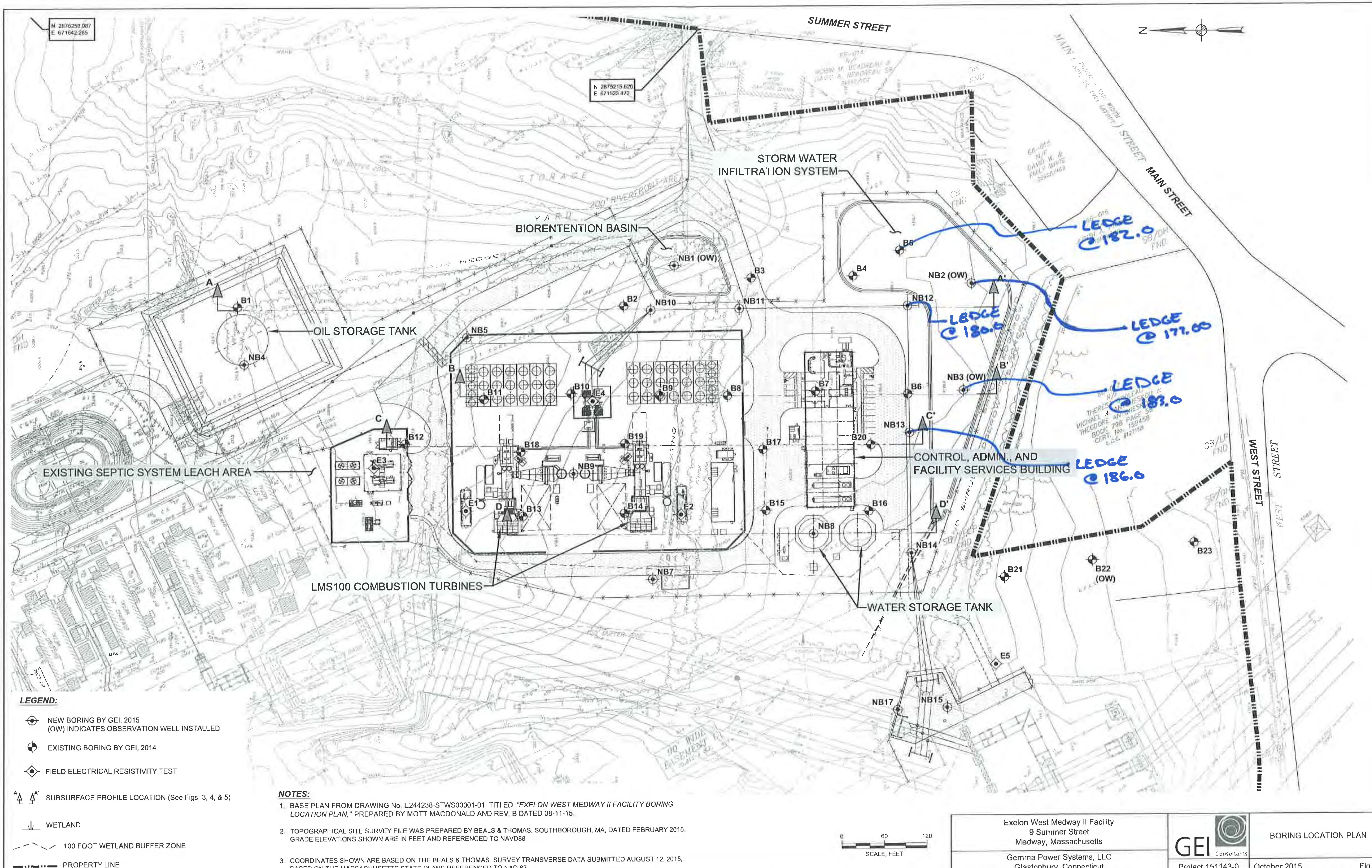
Weeping of GW at 113".

BEALS + THOMAS
Soil Test Pit Log

Deep Observation Hole Number: TP-10

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	A_p	10 YR 3/4	-	-	-	sandy loam	5-10%	< 5%	massive	friable	
10-20	B_w	10 YR 4/6	-	-	-	gravelly sandy loam	15-20%	< 5%	massive	friable	
20-43	C1	10 YR 5/4	-	-	-	gravelly loamy sand	20-25%	< 5%	single grain	very friable	
43-120	C2	10 YR 5/2	83"	7.5 YR 5/8	10%	very fine sandy loam	< 5%	< 5%	massive	friable	

Additional Notes:
GW observed weeping at 84". Bright bands and blotches of high chroma mottles observed in C2 below 83".
Upper C2 layer very moist as well. Side walls of test pit in C2 horizon cleaved off due to rapid weeping of GW.
Difficult to estimate ESHGW.



NOTES:

1. BASE PLAN FROM DRAWING No. E244238-STWS00001-01 TITLED *"EXELON WEST MEDWAY II FACILITY BORING LOCATION PLAN,"* PREPARED BY MOTT MACDONALD AND REV. B DATED 08-11-15.
2. TOPOGRAPHICAL SITE SURVEY FILE WAS PREPARED BY BEALS & THOMAS, SOUTHBOROUGH, MA, DATED FEBRUARY 2015. GRADE ELEVATIONS SHOWN ARE IN FEET AND REFERENCED TO NAVD88.
3. COORDINATES SHOWN ARE BASED ON THE BEALS & THOMAS SURVEY TRANSVERSE DATA SUBMITTED AUGUST 12, 2015, BASED ON THE MASSACHUSETTS STATE PLANE REFERENCED TO NAD 83.

Exelon West Medway II Facility 9 Summer Street Medway, Massachusetts	GEI Consultants	BORING LOCATION PLAN
Gemma Power Systems, LLC Glastonbury, Connecticut	Project 151143-0	October 2015 Fig. 2

BORING INFORMATION

LOCATION: See Plan.

GROUND SURFACE EL. (ft): 198

VERTICAL DATUM: NAVD 88

TOTAL DEPTH (ft): 26.0

LOGGED BY: I.Rawlings

DATE START/END: 9/14/2015 - 9/15/2015

DRILLING COMPANY: Geologic, Inc.

DRILLER NAME: G. Peterson

RIG TYPE: Track Mounted CME D-6

BORING NB2

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer

AUGER I.D./O.D.: NA / NA

DRILLING METHOD: Rotary Drilling with Casing

WATER LEVEL DEPTHS (ft): ⊻ 14.3 9/16/2015 7:00 am

CASING I.D./O.D.: 4.25 inch / 4.5 inch

DRILL ROD O.D.: 2.25 inch

CORE BARREL TYPE: NX

CORE BARREL I.D./O.D. 2.1 inch / 2.3 inch

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/9	2-2-4-3			S1(0"-9"): TOPSOIL.
		S2	2 to 4	24/12	2-5-8-5		SAND AND GRAVEL	S2: SILTY SAND WITH GRAVEL (SM); 40% fine to medium sand; 30% nonplastic fines; 20% fine gravel up to 1/2"; light brown.
	5	S3	4 to 6	24/14	9-9-11-8		SILT	S3: SANDY SILT WITH GRAVEL (ML); similar to S2; gray.
		S4	6 to 8	24/13	5-8-9-10			S4:SILT (ML); 97% nonplastic fines; 3% fine sand; gray.
190		S5	8 to 10	24/10	17-28-31-31		TILL	S5: SILTY SAND WITH GRAVEL (SM); 55% fine to coarse sand; 30% fine to coarse gravel up to 1-1/2"; 15% nonplastic fines; gray.
	10	S6	10 to 12	24/12	28-30-46-31			S6: SILTY SAND WITH GRAVEL (SM); 43.6% fine to coarse sand; 30.3% fine gravel up to 1/2"; 26.1% nonplastic fines; gray.
		S7	12 to 13.3	15/10	18-25-60/3"			S7: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); similar to S7; fine gravel up to 3/8".
	15	S8	14 to 14.3	3/3	100/3"	Possible boulder		S8: WIDELY GRADED GRAVEL WITH SILT AND SAND (GW-GM); 80% fine to coarse gravel; 10% fine to coarse sand; 10% nonplastic fines; brown; likely decomposed granitic bedrock.
		S9	16 to 18	24/11	37-18-31-16			S9: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); 70% fine to coarse sand; 20% fine gravel; 10% low plasticity fines; brown.
180	20	S10	19 to 19.4	5/3	100/5"			S10: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); similar to S8; likely decomposed granitic bedrock.
	25	C1	21 to 26	60/60	68		BEDROCK	C1: GRANITE; pinkish gray; very hard; slightly weathered; coarse grained; joints spaced between 2"-12", coated with fine sand, and approximately 30 degrees from horizontal; RQD = 68%
170								Bottom of boring at depth 26 ft. Installed monitoring well 9/15/2015.

NOTES:
Weather clear - Water level measured 22 hours after completion.

PROJECT NAME: West Medway II Facility Project

CITY/STATE: Medway, MA

GEI PROJECT NUMBER: 1511430

GEI Consultants

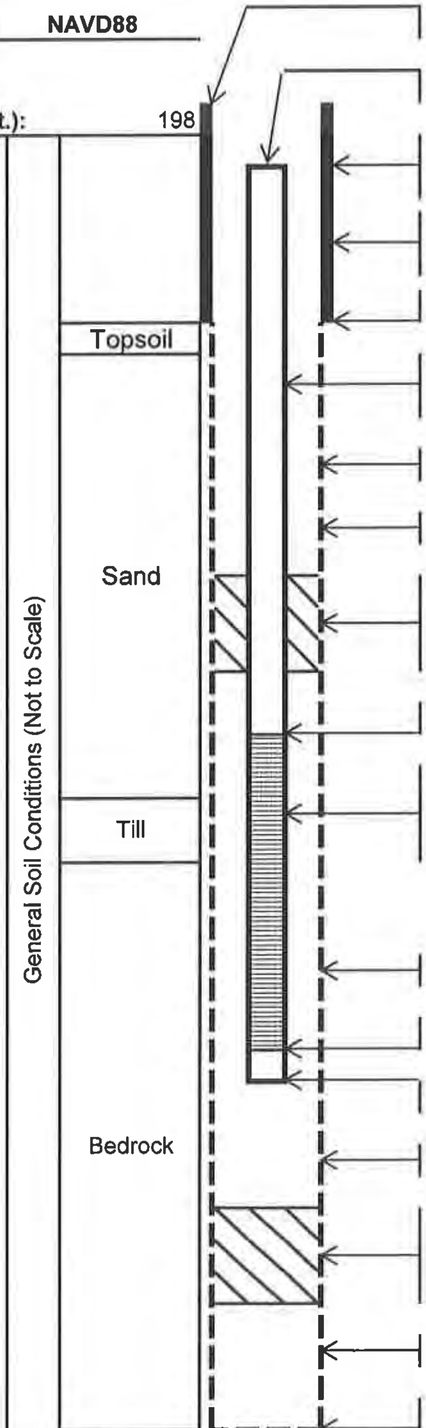
Groundwater Well Installation Log

NB2

Project	Exelon II Facility West Medway	**GEI Proj. No.**	151143-0
City / Town	West Medway, Massachusetts	**Location**	See Plan.
Client	Gemma Power Systems, LLC		
Contractor	GeoLogic-Earth Explorations, Inc.		
Driller	G. Peterson **GEI Rep.** I. Rawlings	**Install Date**	9/15/2015

Survey Datum: NAVD88

Ground Elevation (est.): 198



Date	Time	Distance to ▼ below top of riser pipe
9/16/2015	7:00 AM	17.083 ft
9/18/2015	10:00 AM	17.3 ft

Length of Surface Casing above Ground	3.0 ft
Dist. Top of Surf. Casing to Top of Riser Pipe	3 inch
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	4.0 inch
Type of Surface Casing	Steel guardpipe
Depth Bottom of Surface Casing	2.0 ft
ID and OD of Riser Pipe	2.1-in-ID/2.3-in-OD
Type of Riser Pipe	PVC
Type of Backfill around Riser Pipe	2s Filter Sand
Diameter of Borehole	4.5 inch
Depth Top of Seal	12.0 ft
Type of Seal	Bentonite Chips
Depth Bottom of Seal	16.0 ft
Depth Top of Screened Section	16.0 ft
Type of Screen	Slotted PVC
Description of Screen Openings	Horizontal
ID and OD of Screened Section	2.1-in-ID/2.3-in-OD
Type of Filter Material	2S Filter Sand
Depth Bottom of Screened Section	26.0 ft
Depth Bottom of Silt Trap	NA
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	26.0 ft

Notes:

GEI Consultants

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Groundwater Well Installation Log

NB3

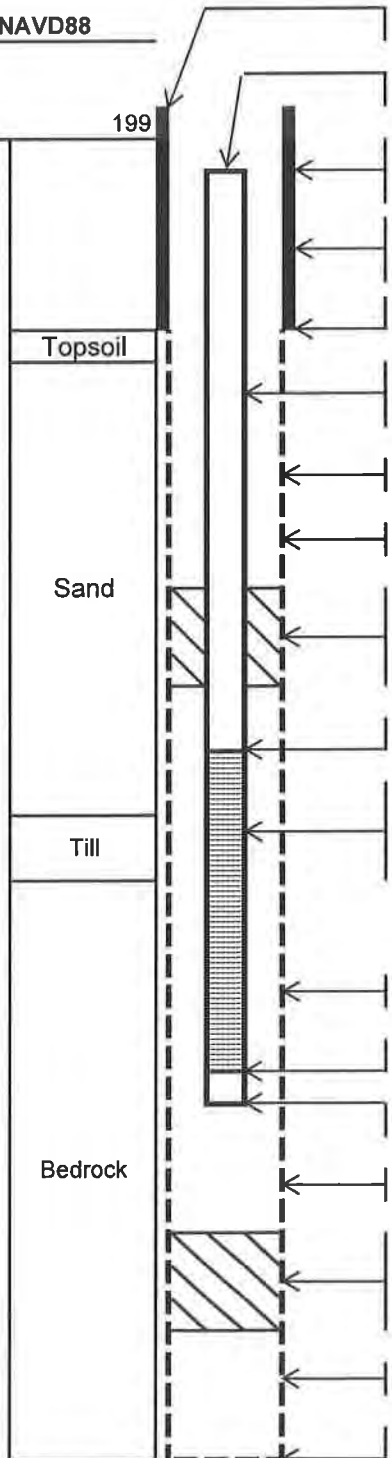
Project	Exelon II Facility West Medway	GEI Proj. No.	151143-0
City / Town	West Medway, Massachusetts	Location	See Plan.
Client	Gemma Power Systems, LLC		
Contractor	GeoLogic-Earth Explorations, Inc.		
Driller	G. Peterson — GEI Rep. I. Rawlings	Install Date	9/16/2015

Survey Datum: NAVD88

Ground Elevation (est.): 199

Date	Time	Distance to ▼ below top of riser pipe
9/16/2015	7:00 AM	19 ft
9/18/2015	2:00 PM	19 ft

General Soil Conditions (Not to Scale)



Length of Surface Casing above Ground	3.0 ft - 4 inch
Dist. Top of Surf. Casing to Top of Riser Pipe	4 inch
Type and Thickness of Seal around Surface Casing	NA
ID of Surface Casing	4.0 inch
Type of Surface Casing	Steel guardpipe
Depth Bottom of Surface Casing	20.0 inch
ID and OD of Riser Pipe	2.1-in-ID/2.3-in-OD
Type of Riser Pipe	PVC
Type of Backfill around Riser Pipe	2s Filter Sand
Diameter of Borehole	4.5 inch
Depth Top of Seal	2.0 ft
Type of Seal	Bentonite Chips
Depth Bottom of Seal	4.0 ft
Depth Top of Screened Section	6.0 ft
Type of Screen	Slotted PVC
Description of Screen Openings	Horizontal
ID and OD of Screened Section	2.1-in-ID/2.3-in-OD
Type of Filter Material	2S Filter Sand
Depth Bottom of Screened Section	26.0 ft
Depth Bottom of Silt Trap	NA
Depth Bottom of Filter Material	NA
Depth Top of Seal	NA
Type of Seal	NA
Depth Bottom of Seal	NA
Type of Backfill below Filter Material	NA
Bottom of Borehole	26.0 ft

Notes:

GEI Consultants

BORING INFORMATION

LOCATION: See Plan.

GROUND SURFACE EL. (ft): 199 **DATE START/END:** 9/15/2015 - 9/16/2015

VERTICAL DATUM: NAVD 88 **DRILLING COMPANY:** Geologic, Inc.

TOTAL DEPTH (ft): 26.0 **DRILLER NAME:** G. Peterson

LOGGED BY: I.Rawlings **RIG TYPE:** Track Mounted CME D-6

BORING NB3

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer **CASING I.D./O.D.:** 4.25 inch / 4.5 inch **CORE BARREL TYPE:** NX

AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.25 inch **CORE BARREL I.D./O.D.** 2.1 inch / 2.3 inch

DRILLING METHOD: Rotary Drilling with Casing

WATER LEVEL DEPTHS (ft): ⊻ 16.0 9/17/2015 7:00 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/13	3-10-6-12		SAND AND GRAVEL	S1(0"-4"): TOPSOIL. S1(4"-13"): SILTY GRAVEL WITH SAND (GM); 55% fine to coarse gravel up to 1"; 25% fine sand; 20% nonplastic fines; gray brown.
		S2	2 to 4	24/12	18-18-20-15			S2: WIDELY GRADED GRAVEL WITH SILT AND SAND (GW-GM); 55% fine to coarse gravel up to 1.5", 35% fine to coarse sand, 10% nonplastic fines, gray brown.
	5	S3	4 to 6	24/12	10-8-9-10		SANDY SILT/SILTY SAND	S3: SANDY SILT (ML); 70% low plasticity fines, 30% fine sand; gray.
		S4	6 to 8	24/11	6-7-10-10			S4: SILTY SAND (SM); 51% fine sand; 49% nonplastic fines; gray.
190		S5	8 to 10	24/16	8-8-10-11			S5: SANDY SILT (ML); 55% nonplastic fines, 45% fine to medium sand, gray.
	10	S6	10 to 12	24/14	8-11-12-11			S6: SILT (ML); 99.2% nonplastic fines; 0.8% fine sand; gray.
		S7	12 to 14	24/12	11-15-22-26		TILL	S7: SILTY SAND WITH GRAVEL (SM); 60% fine to medium sand, 20% nonplastic fines, 20% fine to coarse gravel up to 1", gray.
	15	S8	14 to 16	24/9	16-17-14-19			S8: WIDELY GRADED GRAVEL WITH SAND (GW); 80% fine to coarse gravel up to 1.5", 20% medium to coarse sand.
		C1	16 to 21	60/25	18		BEDROCK	C1: GRANITE; light pinkish gray; very hard; moderately weathered; severely fractured in recovered section; RQD = 18%
180	20							
		C2	21 to 26	60/57	88			C2: GRANITE; light pinkish gray; very hard; coarse grained; joints moderately weathered, one joint at 18", and approximately 45 degrees from horizontal; RQD = 88%.
	25							
								Bottom of boring at depth 26 ft. Installed monitoring well 9/16/2015.
170								

NOTES:
Weather clear - Water level measured 23 hours after completion.

PROJECT NAME: West Medway II Facility Project

CITY/STATE: Medway, MA

GEI PROJECT NUMBER: 1511430

GEI Consultants

BORING INFORMATION

LOCATION: See Plan.

GROUND SURFACE EL. (ft): 199 **DATE START/END:** 9/16/2015 - 9/17/2015

VERTICAL DATUM: NAVD 88 **DRILLING COMPANY:** Geologic, Inc.

TOTAL DEPTH (ft): 24.0 **DRILLER NAME:** G. Peterson

LOGGED BY: I.Rawlings **RIG TYPE:** Track Mounted CME D--6

BORING NB12

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer **CASING I.D./O.D.:** 4.25 inch / 4.5 inch **CORE BARREL TYPE:** NX

AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.25 inch **CORE BARREL I.D./O.D.** 2.1 inch / 2.3 inch

DRILLING METHOD: Rotary Drilling with Casing

WATER LEVEL DEPTHS (ft): ▼ 15.5 9/16/2015 12:30 pm ▼ 15.3 9/17/2015 7:30 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation
= Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/13	2-2-5-10			S1 (0"-6"): TOPSOIL
							SAND AND GRAVEL	S1 (6"-13"): SILTY SAND WITH GRAVEL (SM); 55% fine to coarse sand; 30% fine gravel up to 1/2"; 15% nonplastic fines; light brown.
	5	S2	4 to 6	24/12	20-25-28-20			S2: WIDELY GRADED GRAVEL WITH SILT AND SAND (GW-GM); 55% fine to coarse gravel up to 1-1/2"; 35% fine to coarse sand; 10% nonplastic fines; brown.
190	10	S3	9 to 11	24/13	9-9-10-9		SILT	S3: SANDY SILT (ML); 75% low plasticity fines; 15% fine to medium sand; gray.
	15	S4	14 to 16	24/12	27-18-25-17		TILL	S4: SILTY SAND (SM); 50% fine to coarse sand; 20% fine to coarse gravel up to 3/4"; 30% nonplastic fines; gray.
180	20	C1	19 to 24	60/52	65		BEDROCK	C1: GRANITE; gray; very hard; medium grained; joints slightly weathered, spaced 3"-9", and approximately 35 degrees from horizontal; RQD=65%

NOTES:
Weather clear - Water level measured 19 hours after completion.

Bottom of boring at depth 24 ft.
Left overnight with PVC pipe. Borehole backfilled with c[illegible]
9/17/15.

PROJECT NAME: West Medway II Facility Project

CITY/STATE: Medway, MA

GEI PROJECT NUMBER: 1511430

GEI Consultants

BORING INFORMATION

LOCATION: See Plan.	
GROUND SURFACE EL. (ft): 199	**DATE START/END:** 9/16/2015 - 9/18/2015
VERTICAL DATUM: NAVD 88	**DRILLING COMPANY:** Geologic, Inc.
TOTAL DEPTH (ft): 17.0	**DRILLER NAME:** G. Peterson
LOGGED BY: I.Rawlings	**RIG TYPE:** Track Mounted CME D-6

BORING NB13

PAGE 1 of 1

DRILLING INFORMATION

HAMMER TYPE: Automatic Hammer	**CASING I.D./O.D.:** 4.25 inch / 4.5 inch	**CORE BARREL TYPE:** NX
AUGER I.D./O.D.: NA / NA	**DRILL ROD O.D.:** 2.25 inch	**CORE BARREL I.D./O.D.** 2.1 inch / 2.3 inch

DRILLING METHOD: Rotary Drilling with Casing

WATER LEVEL DEPTHS (ft): ▼ 16.0 9/17/2015 9:00 am ▼ 16.3 9/18/2015 7:00 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/9	2-3-5-5			S1 (0"-9"): TOPSOIL
	5	S2	4 to 6	24/11	14-27-22-45		SILT	S2 (0"-5"): SILT (ML); 95% nonplastic fines; <5% fine sand; gray.
							TILL	S2 (5"-11"): WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); 60% fine to coarse sand; 30% fine to coarse gravel up to 1"; 10% nonplastic fines; brown.
190	10	S3	9 to 11	24/13	30-22-17-25	Driller notes hitting rock at 11.5 feet	TILL	S3; WIDELY GRADED GRAVEL WITH SAND AND SILT (GW-GM); 55% fine to coarse gravel up to 1-1/2"; 35% fine to coarse sand; 10% nonplastic fines; brown.
	15	C1	13 to 17	48/48	73		BEDROCK	C1: GRANITE; gray; very hard; coarse grained; joints slightly weathered, coated in fine sand, spaced 3"-18", and approximately 30 degrees from horizontal; RQD=73%
180	20					Core barrel jammed at 17 feet		Bottom of boring at depth 17 ft. Left overnight with PVC pipe. Borehole backfilled with cuttings 9/18/15.

NOTES:
Weather clear - Water level measured 22 hours after completion.

PROJECT NAME: West Medway II Facility Project
CITY/STATE: Medway, MA
GEI PROJECT NUMBER: 1511430

GEI Consultants

BORING INFORMATION

NORTHING: 2875006
GROUND SURFACE EL. (ft): 200
VERT./HORIZ. DATUMS: NAVD 88/MA State Plane - NAD 83
TOTAL DEPTH (ft): 12.5
LOGGED BY: A. Niesen

EASTING: 671120
DATE START/END: 11/10/2014 - 11/10/2014
DRILLING COMPANY: GeoLogic-Earth Exploration
DRILLER NAME: M. Ferreira
RIG TYPE: CME LC-60

BORING B4

DRILLING INFORMATION

HAMMER TYPE: Automatic
AUGER I.D./O.D.: NA / 5.5 inch
DRILLING METHOD: Hollow Stem Auger
WATER LEVEL DEPTHS (ft): Not measured

CASING I.D./O.D.: NA/ NA
DRILL ROD O.D.: 2.625 inch

CORE BARREL TYPE: NA
CORE BARREL I.D./O.D.: NA / NA

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/15	WOH-2-1-8			S1 (0-8"): TOPSOIL.
							SM	S1 (8-15"): SILTY SAND (SM); ~75% fine to coarse sand, ~15% nonplastic fines, ~10% fine gravel up to 1/2 inch. Dark brown.
		S2	2 to 4	24/13	7-11-13-12		SAND&GRAVEL	S2: WIDELY GRADED SAND WITH GRAVEL (SW); ~55% fine to coarse sand, ~40% fine to coarse gravel up to 1 inch, <5% nonplastic fines. Light brown.
	5	S3	4 to 6	24/11	8-10-9-8	Possible groundwater around 7-8 feet.	SAND	S3: NARROWLY GRADED SAND WITH SILT (SP-SM); ~85% fine sand, ~10% nonplastic fines, <5% gravel. Light brown.
190	10	S4	10 to 12	24/11	20-24-24-25	Hit a cobble/boulder at 8.5 ft.	TILL	S4: SILTY SAND WITH GRAVEL (SM); ~65% fine to coarse sand, ~20% nonplastic fines, ~15% fine gravel up to 3/4 inch. Brown.
						Auger refusal, possible top of bedrock at 12.5 ft.		Bottom of boring at depth 12.5 ft. Backfilled with drill cuttings.

NOTES: - Boring location coordinates estimated based on data provided by Exelon Power, on drawing C-0001 Rev. A, BORING LOCATION PLAN, prepared by CH2M HILL, dated 10/13/14.
- Ground surface elevations estimated from drawing TP-1, Topographic Plan, prepared by Beals and Thomas, Inc., dated 09/18/14.

PROJECT NAME: Exelon West Medway NEMA Project
CITY/STATE: Medway, Massachusetts
GEI PROJECT NUMBER: 141354-0

GEI Consultants

BORING INFORMATION

NORTHING: 2874939 **EASTING:** 671156
GROUND SURFACE EL. (ft): 199 **DATE START/END:** 11/14/2014 - 11/14/2014
VERT./HORIZ. DATUMS: NAVD 88/MA State Plane - NAD 83 **DRILLING COMPANY:** GeoLogic-Earth Exploration
TOTAL DEPTH (ft): 24.0 **DRILLER NAME:** G. Peterson
LOGGED BY: A. Niesen **RIG TYPE:** Mobile B-57

BORING B5

DRILLING INFORMATION

HAMMER TYPE: Donut Hammer - spooling winch **CASING I.D./O.D.:** NA/ NA **CORE BARREL TYPE:** NX
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** 1.875 inch / 3 inch
DRILLING METHOD: Rotary Drilling with Casing
WATER LEVEL DEPTHS (ft): ▼ 12.9 11/14/2014 2:30 pm

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/14	2-3-4-5		SILTY SAND	S1: SILTY SAND (SM); ~60% fine to coarse sand, ~30% nonplastic fines, 10% gravel. Reddish-brown.
	5	S2	4 to 4.8	9/8	64-100/3"		TILL	S2: SILTY SAND WITH GRAVEL (SM); ~65% fine to medium sand, ~20% nonplastic fines, ~15% gravel. Light brown. GLACIAL TILL.
190	10	C1	6 to 11	60/22	25		TILL	C1: BOULDER; hard, fine to coarse grained, fractured at 2-inches and 16-inches, Gray/Dark gray.
		S3	11 to 13	24/14	47-62-48-28		TILL	S3: SILTY SAND WITH GRAVEL (SM); ~50% fine to coarse sand, ~30% fine to coarse gravel up to 1-inch, ~20% nonplastic fines. Light brown. GLACIAL TILL.
	15	S4	14 to 16	24/11	27-18-18-68		TILL	S4: 0"-5" SILTY SAND WITH GRAVEL (SM); Similar to S3. 5"-11" SILTY SAND (SM); ~55% fine to medium sand, ~40% nonplastic fines, <5% gravel.
						No drill water return. Possible top of rock at 17 ft.		
180	20	C2	19 to 24	60/52	43	Core times (min/ft): 1.5, 1, 1, 2, 1.5	BEDROCK	C2: GRANITE; hard, fine to coarse grained, fractures spared 0"-12" and 30"-45". Gray/Dark-gray.
								Bottom of boring at depth 24 ft. Backfilled with drill cuttings.

NOTES: - Boring location coordinates estimated based on data provided by Exelon Power, on drawing C-0001 Rev. A, BORING LOCATION PLAN, prepared by CH2M HILL, dated 10/13/14.
- Ground surface elevations estimated from drawing TP-1, Topographic Plan, prepared by Beals and Thomas, Inc., dated 09/18/14.

PROJECT NAME: Exelon West Medway NEMA Project
CITY/STATE: Medway, Massachusetts
GEI PROJECT NUMBER: 141354-0

GEI Consultants

BORING INFORMATION

NORTHING: 2874930 | **EASTING:** 670953

GROUND SURFACE EL. (ft): 199 | **DATE START/END:** 11/10/2014 - 11/10/2014

VERT./HORIZ. DATUMS: NAVD 88/MA State Plane - NAD 83 | **DRILLING COMPANY:** GeoLogic-Earth Exploration

TOTAL DEPTH (ft): 16.0 | **DRILLER NAME:** M. Ferreira

LOGGED BY: A. Niesen | **RIG TYPE:** CME LC-60

BORING B6

DRILLING INFORMATION

HAMMER TYPE: Automatic | **CASING I.D./O.D.:** NA/ NA | **CORE BARREL TYPE:** NA

AUGER I.D./O.D.: NA / 5.5 inch | **DRILL ROD O.D.:** 2.625 inch | **CORE BARREL I.D./O.D.:** NA / NA

DRILLING METHOD: Hollow Stem Auger

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation
= Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/18	1-2-2-4			S1 (0-11"): TOPSOIL.
							SM	S1 (11-18"): SILTY SAND (SM); ~65% fine to coarse sand, ~25% nonplastic fines, ~10% fine gravel. Reddish-brown.
		S2	2 to 4	24/16	8-18-19		SAND AND GRAVEL	S2: WIDELY GRADED GRAVEL WITH SAND (GW); ~50% fine to coarse gravel up to 1 inch, ~45% fine to coarse sand, <5% nonplastic fines. Light brown.
	5	S3	4 to 6	24/13	3-11-10-54	Hit a cobble/boulder in last 6 inches of S3. Auger refusal. Driller moved boring location 2 feet and drilled to 6.5 ft without sampling.	SAND AND GRAVEL	S3: SILTY GRAVEL WITH SAND (GM); ~50% fine to coarse gravel up to 1.5 inches, ~25% fine to coarse sand, ~25% nonplastic fines. Light brown.
190	10	S4	9 to 11	24/16	12-22-21-23	Boulders encountered at 6.5 and 7.5 ft.	TILL	S4: SILTY SAND WITH GRAVEL (SM); ~60% fine to medium sand, ~25% nonplastic fines, ~15% fine to coarse gravel up to 1 inch, Gray-brown.
	15	S5	14 to 16	24/17	11-13-17-15		TILL	S5: SILTY SAND WITH GRAVEL (SM); Similar to S4.
180	20					Groundwater not observed during drilling.		Bottom of boring at depth 16 ft. Backfilled with drill cuttings.

NOTES: - Boring location coordinates estimated based on data provided by Exelon Power, on drawing C-0001 Rev. A, BORING LOCATION PLAN, prepared by CH2M HILL, dated 10/13/14.
- Ground surface elevations estimated from drawing TP-1, Topographic Plan, prepared by Beals and Thomas, Inc., dated 09/18/14.

PROJECT NAME: Exelon West Medway NEMA Project

CITY/STATE: Medway, Massachusetts

GEI PROJECT NUMBER: 141354-0

GEI Consultants

Appendix B
Pre-Development Hydrologic Analysis

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

1422.10
Medway, Massachusetts

CLIENT/PROJECT:

Exelon
West Medway II

SUBJECT/TITLE:

Existing Conditions Hydrology Analysis

OBJECTIVE OF CALCULATION:

- To determine the pre-development peak rates of runoff from the site for the 2-, 10-, 25- and 100-year storm events.

CALCULATION METHOD(S):

- CN and Tc determined based on TR-55 methodology.
- Runoff rates computed using HydroCAD version 10.00.

ASSUMPTIONS:

- Surface cover types and boundaries have been estimated based upon MassGIS, USGS Color Ortho Imagery 2008.
- Hydrologic group of on-site soils was determined based on the United States Department of Agriculture, NRCS Soil Survey information.
- Per TR-55, a minimum time of concentration of 6.0 minutes was used.

SOURCES OF DATA/EQUATIONS:

- Pre-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc, file 142210P013A-001.
- TR-55 Urban Hydrology for Small Watersheds, SCS, 1986.
- NRCS Soil Survey for Middlesex County downloaded from Web Soil Survey 2.0 on March 31, 2015.

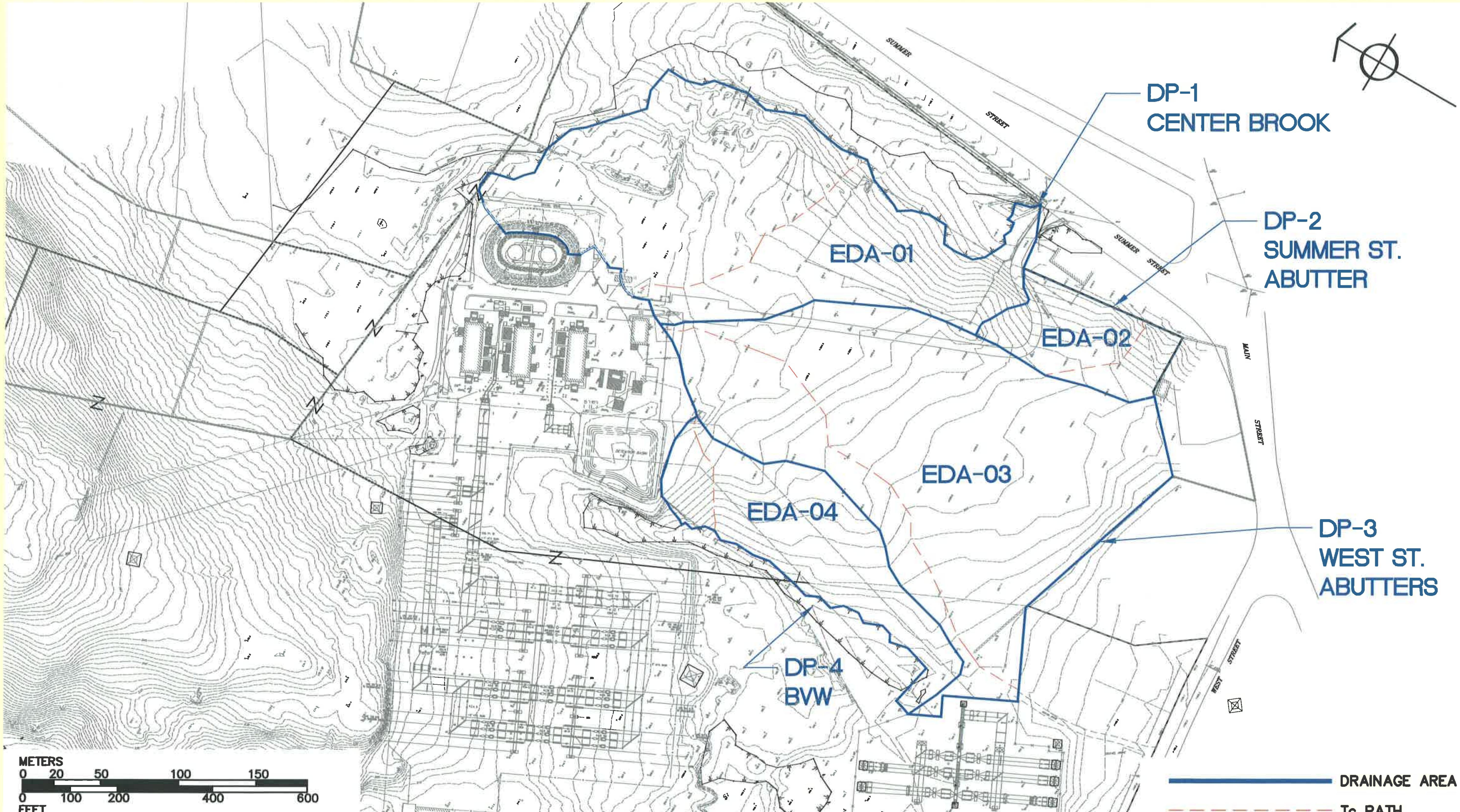
CONCLUSIONS:

Storm Event	Design Point 1 Center Brook	Design Point 2 Summer St. Abutter	Design Point 3 West Street Abutters	Design Point 4 BVW
2-year	0.01	0.01	0.01	0.00
10-year	0.20	0.16	0.25	0.03
25-year	0.83	0.39	0.93	0.08
100-year	3.17	1.26	3.60	0.65

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	E. Clark	04-06-2015	J. Murphy	05-01-2015	E. Clark	04-06-2015
1.	E. Clark	1/6/2016	J. Murphy	1/12/16		

West Medway II

Medway, Massachusetts



BEALS + THOMAS
Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

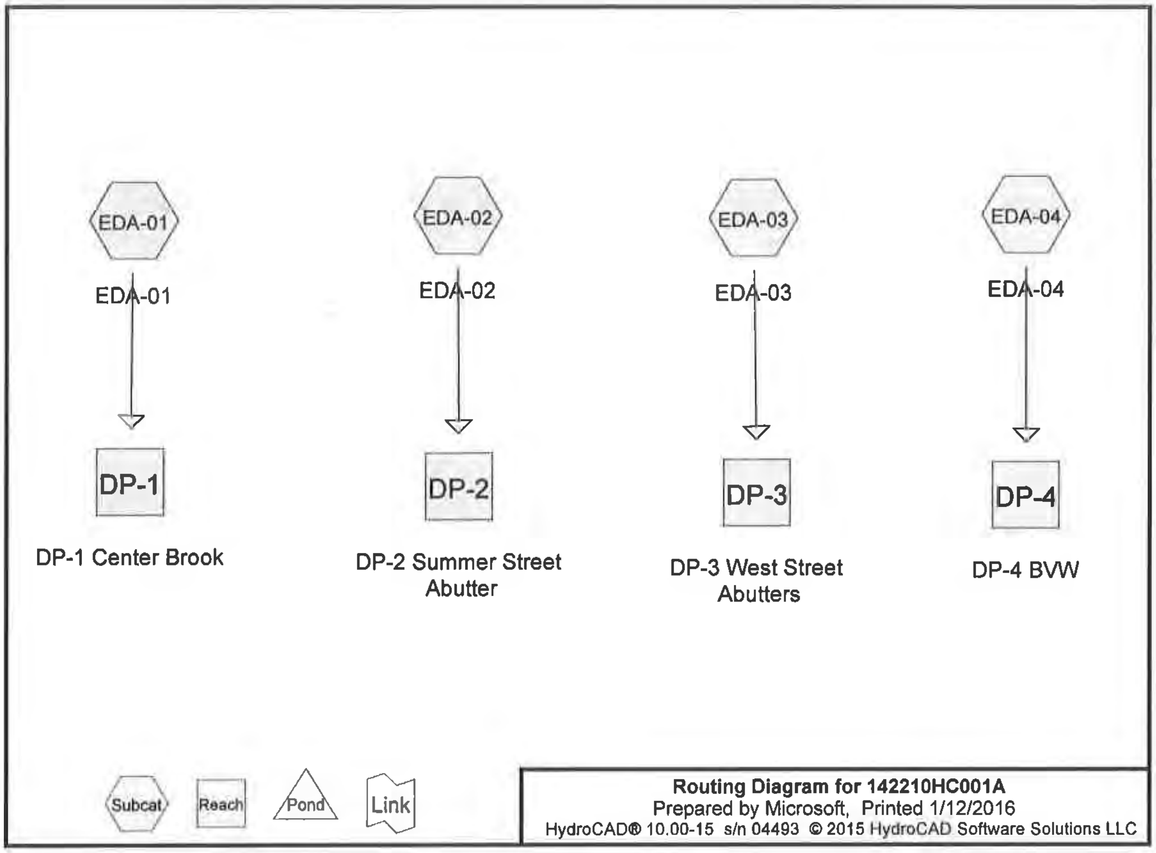
B+T Drawing No. 142210P013A-001 Date: 1/06/2016 Scale: 1" = 200'

Pre-Development Conditions

Hydrologic Areas Map

Figure

1



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.980	49	50-75% Grass cover, Fair, HSG A (EDA-01)
0.180	76	Gravel roads, HSG A (EDA-01, EDA-02)
14.400	39	Pasture/grassland/range, Good, HSG A (EDA-01, EDA-02, EDA-03, EDA-04)
0.240	98	Paved parking, HSG A (EDA-03)
0.620	98	Paved roads w/curbs & sewers, HSG A (EDA-01, EDA-02)
6.260	30	Woods, Good, HSG A (EDA-01, EDA-02, EDA-03, EDA-04)
22.680	**39**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
22.680	HSG A	EDA-01, EDA-02, EDA-03, EDA-04
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
22.680		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.980	0.000	0.000	0.000	0.000	0.980	50-75% Grass cover, Fair	EDA-01
0.180	0.000	0.000	0.000	0.000	0.180	Gravel roads	EDA-01, EDA-02
14.400	0.000	0.000	0.000	0.000	14.400	Pasture/grassland/range, Good	EDA-01, EDA-02, EDA-03, EDA-04
0.240	0.000	0.000	0.000	0.000	0.240	Paved parking	EDA-03
0.620	0.000	0.000	0.000	0.000	0.620	Paved roads w/curbs & sewers	EDA-01, EDA-02
6.260	0.000	0.000	0.000	0.000	6.260	Woods, Good	EDA-01, EDA-02, EDA-03, EDA-04
22.680	**0.000**	**0.000**	**0.000**	**0.000**	**22.680**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEDA-01: EDA-01	Runoff Area=8.080 ac 6.68% Impervious Runoff Depth=0.00" Flow Length=588' Tc=21.0 min CN=40 Runoff=0.01 cfs 0.002 af
SubcatchmentEDA-02: EDA-02	Runoff Area=1.470 ac 5.44% Impervious Runoff Depth=0.03" Flow Length=271' Tc=9.5 min CN=44 Runoff=0.01 cfs 0.004 af
SubcatchmentEDA-03: EDA-03	Runoff Area=10.210 ac 2.35% Impervious Runoff Depth=0.00" Flow Length=1,170' Tc=29.1 min CN=40 Runoff=0.01 cfs 0.002 af
SubcatchmentEDA-04: EDA-04	Runoff Area=2.920 ac 0.00% Impervious Runoff Depth=0.00" Flow Length=256' Tc=10.9 min CN=36 Runoff=0.00 cfs 0.000 af
Reach DP-1: DP-1 Center Brook	Inflow=0.01 cfs 0.002 af Outflow=0.01 cfs 0.002 af
Reach DP-2: DP-2 Summer Street Abutter	Inflow=0.01 cfs 0.004 af Outflow=0.01 cfs 0.004 af
Reach DP-3: DP-3 West Street Abutters	Inflow=0.01 cfs 0.002 af Outflow=0.01 cfs 0.002 af
Reach DP-4: DP-4 BVW	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 22.680 ac Runoff Volume = 0.008 af Average Runoff Depth = 0.00"
96.21% Pervious = 21.820 ac 3.79% Impervious = 0.860 ac

Summary for Subcatchment EDA-01: EDA-01

Runoff = 0.01 cfs @ 24.01 hrs, Volume= 0.002 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
0.540	98	Paved roads w/curbs & sewers, HSG A
0.070	76	Gravel roads, HSG A
4.250	30	Woods, Good, HSG A
2.240	39	Pasture/grassland/range, Good, HSG A
0.980	49	50-75% Grass cover, Fair, HSG A
8.080	40	Weighted Average
7.540		93.32% Pervious Area
0.540		6.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	50	0.0250	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.5	22	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.8	197	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	26	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.7	153	0.0180	0.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.0	140	0.0540	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.0	588	Total			

Summary for Subcatchment EDA-02: EDA-02

Runoff = 0.01 cfs @ 15.76 hrs, Volume= 0.004 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
0.080	98	Paved roads w/curbs & sewers, HSG A
0.110	76	Gravel roads, HSG A
0.240	30	Woods, Good, HSG A
1.040	39	Pasture/grassland/range, Good, HSG A
1.470	44	Weighted Average
1.390		94.56% Pervious Area
0.080		5.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0140	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.8	90	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	97	0.0620	1.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	34	0.0790	1.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	271	Total			

Summary for Subcatchment EDA-03: EDA-03

Runoff = 0.01 cfs @ 24.03 hrs, Volume= 0.002 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
0.240	98	Paved parking, HSG A
0.730	30	Woods, Good, HSG A
9.240	39	Pasture/grassland/range, Good, HSG A
10.210	40	Weighted Average
9.970		97.65% Pervious Area
0.240		2.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.1	155	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.8	38	0.0050	0.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	115	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	58	0.0340	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	205	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	23	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	381	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.1	39	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	106	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.1	1,170	Total			

Summary for Subcatchment EDA-04: EDA-04

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
1.040	30	Woods, Good, HSG A
1.880	39	Pasture/grassland/range, Good, HSG A
2.920	36	Weighted Average
2.920		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0560	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	34	0.0210	0.72		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.6	148	0.0510	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0590	1.21		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.9	256	Total			

Summary for Reach DP-1: DP-1 Center Brook

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8.080 ac, 6.68% Impervious, Inflow Depth = 0.00" for Norfolk-002yr event
Inflow = 0.01 cfs @ 24.01 hrs, Volume= 0.002 af
Outflow = 0.01 cfs @ 24.01 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: DP-2 Summer Street Abutter

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.470 ac, 5.44% Impervious, Inflow Depth = 0.03" for Norfolk-002yr event
Inflow = 0.01 cfs @ 15.76 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 15.76 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: DP-3 West Street Abutters

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.210 ac, 2.35% Impervious, Inflow Depth = 0.00" for Norfolk-002yr event
Inflow = 0.01 cfs @ 24.03 hrs, Volume= 0.002 af
Outflow = 0.01 cfs @ 24.03 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: DP-4 BVW

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.920 ac, 0.00% Impervious, Inflow Depth = 0.00" for Norfolk-002yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-01: EDA-01 Runoff Area=8.080 ac 6.68% Impervious Runoff Depth=0.17"
Flow Length=588' Tc=21.0 min CN=40 Runoff=0.20 cfs 0.117 af

Subcatchment EDA-02: EDA-02 Runoff Area=1.470 ac 5.44% Impervious Runoff Depth=0.31"
Flow Length=271' Tc=9.5 min CN=44 Runoff=0.16 cfs 0.038 af

Subcatchment EDA-03: EDA-03 Runoff Area=10.210 ac 2.35% Impervious Runoff Depth=0.17"
Flow Length=1,170' Tc=29.1 min CN=40 Runoff=0.25 cfs 0.147 af

Subcatchment EDA-04: EDA-04 Runoff Area=2.920 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=256' Tc=10.9 min CN=36 Runoff=0.03 cfs 0.017 af

Reach DP-1: DP-1 Center Brook Inflow=0.20 cfs 0.117 af
Outflow=0.20 cfs 0.117 af

Reach DP-2: DP-2 Summer Street Abutter Inflow=0.16 cfs 0.038 af
Outflow=0.16 cfs 0.038 af

Reach DP-3: DP-3 West Street Abutters Inflow=0.25 cfs 0.147 af
Outflow=0.25 cfs 0.147 af

Reach DP-4: DP-4 BVW Inflow=0.03 cfs 0.017 af
Outflow=0.03 cfs 0.017 af

Total Runoff Area = 22.680 ac Runoff Volume = 0.319 af Average Runoff Depth = 0.17"
96.21% Pervious = 21.820 ac 3.79% Impervious = 0.860 ac

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-01: EDA-01 Runoff Area=8.080 ac 6.68% Impervious Runoff Depth=0.36"
Flow Length=588' Tc=21.0 min CN=40 Runoff=0.83 cfs 0.240 af

Subcatchment EDA-02: EDA-02 Runoff Area=1.470 ac 5.44% Impervious Runoff Depth=0.56"
Flow Length=271' Tc=9.5 min CN=44 Runoff=0.39 cfs 0.068 af

Subcatchment EDA-03: EDA-03 Runoff Area=10.210 ac 2.35% Impervious Runoff Depth=0.36"
Flow Length=1,170' Tc=29.1 min CN=40 Runoff=0.93 cfs 0.304 af

Subcatchment EDA-04: EDA-04 Runoff Area=2.920 ac 0.00% Impervious Runoff Depth=0.19"
Flow Length=256' Tc=10.9 min CN=36 Runoff=0.08 cfs 0.047 af

Reach DP-1: DP-1 Center Brook Inflow=0.83 cfs 0.240 af
Outflow=0.83 cfs 0.240 af

Reach DP-2: DP-2 Summer Street Abutter Inflow=0.39 cfs 0.068 af
Outflow=0.39 cfs 0.068 af

Reach DP-3: DP-3 West Street Abutters Inflow=0.93 cfs 0.304 af
Outflow=0.93 cfs 0.304 af

Reach DP-4: DP-4 BVW Inflow=0.08 cfs 0.047 af
Outflow=0.08 cfs 0.047 af

Total Runoff Area = 22.680 ac Runoff Volume = 0.659 af Average Runoff Depth = 0.35"
96.21% Pervious = 21.820 ac 3.79% Impervious = 0.860 ac

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-01: EDA-01 Runoff Area=8.080 ac 6.68% Impervious Runoff Depth=0.84"
Flow Length=588' Tc=21.0 min CN=40 Runoff=3.17 cfs 0.567 af

Subcatchment EDA-02: EDA-02 Runoff Area=1.470 ac 5.44% Impervious Runoff Depth=1.15"
Flow Length=271' Tc=9.5 min CN=44 Runoff=1.26 cfs 0.141 af

Subcatchment EDA-03: EDA-03 Runoff Area=10.210 ac 2.35% Impervious Runoff Depth=0.84"
Flow Length=1,170' Tc=29.1 min CN=40 Runoff=3.60 cfs 0.716 af

Subcatchment EDA-04: EDA-04 Runoff Area=2.920 ac 0.00% Impervious Runoff Depth=0.56"
Flow Length=256' Tc=10.9 min CN=36 Runoff=0.65 cfs 0.136 af

Reach DP-1: DP-1 Center Brook Inflow=3.17 cfs 0.567 af
Outflow=3.17 cfs 0.567 af

Reach DP-2: DP-2 Summer Street Abutter Inflow=1.26 cfs 0.141 af
Outflow=1.26 cfs 0.141 af

Reach DP-3: DP-3 West Street Abutters Inflow=3.60 cfs 0.716 af
Outflow=3.60 cfs 0.716 af

Reach DP-4: DP-4 BVW Inflow=0.65 cfs 0.136 af
Outflow=0.65 cfs 0.136 af

Total Runoff Area = 22.680 ac Runoff Volume = 1.561 af Average Runoff Depth = 0.83"
96.21% Pervious = 21.820 ac 3.79% Impervious = 0.860 ac

Appendix C
Post-Development Hydrologic Analysis

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

1422.10
Medway, Massachusetts

CLIENT/PROJECT:

Exelon
West Medway II

SUBJECT/TITLE:

Proposed Conditions Hydrology Analysis

OBJECTIVE OF CALCULATION:

- To determine the post-development peak rates of runoff from the site for the 2-, 10-, 25- and 100-year storm events.

CALCULATION METHOD(S):

- CN and Tc determined based on TR-55 methodology.
- Runoff rates computed using HydroCAD version 10.00.

ASSUMPTIONS:

- Surface cover types and boundaries have been estimated based upon MassGIS, USGS Color Ortho Imagery 2008.
- Hydrologic group of on-site soils was determined based on the United States Department of Agriculture, NRCS Soil Survey information.
- Per TR-55, a minimum time of concentration of 6.0 minutes was used.

SOURCES OF DATA/EQUATIONS:

- Post-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc, file 142210P013A-002.
- TR-55 Urban Hydrology for Small Watersheds, SCS, 1986.
- NRCS Soil Survey for Middlesex County downloaded from Web Soil Survey 2.0 on March 31, 2015.

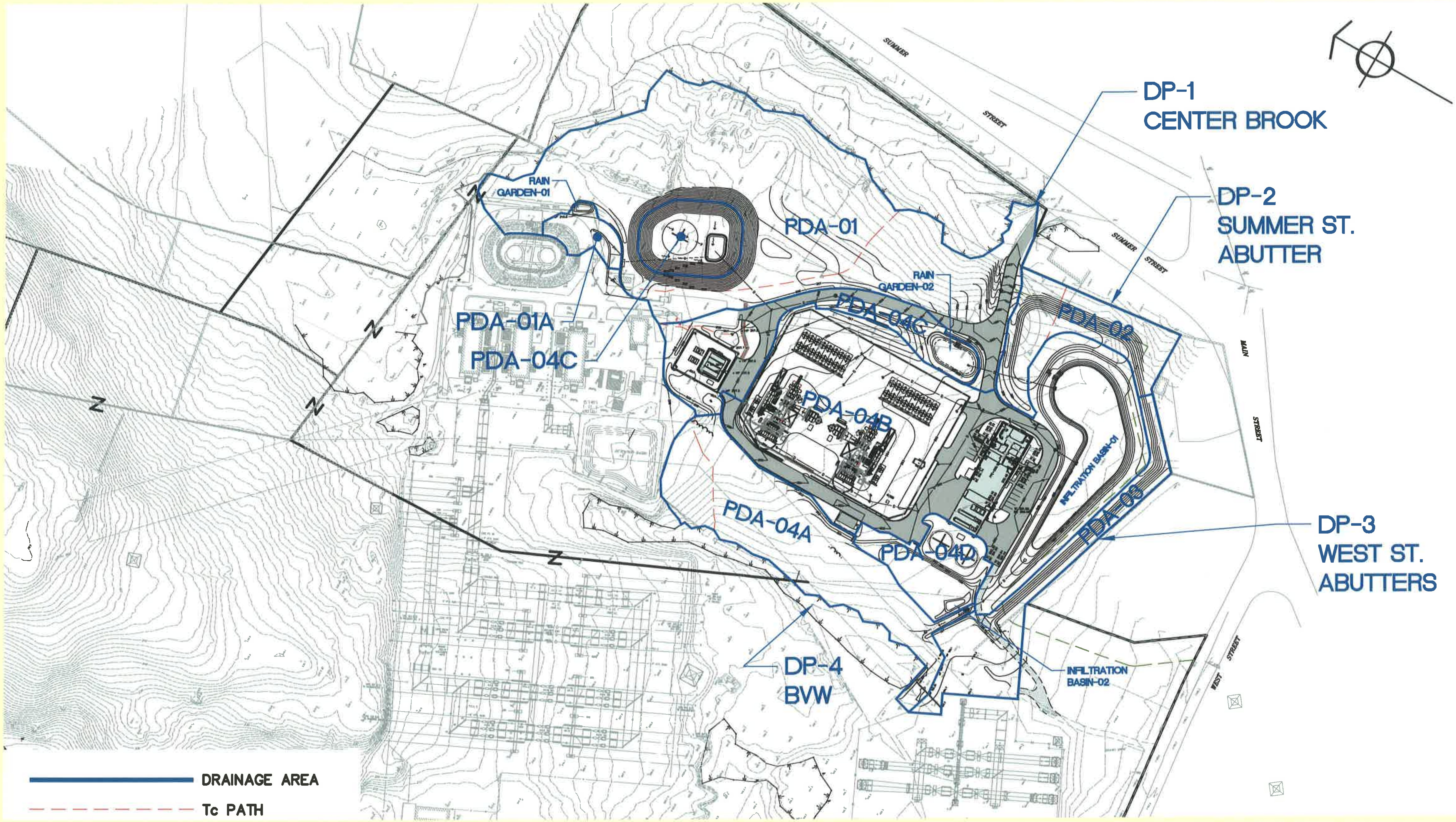
CONCLUSIONS:

Storm Event	Design Point 1 Center Brook	Design Point 2 Summer St. Abutter	Design Point 3 West Street Abutters	Design Point 4 BVW
2-year	0.01	0.00	0.01	0.00
10-year	0.17	0.02	0.22	0.02
25-year	0.76	0.11	0.54	0.07
100-year	2.88	0.47	1.55	0.56

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	E. Che	1/12/16	J. Murphy	1/12/16		

West Medway II

Medway, Massachusetts



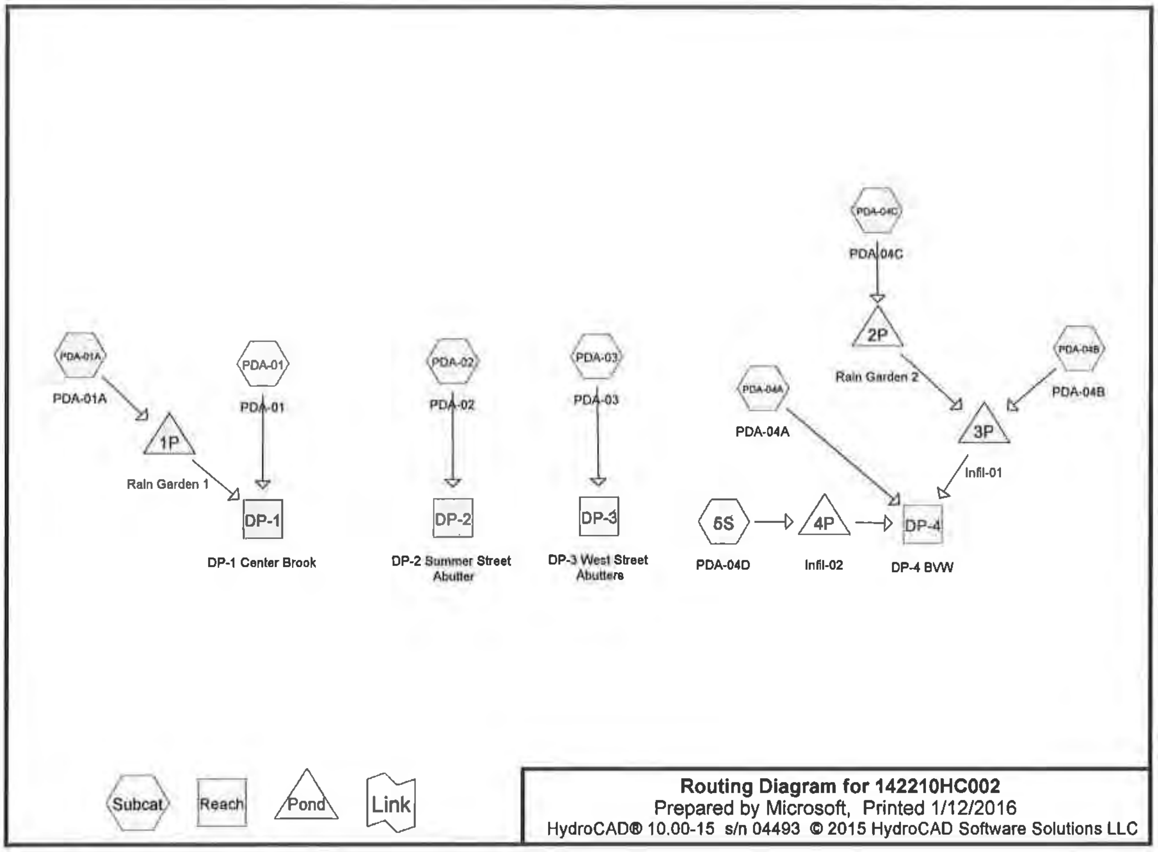
BEALS + THOMAS
Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

B+T Drawing No. 142210P013A-002 Date: 01/06/2016 Scale: 1" = 200'

Post-Development Conditions

Hydrologic Areas Map

Figure **2**



Routing Diagram for 142210HC002
Prepared by Microsoft, Printed 1/12/2016
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.300	49	50-75% Grass cover, Fair, HSG A (PDA-01)
8.518	39	>75% Grass cover, Good, HSG A (PDA-01, PDA-01A, PDA-02, PDA-03, PDA-04B, PDA-04C)
2.368	76	Gravel roads, HSG A (PDA-01, PDA-03, PDA-04A, PDA-04B, PDA-04C)
2.330	39	Pasture/grassland/range, Good, HSG A (5S, PDA-04A)
5.100	98	Paved parking, HSG A (5S, PDA-01, PDA-01A, PDA-04B, PDA-04C)
4.160	30	Woods, Good, HSG A (PDA-01, PDA-04A)
22.776	**55**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
22.776	HSG A	5S, PDA-01, PDA-01A, PDA-02, PDA-03, PDA-04A, PDA-04B, PDA-04C
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
22.776		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.300	0.000	0.000	0.000	0.000	0.300	50-75% Grass cover, Fair	PDA-01
8.518	0.000	0.000	0.000	0.000	8.518	>75% Grass cover, Good	PDA-01, PDA-01A, PDA-02, PDA-03, PDA-04B, PDA-04C
2.368	0.000	0.000	0.000	0.000	2.368	Gravel roads	PDA-01, PDA-03, PDA-04A, PDA-04B, PDA-04C
2.330	0.000	0.000	0.000	0.000	2.330	Pasture/grassland/range, Good	5S, PDA-04A
5.100	0.000	0.000	0.000	0.000	5.100	Paved parking	5S, PDA-01, PDA-01A, PDA-04B, PDA-04C
4.160	0.000	0.000	0.000	0.000	4.160	Woods, Good	PDA-01, PDA-04A
22.776	**0.000**	**0.000**	**0.000**	**0.000**	**22.776**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: PDA-04D	Runoff Area=0.820 ac 10.98% Impervious Runoff Depth=0.04" Tc=6.0 min CN=45 Runoff=0.00 cfs 0.003 af
SubcatchmentPDA-01: PDA-01	Runoff Area=7.040 ac 8.10% Impervious Runoff Depth=0.00" Flow Length=619' Tc=17.8 min CN=40 Runoff=0.01 cfs 0.002 af
SubcatchmentPDA-01A:PDA-01A	Runoff Area=0.300 ac 53.33% Impervious Runoff Depth=0.83" Tc=6.0 min CN=70 Runoff=0.26 cfs 0.021 af
SubcatchmentPDA-02: PDA-02	Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.00" Flow Length=126' Tc=6.3 min CN=39 Runoff=0.00 cfs 0.000 af
SubcatchmentPDA-03: PDA-03	Runoff Area=1.276 ac 0.00% Impervious Runoff Depth=0.06" Tc=6.0 min CN=46 Runoff=0.01 cfs 0.006 af
SubcatchmentPDA-04A:PDA-04A	Runoff Area=2.500 ac 0.00% Impervious Runoff Depth=0.00" Flow Length=266' Tc=11.1 min CN=36 Runoff=0.00 cfs 0.000 af
SubcatchmentPDA-04B: PDA-04B	Runoff Area=7.410 ac 39.81% Impervious Runoff Depth=0.93" Tc=6.0 min CN=72 Runoff=7.47 cfs 0.574 af
SubcatchmentPDA-04C: PDA-04C	Runoff Area=2.310 ac 57.58% Impervious Runoff Depth=1.09" Tc=6.0 min CN=75 Runoff=2.84 cfs 0.211 af
Reach DP-1: DP-1 Center Brook	Inflow=0.01 cfs 0.002 af Outflow=0.01 cfs 0.002 af
Reach DP-2: DP-2 Summer Street Abutter	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Reach DP-3: DP-3 West Street Abutters	Inflow=0.01 cfs 0.006 af Outflow=0.01 cfs 0.006 af

Reach DP-4: DP-4 BVW	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Pond 1P: Rain Garden 1	Peak Elev=209.00' Storage=2 cf Inflow=0.26 cfs 0.021 af Discarded=0.26 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.26 cfs 0.021 af
Pond 2P: Rain Garden 2	Peak Elev=201.31' Storage=3,512 cf Inflow=2 84 cfs 0.211 af Discarded=0.27 cfs 0.211 af Primary=0.00 cfs 0.000 af Outflow=0.27 cfs 0.211 af
Pond 3P: Infil-01	Peak Elev=195.38' Storage=12,766 cf Inflow=7.47 cfs 0.574 af Outflow=0.41 cfs 0.574 af
Pond 4P: Infil-02	Peak Elev=196.00' Storage=0 cf Inflow=0.00 cfs 0.003 af Discarded=0.00 cfs 0.003 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.003 af

Total Runoff Area = 22.776 ac Runoff Volume = 0.816 af Average Runoff Depth = 0.43"
77.61% Pervious = 17.676 ac 22.39% Impervious = 5.100 ac

Summary for Subcatchment 5S: PDA-04D

Runoff = 0.00 cfs @ 15.34 hrs, Volume= 0.003 af, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
0.730	39	Pasture/grassland/range, Good, HSG A
0.090	98	Paved parking, HSG A
0.820	45	Weighted Average
0.730		89.02% Pervious Area
0.090		10.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct Entry**

Summary for Subcatchment PDA-01: PDA-01

Runoff = 0.01 cfs @ 23.99 hrs, Volume= 0.002 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
0.570	98	Paved parking, HSG A
0.050	76	Gravel roads, HSG A
3.300	30	Woods, Good, HSG A
2.820	39	>75% Grass cover, Good, HSG A
0.300	49	50-75% Grass cover, Fair, HSG A
7.040	40	Weighted Average
6.470		91.90% Pervious Area
0.570		8.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0250	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.2	64	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.9	314	0.0070	0.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	108	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	83	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.8	619	Total			

Summary for Subcatchment PDA-01A: PDA-01A

Runoff = 0.26 cfs @ 12.10 hrs, Volume= 0.021 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
0.160	98	Paved parking, HSG A
0.140	39	>75% Grass cover, Good, HSG A
0.300	70	Weighted Average
0.140		46.67% Pervious Area
0.160		53.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct Entry**

Summary for Subcatchment PDA-02: PDA-02

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
1.120	39	>75% Grass cover, Good, HSG A
1.120		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	10	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.3400	4.08		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	34	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.3	126	Total			

Summary for Subcatchment PDA-03: PDA-03

Runoff = 0.01 cfs @ 15.06 hrs, Volume= 0.006 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
1.018	39	>75% Grass cover, Good, HSG A
0.258	76	Gravel roads, HSG A
1.276	46	Weighted Average
1.276		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct Entry**

Summary for Subcatchment PDA-04A: PDA-04A

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
0.040	76	Gravel roads, HSG A
0.860	30	Woods, Good, HSG A
1.600	39	Pasture/grassland/range, Good, HSG A
2.500	36	Weighted Average
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0560	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	34	0.0210	0.72		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.6	148	0.0510	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0590	1.21		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.1	266	Total			

Summary for Subcatchment PDA-04B: PDA-04B

Runoff = 7.47 cfs @ 12.10 hrs, Volume= 0.574 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
2.950	98	Paved parking, HSG A
2.590	39	>75% Grass cover, Good, HSG A
1.870	76	Gravel roads, HSG A
7.410	72	Weighted Average
4.460		60.19% Pervious Area
2.950		39.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment PDA-04C: PDA-04C

Runoff = 2.84 cfs @ 12.09 hrs, Volume= 0.211 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr Norfolk-002yr Rainfall=3.20"

Area (ac)	CN	Description
1.330	98	Paved parking, HSG A
0.830	39	>75% Grass cover, Good, HSG A
0.150	76	Gravel roads, HSG A
2.310	75	Weighted Average
0.980		42.42% Pervious Area
1.330		57.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct Entry

Summary for Reach DP-1: DP-1 Center Brook

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	7.340 ac,	9.95% Impervious,	Inflow Depth = 0.00"	for Norfolk-002yr event	
Inflow =	0.01 cfs @	23.99 hrs,	Volume=	0.002 af	
Outflow =	0.01 cfs @	23.99 hrs,	Volume=	0.002 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: DP-2 Summer Street Abutter

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1.120 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for Norfolk-002yr event	
Inflow =	0.00 cfs @	24.01 hrs,	Volume=	0.000 af	
Outflow =	0.00 cfs @	24.01 hrs,	Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: DP-3 West Street Abutters

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.276 ac, 0.00% Impervious, Inflow Depth = 0.06" for Norfolk-002yr event
Inflow = 0.01 cfs @ 15.06 hrs, Volume= 0.006 af
Outflow = 0.01 cfs @ 15.06 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP-4: DP-4 BVW

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.040 ac, 33.51% Impervious, Inflow Depth = 0.00" for Norfolk-002yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: Rain Garden 1

Inflow Area = 0.300 ac, 53.33% Impervious, Inflow Depth = 0.83" for Norfolk-002yr event
Inflow = 0.26 cfs @ 12.10 hrs, Volume= 0.021 af
Outflow = 0.26 cfs @ 12.10 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.1 min
Discarded = 0.26 cfs @ 12.10 hrs, Volume= 0.021 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 209.00' @ 12.10 hrs Surf.Area= 351 sf Storage= 2 cf

Plug-Flow detention time= 0.1 min calculated for 0.021 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (875.8 - 875.7)

Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	437 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	350	0	0
209.90	620	437	437

Device	Routing	Invert	Outlet Devices
#1	Discarded	209.00'	**0.52 cfs Exfiltration at all elevations**
#2	Primary	209.80'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.52 cfs @ 12.10 hrs HW=209.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=209.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond 2P: Rain Garden 2

Inflow Area = 2.310 ac, 57.58% Impervious, Inflow Depth = 1.09" for Norfolk-002yr event
Inflow = 2.84 cfs @ 12.09 hrs, Volume= 0.211 af
Outflow = 0.27 cfs @ 13.49 hrs, Volume= 0.211 af, Atten= 90%, Lag= 84.0 min
Discarded = 0.27 cfs @ 13.49 hrs, Volume= 0.211 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 201.31' @ 13.49 hrs Surf.Area= 4,908 sf Storage= 3,512 cf

Plug-Flow detention time= 128.5 min calculated for 0.211 af (100% of inflow)
Center-of-Mass det. time= 128.4 min (987.2 - 858.8)

Volume	Invert	Avail.Storage	Storage Description
#1	200.50'	7,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
200.50	3,600	0	0
201.00	4,600	2,050	2,050
202.00	5,600	5,100	7,150

Device	Routing	Invert	Outlet Devices
#1	Primary	201.35'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	200.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0 00'

Discarded OutFlow Max=0.27 cfs @ 13.49 hrs HW=201.31' (Free Discharge)
└─**2=Exfiltration** (Controls 0.27 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=200.50' (Free Discharge)
└─**1=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 3P: Infil-01

Inflow Area = 9.720 ac, 44.03% Impervious, Inflow Depth = 0.71" for Norfolk-002yr event
Inflow = 7.47 cfs @ 12.10 hrs, Volume= 0.574 af
Outflow = 0.41 cfs @ 15.71 hrs, Volume= 0.574 af, Atten= 94%, Lag= 217.0 min
Discarded = 0.41 cfs @ 15.71 hrs, Volume= 0.574 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 195.38' @ 15.71 hrs Surf.Area= 34,141 sf Storage= 12,766 cf

Plug-Flow detention time= 346.0 min calculated for 0.574 af (100% of inflow)
Center-of-Mass det. time= 346.0 min (1,214.8 - 868.8)

Volume	Invert	Avail.Storage	Storage Description
#1	195.00'	114,500 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.00	33,000	0	0
196.00	36,000	34,500	34,500
197.00	40,000	38,000	72,500
198.00	44,000	42,000	114,500

Device	Routing	Invert	Outlet Devices
#1	Discarded	195.00'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.41 cfs @ 15.71 hrs HW=195.38' (Free Discharge)
└─**1=Exfiltration** (Controls 0.41 cfs)

Summary for Pond 4P: Infil-02

Inflow Area = 0.820 ac, 10.98% Impervious, Inflow Depth = 0.04" for Norfolk-002yr event
Inflow = 0.00 cfs @ 15.34 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 15.34 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.2 min
Discarded = 0.00 cfs @ 15.34 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 196.00' @ 15.34 hrs Surf.Area= 500 sf Storage= 0 cf

Plug-Flow detention time= 0.2 min calculated for 0.003 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (1,107.2 - 1,107.1)

Volume	Invert	Avail.Storage	Storage Description
#1	196.00'	750 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	500	0	0
197.00	1,000	750	750

Device	Routing	Invert	Outlet Devices
#1	Discarded	196.00'	**0.52 cfs Exfiltration at all elevations**
#2	Primary	196.70'	**5.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.52 cfs @ 15.34 hrs HW=196.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=196.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: PDA-04D Runoff Area=0.820 ac 10.98% Impervious Runoff Depth=0.35"
Tc=6.0 min CN=45 Runoff=0.12 cfs 0.024 af

Subcatchment PDA-01: PDA-01 Runoff Area=7.040 ac 8.10% Impervious Runoff Depth=0.17"
Flow Length=619' Tc=17.8 min CN=40 Runoff=0.17 cfs 0.102 af

Subcatchment PDA-01A: PDA-01A Runoff Area=0.300 ac 53.33% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=70 Runoff=0.62 cfs 0.045 af

Subcatchment PDA-02: PDA-02 Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=126' Tc=6.3 min CN=39 Runoff=0.02 cfs 0.013 af

Subcatchment PDA-03: PDA-03 Runoff Area=1.276 ac 0.00% Impervious Runoff Depth=0.39"
Tc=6.0 min CN=46 Runoff=0.22 cfs 0.042 af

Subcatchment PDA-04A: PDA-04A Runoff Area=2.500 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=266' Tc=11.1 min CN=36 Runoff=0.02 cfs 0.014 af

Subcatchment PDA-04B: PDA-04B Runoff Area=7.410 ac 39.81% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=72 Runoff=16.87 cfs 1.216 af

Subcatchment PDA-04C: PDA-04C Runoff Area=2.310 ac 57.58% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=75 Runoff=5.95 cfs 0.425 af

Reach DP-1: DP-1 Center Brook Inflow=0.17 cfs 0.102 af
Outflow=0.17 cfs 0.102 af

Reach DP-2: DP-2 Summer Street Abutter Inflow=0.02 cfs 0.013 af
Outflow=0.02 cfs 0.013 af

Reach DP-3: DP-3 West Street Abutters Inflow=0.22 cfs 0.042 af
Outflow=0.22 cfs 0.042 af

Reach DP-4: DP-4 BVW Inflow=0.02 cfs 0.014 af
Outflow=0.02 cfs 0.014 af

Pond 1P: Rain Garden 1 Peak Elev=209.08' Storage=27 cf Inflow=0.62 cfs 0.045 af
Discarded=0.52 cfs 0.045 af Primary=0.00 cfs 0.000 af Outflow=0.52 cfs 0.045 af

Pond 2P: Rain Garden 2 Peak Elev=201.60' Storage=4,989 cf Inflow=5.95 cfs 0.425 af
Discarded=0.29 cfs 0.288 af Primary=2.57 cfs 0.138 af Outflow=2.86 cfs 0.425 af

Pond 3P: Infil-01 Peak Elev=196.18' Storage=41,021 cf Inflow=16.87 cfs 1.354 af
Outflow=0.44 cfs 0.900 af

Pond 4P: Infil-02 Peak Elev=196.00' Storage=1 cf Inflow=0.12 cfs 0.024 af
Discarded=0.12 cfs 0.024 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.024 af

Total Runoff Area = 22.776 ac Runoff Volume = 1.882 af Average Runoff Depth = 0.99"
77.61% Pervious = 17.676 ac 22.39% Impervious = 5.100 ac

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: PDA-04D Runoff Area=0.820 ac 10.98% Impervious Runoff Depth=0.61"
Tc=6.0 min CN=45 Runoff=0.28 cfs 0.042 af

Subcatchment PDA-01: PDA-01 Runoff Area=7.040 ac 8.10% Impervious Runoff Depth=0.36"
Flow Length=619' Tc=17.8 min CN=40 Runoff=0.76 cfs 0.210 af

Subcatchment PDA-01A: PDA-01A Runoff Area=0.300 ac 53.33% Impervious Runoff Depth=2.41"
Tc=6.0 min CN=70 Runoff=0.84 cfs 0.060 af

Subcatchment PDA-02: PDA-02 Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.31"
Flow Length=126' Tc=6.3 min CN=39 Runoff=0.11 cfs 0.029 af

Subcatchment PDA-03: PDA-03 Runoff Area=1.276 ac 0.00% Impervious Runoff Depth=0.67"
Tc=6.0 min CN=46 Runoff=0.54 cfs 0.071 af

Subcatchment PDA-04A: PDA-04A Runoff Area=2.500 ac 0.00% Impervious Runoff Depth=0.19"
Flow Length=266' Tc=11.1 min CN=36 Runoff=0.07 cfs 0.040 af

Subcatchment PDA-04B: PDA-04B Runoff Area=7.410 ac 39.81% Impervious Runoff Depth=2.59"
Tc=6.0 min CN=72 Runoff=22.40 cfs 1.599 af

Subcatchment PDA-04C: PDA-04C Runoff Area=2.310 ac 57.58% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=75 Runoff=7.75 cfs 0.551 af

Reach DP-1: DP-1 Center Brook Inflow=0.76 cfs 0.210 af
Outflow=0.76 cfs 0.210 af

Reach DP-2: DP-2 Summer Street Abutter Inflow=0.11 cfs 0.029 af
Outflow=0.11 cfs 0.029 af

Reach DP-3: DP-3 West Street Abutters Inflow=0.54 cfs 0.071 af
Outflow=0.54 cfs 0.071 af

Reach DP-4: DP-4 BVW Inflow=0.07 cfs 0.040 af
Outflow=0.07 cfs 0.040 af

Pond 1P: Rain Garden 1 Peak Elev=209.32' Storage=128 cf Inflow=0.84 cfs 0.060 af
Discarded=0.52 cfs 0.060 af Primary=0.00 cfs 0.000 af Outflow=0.52 cfs 0.060 af

Pond 2P: Rain Garden 2 Peak Elev=201.73' Storage=5,649 cf Inflow=7.75 cfs 0.551 af
Discarded=0.30 cfs 0.318 af Primary=4.72 cfs 0.232 af Outflow=5.02 cfs 0.551 af

Pond 3P: Infil-01 Peak Elev=196.66' Storage=59,042 cf Inflow=24.95 cfs 1.831 af
Outflow=0.47 cfs 0.964 af

Pond 4P: Infil-02 Peak Elev=196.01' Storage=3 cf Inflow=0.28 cfs 0.042 af
Discarded=0.28 cfs 0.042 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.042 af

Total Runoff Area = 22.776 ac Runoff Volume = 2.601 af Average Runoff Depth = 1.37"
77.61% Pervious = 17.676 ac 22.39% Impervious = 5.100 ac

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: PDA-04D Runoff Area=0.820 ac 10.98% Impervious Runoff Depth=1.24"
Tc=6.0 min CN=45 Runoff=0.90 cfs 0.085 af

Subcatchment PDA-01: PDA-01 Runoff Area=7.040 ac 8.10% Impervious Runoff Depth=0.84"
Flow Length=619' Tc=17.8 min CN=40 Runoff=2.88 cfs 0.494 af

Subcatchment PDA-01A: PDA-01A Runoff Area=0.300 ac 53.33% Impervious Runoff Depth=3.62"
Tc=6.0 min CN=70 Runoff=1.27 cfs 0.090 af

Subcatchment PDA-02: PDA-02 Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.77"
Flow Length=126' Tc=6.3 min CN=39 Runoff=0.47 cfs 0.072 af

Subcatchment PDA-03: PDA-03 Runoff Area=1.276 ac 0.00% Impervious Runoff Depth=1.32"
Tc=6.0 min CN=46 Runoff=1.55 cfs 0.140 af

Subcatchment PDA-04A: PDA-04A Runoff Area=2.500 ac 0.00% Impervious Runoff Depth=0.56"
Flow Length=266' Tc=11.1 min CN=36 Runoff=0.56 cfs 0.116 af

Subcatchment PDA-04B: PDA-04B Runoff Area=7.410 ac 39.81% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=72 Runoff=33.29 cfs 2.364 af

Subcatchment PDA-04C: PDA-04C Runoff Area=2.310 ac 57.58% Impervious Runoff Depth=4.15"
Tc=6.0 min CN=75 Runoff=11.23 cfs 0.799 af

Reach DP-1: DP-1 Center Brook Inflow=2.88 cfs 0.495 af
Outflow=2.88 cfs 0.495 af

Reach DP-2: DP-2 Summer Street Abutter Inflow=0.47 cfs 0.072 af
Outflow=0.47 cfs 0.072 af

Reach DP-3: DP-3 West Street Abutters Inflow=1.55 cfs 0.140 af
Outflow=1.55 cfs 0.140 af

Reach DP-4: DP-4 BVW Inflow=0.56 cfs 0.116 af
Outflow=0.56 cfs 0.116 af

Pond 1P: Rain Garden 1 Peak Elev=209.84' Storage=398 cf Inflow=1.27 cfs 0.090 af
Discarded=0.52 cfs 0.089 af Primary=0.16 cfs 0.001 af Outflow=0.68 cfs 0.090 af

Pond 2P: Rain Garden 2 Peak Elev=201.92' Storage=6,713 cf Inflow=11.23 cfs 0.799 af
Discarded=0.31 cfs 0.367 af Primary=8.87 cfs 0.432 af Outflow=9.18 cfs 0.799 af

Pond 3P: Infil-01 Peak Elev=197.59' Storage=96,760 cf Inflow=40.93 cfs 2.797 af
Outflow=0.52 cfs 1.085 af

Pond 4P: Infil-02 Peak Elev=196.34' Storage=197 cf Inflow=0.90 cfs 0.085 af
Discarded=0.52 cfs 0.085 af Primary=0.00 cfs 0.000 af Outflow=0.52 cfs 0.085 af

Total Runoff Area = 22.776 ac Runoff Volume = 4.161 af Average Runoff Depth = 2.19"
77.61% Pervious = 17.676 ac 22.39% Impervious = 5.100 ac

Appendix D
Reserved

Appendix E
TSS Removal, Water Quality Volume, Groundwater Mounding and Recharge Calculations

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TSS Removal Calculations

Location: WQI-02

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
WQI-02	0.80	1.00	0.80	0.20

Total TSS Removal = 80%

Location: Rain Garden 1

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Rain Garden 1	0.90	1.00	0.90	0.10

Total TSS Removal = 90%

Location: Rain Garden 2

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Rain Garden 2	0.90	1.00	0.90	0.10

Total TSS Removal = 90%

Location: Infiltration Basin 1

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump Hooded Catch Basins	0.25	1.00	0.25	0.75
WQI-03	0.80	0.75	0.60	0.15
Infiltration Basin 1	0.55	0.15	0.08	0.07

Total TSS Removal = 93%

Location: Infiltration Basin 2

A	B	C	D	E
BMP[1]	TSS Removal Rate[1]	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)

Runoff from impervious areas tributary to Infiltration Basin 2 is from roof areas only and is considered clean; therefore TSS removal calculations are not required.

Total TSS Removal = N/A

JOB NO. 1422.10
JOB: Exelon West Medway II

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DATE:

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DATE:

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Standard 3: Groundwater Recharge

Groundwater Recharge Volume Required:

Rv = F x Impervious Area, where:

Rv = Required Recharge Volume [Ac-ft]

F = Target Depth Factor associated with each Hydrologic Soil Group (HSG) [in]

Impervious Area = Total Pavement and Rooftop Area under Post-development Conditions [Ac]

Existing Conditions Impervious Area:	0.86	Acres
Proposed Conditions Impervious Area:	5.29	Acres
Impervious Area to be Recharged:	4.43	Acres

			Impervious Area [Acres]	Required Recharge Volume [Ac-ft]	
HSG "A", use F =	0.6	in	4.430	0.222	
HSG "B", use F =	0.35	in	0.000	0.000	
HSG "C", use F =	0.25	in	0.000	0.000	
HSG "D", use F =	0.1	in	0.000	0.000	
Total Required Recharge Volume (Rv) =				**0.222**	**Ac-ft**

Capture Area Adjustment: (Ref: DEP Handbook V.3 Ch.1 P.27-28)

Total Site Impervious Area (Total)=	5.29	Acres
Impervious Area Draining to Infiltrative BMPs (infil) (PDA-01A, PDA-4B, PDA--4C, & PDA-04D)=	4.72	Acres
Percent Imp. Area Draining to Infiltrative BMPs =	89.2%	
Capture Area Adjustment Factor = (Total)/(Infil) = Ca =	1.12	
Adjusted Required Recharge Volume = Ca x Rv	**0.248**	**Ac-ft**

Groundwater Recharge Volume Provided :

BMP	Provided Recharge Volume [Ac-ft]	
Rain Garden-01	0.014	
Rain Garden-02	0.129	
Infiltration Basin-01	2.330	
Infiltration Basin-02	0.011	
Total Provided Recharge Volume =	**2.484**	**Ac-ft**

PROVIDED GROUNDWATER RECHARGE VOLUME IS GREATER THAN OR EQUAL TO THE REQUIRED RECHARGE VOLUME, THEREFORE PROPOSED STORMWATER MANAGEMENT DESIGN IS IN COMPLIANCE WITH STANDARD 3.

JOB NO. 1422.1
JOB: Exelon West Medway II

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DATE: 1/12/16

CHECKED BY: JRM
DATE: 1/12/16

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Standard 3: Drawdown

$$\text{Drawdown Time} = \frac{Rv}{(K)\ (\text{Bottom Area})}$$

where:

Rv = Storage Volume Below Outlet [Ac-ft]

K= Infiltration Rate [in/hr]

Bottom Area= Bottom Area of Recharge System [Ac]

Rain Garden-01

Rv =	0.014 Ac-ft	
K =	2.410 in/hr	
Bottom Area =	0.008 Acres	
Drawdown Time =	**8.485 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Rain Garden-02

Rv =	0.105 Ac-ft	
K =	2.410 in/hr	
Bottom Area =	0.083 Acres	
Drawdown Time =	**6.315 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-01

Rv =	2.330 Ac-ft	
K =	0.520 in/hr	
Bottom Area =	0.758 Acres	
Drawdown Time =	**70.965 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-02

Rv =	0.011 Ac-ft	
K =	0.520 in/hr	
Bottom Area =	0.011 Acres	
Drawdown Time =	**21.785 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Note:

1. The infiltration BMPs have been designed to fully drain within 72 hours, therefore the proposed stormwater management design is in compliance with Standard 3 .

2. Infiltration Rate based on Volume 3, Chapter 1, Table 2.3.3 *Rawls Rates* from the 2008 MA DEP Stormwater Management Handbook.

JOB NO. 1422.10 COMPUTED BY: L. Cl[illegible] CHECKED BY: JRM

JOB: Exelon West Medway II DATE: 1/6/16 DATE: 1/12/16

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Rain Garden Provided Recharge and Water Quality Volume

Rain Garden 1

Provided Volume:

Elevation	Area (SF)	Voids	STORAGE (Cubic Feet) INTERVAL	STORAGE (Cubic Feet) CUMULATIVE	
206.00	350	30%	0	0	
206.74	350	30%	78	78	
206.75	350	10%	0	78	
208.99	350	10%	78	156	
209.00	350	100%	3	160	
209.90	620	100%	437	**596**	**CF**

Rain Garden 2

Provided Volume:

Elevation	Area (SF)	Voids	STORAGE (Cubic Feet) INTERVAL	STORAGE (Cubic Feet) CUMULATIVE	
197.25	3,600	30%	0	0	
198.24	3,600	30%	1,069	1,069	
198.25	3,600	10%	4	1,073	
200.49	3,600	10%	806	1,879	
200.5	3,600	100%	36	1,915	
201.0	4,600	100%	2,050	2,896	
201.4	4,960	100%	1,673	**5,638**	**CF**

JOB NO. 1422.10

JOB: Exelon

COMPUTED BY: Eae

DATE: 1/12/16

CHECKED BY: JRM

DATE: 1/12/16

Stage-Area-Storage for Pond 3P: Infil-01

BOTTOM AREA

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
195.00	33,000	0
195.05	33,150	1,654
195.10	33,300	3,315
195.15	33,450	4,984
195.20	33,600	6,660
195.25	33,750	8,344
195.30	33,900	10,035
195.35	34,050	11,734
195.40	34,200	13,440
195.45	34,350	15,154
195.50	34,500	16,875
195.55	34,650	18,604
195.60	34,800	20,340
195.65	34,950	22,084
195.70	35,100	23,835
195.75	35,250	25,594
195.80	35,400	27,360
195.85	35,550	29,134
195.90	35,700	30,915
195.95	35,850	32,704
196.00	36,000	34,500
196.05	36,200	36,305
196.10	36,400	38,120
196.15	36,600	39,945
196.20	36,800	41,780
196.25	37,000	43,625
196.30	37,200	45,480
196.35	37,400	47,345
196.40	37,600	49,220
196.45	37,800	51,105
196.50	38,000	53,000
196.55	38,200	54,905
196.60	38,400	56,820
196.65	38,600	58,745
196.70	38,800	60,680
196.75	39,000	62,625
196.80	39,200	64,580
196.85	39,400	66,545
196.90	39,600	68,520
196.95	39,800	70,505
197.00	40,000	72,500
197.05	40,200	74,505
197.10	40,400	76,520
197.15	40,600	78,545
197.20	40,800	80,580
197.25	41,000	82,625
197.30	41,200	84,680
197.35	41,400	86,745
197.40	41,600	88,820
197.45	41,800	90,905
197.50	42,000	93,000
197.55	42,200	95,105
197.60	42,400	97,220
197.65	42,600	99,345
197.70	42,800	101,480 ← OUTLET ELEV.
197.75	43,000	103,625
197.80	43,200	105,780
197.85	43,400	107,945
197.90	43,600	110,120
197.95	43,800	112,305
198.00	**44,000**	**114,500**

BOTTOM AREA

Stage-Area-Storage for Pond 4P: Infil-02

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	
196.00	500	0	
196.01	505	5	
196.02	510	10	
196.03	515	15	
196.04	520	20	
196.05	525	26	
196.06	530	31	
196.07	535	36	
196.08	540	42	
196.09	545	47	
196.10	550	52	
196.11	555	58	
196.12	560	64	
196.13	565	69	
196.14	570	75	
196.15	575	81	
196.16	580	86	
196.17	585	92	
196.18	590	98	
196.19	595	104	
196.20	600	110	
196.21	605	116	
196.22	610	122	
196.23	615	128	
196.24	620	134	
196.25	625	141	
196.26	630	147	
196.27	635	153	
196.28	640	160	
196.29	645	166	
196.30	650	173	
196.31	655	179	
196.32	660	186	
196.33	665	192	
196.34	670	199	
196.35	675	206	
196.36	680	212	
196.37	685	219	
196.38	690	226	
196.39	695	233	
196.40	700	240	
196.41	705	247	
196.42	710	254	
196.43	715	261	
196.44	720	268	
196.45	725	276	
196.46	730	283	
196.47	735	290	
196.48	740	298	
196.49	745	305	
196.50	750	313	
196.51	755	320	
196.52	760	328	
196.53	765	335	
196.54	770	343	
196.55	775	351	
196.56	780	358	
196.57	785	366	
196.58	790	374	
196.59	795	382	
196.60	800	390	
196.61	805	398	
196.62	810	406	
196.63	815	414	
196.64	820	422	
196.65	825	431	
196.66	830	439	
196.67	835	447	
196.68	840	456	
196.69	845	464	
196.70	850	472	← OUTLET ELEV.
196.71	855	481	
196.72	860	490	
196.73	865	498	
196.74	870	507	
196.75	875	516	
196.76	880	524	
196.77	885	533	
196.78	890	542	
196.79	895	551	
196.80	900	560	
196.81	905	569	
196.82	910	578	
196.83	915	587	
196.84	920	596	
196.85	925	606	
196.86	930	615	
196.87	935	624	
196.88	940	634	
196.89	945	643	
196.90	950	653	
196.91	955	662	
196.92	960	672	
196.93	965	681	
196.94	970	691	
196.95	975	701	
196.96	980	710	
196.97	985	720	
196.98	990	730	
196.99	995	740	
197.00	**1,000**	**750**	

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Standard 4: Water Quality Volume Summary

$$V_{WQ} = (D_{WQ} / 12 \text{ in/ft}) \times (A_{IMP} \times 43{,}560 \text{ SF/Ac}) \text{ where:}$$

V_{WQ} = Required Water Quality Volume [CF]

D_{WQ} = Water Quality Depth : 1-inch for discharges within a Zone II or Interim Wellhead Protection Area, to or near critical areas, runoff from LUHPPL, or exfiltration to soil with infiltration rate 2.4 in/hr or greater; ½-inch for discharges to other areas.

A_{IMP} = Post-development Impervious Area; may exclude roof top areas [Ac]

Required Water Quality Volume:

Drainage Area/ Treatment Train	A_{IMP} [Ac]	D_{WQ} [in]	V_{WQ} Required [CF]	
PDA-01	0.570	1	2,069	
PDA-01A	0.160	1	581	
PDA-02	0.000	1	0	
PDA-03	0.000	1	0	
PDA-04A	0.000	1	0	
PDA-04B	2.950	1	10,709	
PDA-04C	1.520	1	5,518	
PDA-04D	0.090	1	327	
Total Required Water Quality Volume:			19,203	Cubic Feet

Provided Water Quality Volume:

Drainage Area/ Treatment Train	BMP	Water Quality Volume Provided [CF]	
PDA-01	WQI-02	2,069	
PDA-01A	Rain Garden-01	596	
PDA-04B	Infiltration Basin-01	101,480	
PDA-04C	Rain Garden-02	5,638	
PDA-04D	Infiltration Basin-02	472	
Total Provided Water Quality Volume:		110,256	Cubic Feet

WATER QUALITY VOLUME PROVIDED IS GREATER THAN OR EQUAL TO THE REQUIRED WATER QUALITY VOLUME, THEREFORE PROPOSED STORMWATER MANAGEMENT DESIGN IS IN COMPLIANCE WITH STANDARD 4.

Note: PDA-04C is treated by both Rain Garden-02 and the Infiltration Basin

JOB NO.	1422.10	COMPUTED BY:	EAC	CHECKED BY:	JRM
JOB:	Exelon West Medway II	DATE:	1/12/16	DATE:	1/12/16

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JOB NO./LOCATION:

1422.10
Medway, Massachusetts

CLIENT/PROJECT:

Exelon
West Medway II

SUBJECT/TITLE:

Groundwater Mounding Calculations for Infiltration Basin-1

OBJECTIVE OF CALCULATION:

- To determine the maximum groundwater mounding height beneath Infiltration Basin 1.

CALCULATION METHOD(S):

- Estimated maximum groundwater mounding height calculated using Hantush equation.

ASSUMPTIONS:

- Vertical hydraulic conductivity (unsaturated zone) is equal to the infiltration rate of the proposed basin = 0.52 in/hr = 1.04 ft/day
- Horizontal hydraulic conductivity (saturated zone) is assumed to be 260 ft/day based on data shown for Hopping Brook Watershed.
- Specific yield = 0.21 for fine sandy loam
- Saturated Thickness; St = 10.4 ft. Moist soil observed at elevation 192± at B+T TP-4 and an average bedrock elevation of was observed 181.6± in GEI borings B5, NB2, NB3, NB-12, and NB-13 (192 – 181.6 = 10.4 ft).
- Area of basin bottom modeled as 400' x 82.5' = 33,000 SF
- Infiltration Basin-1 takes approximately 71 hours days to dewater after the 100-year storm event; modeled as 3 days.

SOURCES OF DATA/EQUATIONS:

- Hantush equation spreadsheet published by the USGS.
- Figure 16 of Simulation of Groundwater-Flow and Evaluation of Water-Management Alternatives in the Upper Charles River Basin, Eastern Massachusetts, Water Resources Investigation Report 02-4234 by Massachusetts Department of Environmental Management and Massachusetts Department of Environmental Protection, dated 2002.
- Final Geotechnical Report, Exelon West Medway II Facility, prepared by GEI, dated October 2015.

CONCLUSIONS:

The mounding analysis indicated that the groundwater elevation would rise approximately 2.401-feet were it to infiltrate the entire volume of water associated with the 100-year storm event. Therefore it can be concluded that the rise in groundwater elevation will not prohibit the basin from dewatering within 72-hours.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	E. Clark	1/13/16	J. Murphy	1/13/16		

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
1.0400	*R*	**Recharge (infiltration) rate (feet/day)**
0.210	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
260.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
41.250	x	**1/2 length of basin (x direction, in feet)**
200.000	y	**1/2 width of basin (y direction, in feet)**
3.000	t	**duration of infiltration period (days)**
10.400	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

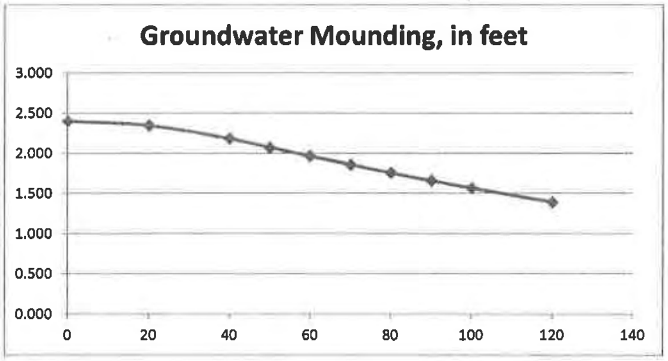
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

12.801	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
2.401	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
2.401	0
2.346	20
2.183	40
2.074	50
1.964	60
1.860	70
1.759	80
1.667	90
1.569	100
1.395	120

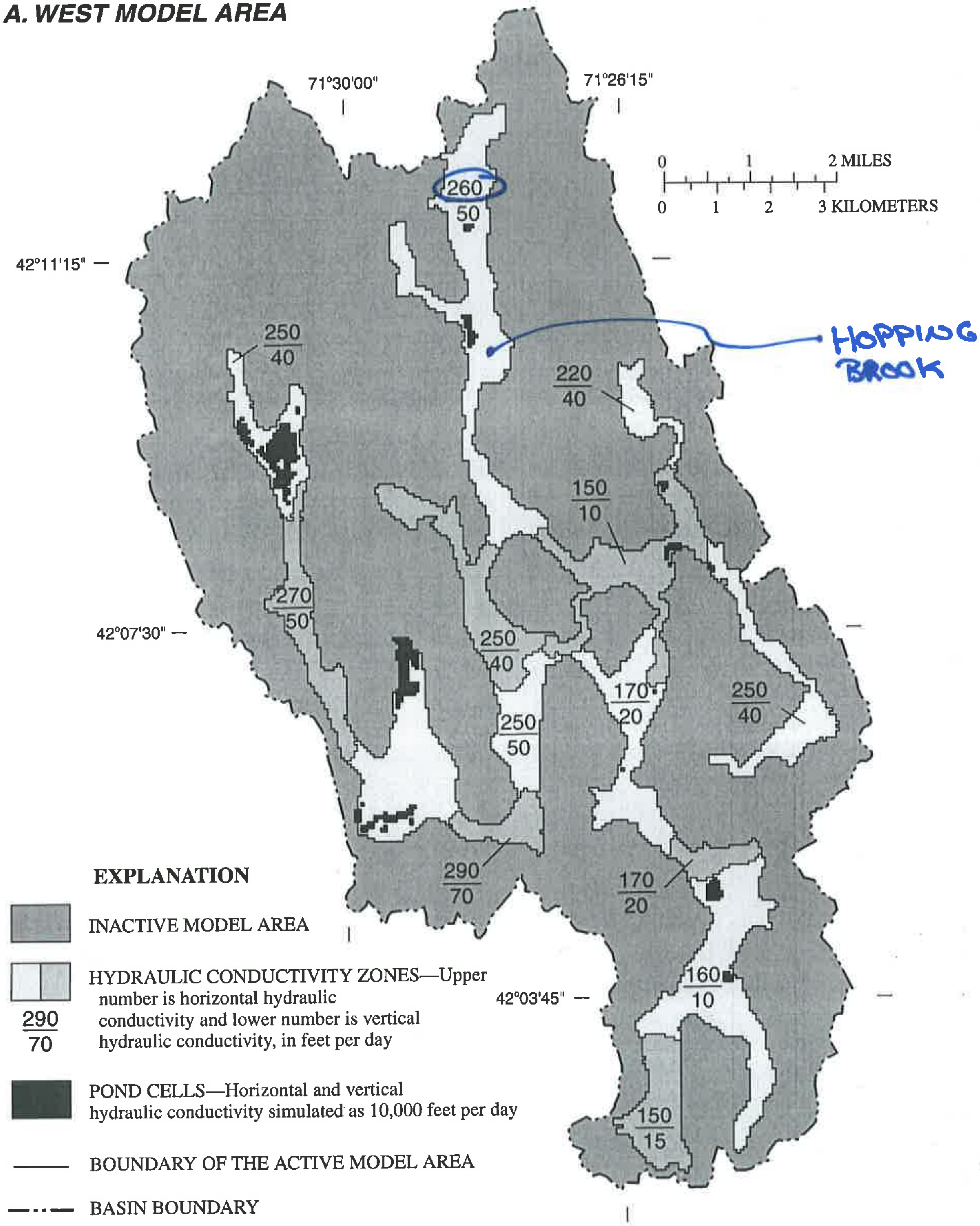
Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

A. WEST MODEL AREA



From USGS and MassGIS data sources, Geographic Projection, Spheroid GRS 1980, Datum NAD 83

Figure 16. Hydraulic conductivity zones for the simulation models of the upper Charles River Basin, eastern Massachusetts: (*A*) West model area, and (*B*) East model area.

Appendix F
Phosphorus Removal Calculations

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION: 1422.10 Medway, Massachusetts
CLIENT/PROJECT: Exelon West Medway II
SUBJECT/TITLE: Phosphorus Mitigation Calculations
OBJECTIVE OF CALCULATION: • To determine the pre-developed estimated annual total phosphorus (TP) load tributary to the Charles River. • Based on the 2014 Draft MS4 Permit, design a stormwater management system that removes the maximum practicable amount of total phosphorus.
CALCULATION METHOD(S): • Area takes-offs performed using Civil 3D. • Phosphorus loads calculated in accordance with 2014 Draft General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts.
ASSUMPTIONS: • No credit assumed for the existing stomrwater management system or good housekeeping practices. • Full Site calculation boundary includes developed area maintained by Exelon.
SOURCES OF DATA/EQUATIONS: • 2014 Draft General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts. • Full Site Limit of Work Pre-Developed Conditions and Post-Developed Conditions Estimated Annual Phosphorus Loading Calculation Plans, prepared by B+T, plan numbers 142210P028A-001 & -002. • Limit of Work Pre-Developed Conditions and Post-Developed Conditions Estimated Annual Phosphorus Loading Calculation Plans, prepared by B+T, plan numbers 142210P035A-001 & -002.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	E. Ch	1/13/16	J. Murphy	1/13/16		

CONCLUSIONS:

FULL SITE

Estimated Annual Pre-Developed TP Load [TP_1]: 15.52 lbs

Post-Developed Estimated TP Load [TP_2]: 8.31 lbs

Percent Reduction $(TP_1-TP_2)/TP_1 \times 100\%$: **46.5%**

The design is in compliance with the draft MS4 permit, which requires a total phosphorus reduction of 32% for the Town of Medway.

LIMIT OF WORK

Estimated Annual Pre-Developed TP Load [TP_1]: 7.28 lbs

Post-Developed Estimated TP Load [TP_2]: 1.20 lbs

Percent Reduction $(TP_1-TP_2)/TP_1 \times 100\%$: **83.5%**

The design is in compliance with the *Total Maximum Daily Load for Nutrients in the Upper/ Middle Charles River, Massachusetts*, as it reduces the TP load by more than 65%.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	E. Cole	1/13/16	J. Murphy	1/13/16		

West Medway II

Medway, Massachusetts

BEALS + THOMAS
Civil Engineers + Landscape Architects +
Land Surveyors + Planners +
Environmental Specialists

B+T Drawing No. 142210P028A-001 Date: 1/05/2016 Scale: 1" = 200'

Full Site Pre-Developed Conditions

Estimated Annual Phosphorus Loading

Figure

1

West Medway II

Medway, Massachusetts

BEALS + THOMAS
Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

B+T Drawing No. 142210P028A-002 Date: 1/05/2016 Scale: 1" = 200'

Full Site Post-Developed Conditions

Estimated Annual Phosphorus Loading

Figure 2

BEALS + THOMAS

Full Site Pre-Developed Phosphorus Loading Calculations

Estimated Annual Pre-Developed Total Phosphorus Load Tributary to the Charles River

	Area [Ac]	Estimated Annual TP Loading [lb/yr/ac]	Annual TP Loading [lbs]
Commercial/ Industrial Directly Connected Impervious	3.48	1.78	6.19
Developed Land Pervious Hydrologic Soil Class A	4.60	0.03	0.14
Developed Land Pervious Hydrologic Soil Class D (Wetlands)	3.02	0.37	1.12
Agriculture Pervious	13.51	0.50	6.76
Forest Pervious	10.15	0.13	1.32
	34.76		

Estimated Annual Pre-Developed TP Load [TP_1]: 15.52 lbs

1. See attached "Full Site Pre-Developed Conditions Estimated Annual Phosphorus Loading," figure for an illustration of tributary areas.
2. Annual TP Loading based upon table 3-1: Average annual distinct phosphorus load (P Load) export rates for use in estimated phosphorus load reduction credits the MA MS4 Permit, Appendix F Attachment 3.
3. Required Percent Reduction in TP Load based upon *Community Annual Stormwater Phosphorus Load Reduction by Permitted, Charles River Watershed,* from Appendix F of the Draft MA MS4 General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts

BEALS + THOMAS

Full Site Post-Developed Phosphorus Loading Calculations

Estimated Unmitigated Annual Post-Developed Total Phosphorus Load Tributary to the Charles River

Land Use	Area [Ac]	Estimated Annual TP Loading [lb/yr/ac]	Annual TP Loading [lbs]
Commercial/ Industrial Directly Connected Impervious	8.00	1.78	14.24
Developed Land Pervious Hydrologic Soil Class A	15.77	0.03	0.47
Developed Land Pervious Hydrologic Soil Class D (Wetlands)	3.00	0.37	1.11
Agriculture Pervious	0.00	0.50	0.00
Forest Pervious	7.99	0.13	1.04
	34.76		

Estimated Unmitigated Annual TP Load [TP_U]: 16.86 lbs

Notes:

1. See attached "Full Site Post-Developed Estimated Annual Phosphorus Loading," figure for an illustration of tributary areas.
2. Annual TP Loading based upon table 3-1: Average annual distinct phosphorus load (P Load) export rates for use in estimated phosphorus load reduction credits the MA MS4 Permit, Appendix F Attachment 3.
3. Required Percent Reduction in TP Load based upon *Community Annual Stormwater Phosphorus Load Reduction by Permitted, Charles River Watershed,* from Appendix F of the Draft MA MS4 General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts

BEALS + THOMAS
Structural Credits Phosphorus Removal Calculations

Structural BMP Phosphorus Reduction Credits

BMP	Land Use	Area Tributary to BMP [Ac]	Estimated Annual TP Loading [lb/yr/ac]	Annual TP Loading [lbs]	BMP % Phosphorus Load Reduction [% Reduction]	Amount of Phosphorus Removed by BMP = [% Reduction] x [BMP_{Load}]
Infiltration Basin 1 (PDA-04B & PDA-04C)	Commercial/ Industrial Directly Connected Impervious	4.47	1.78	7.96	100%	8.114
	Developed Land Pervious Hydrologic Soil Class A	5.23	0.03	0.16		
Infiltration Basin 2 (PDA-04D)	Commercial/ Industrial Directly Connected Impervious	0.09	1.78	0.16	100%	0.182
	Developed Land Pervious Hydrologic Soil Class A	0.73	0.03	0.02		
Rain Garden 1 (PDA-01A)	Commercial/ Industrial Directly Connected Impervious	0.16	1.78	0.28	89%	0.257
	Developed Land Pervious Hydrologic Soil Class A	0.14	0.03	0.00		

BEALS + THOMAS
Full Site Phosphorus Mitigation

Phosphorus Mitigation

	Amount of Phosphorus Removed per Year [lb/yr]
Infiltration Basin 1	8.114
Infiltration Basin 2	0.182
Rain Garden 1	0.257

Total Phosphorus Removed per Year [TP_R]:	8.553	lbs/yr
Estimated Unmitigated Annual TP Load [TP_U]:	16.86	lbs/yr
Post Developed Estimated TP Load [TP_2] = TP_U - TP_R:	8.31	lbs/yr
Estimated Annual Pre-Developed TP Load [TP_1]:	15.52	lbs/yr
Percent Reduction = ((TP_1 - TP_2)/TP_1) X 100%:	**46.5%**	

JOB NO. 1422.1
JOB: West Medway II

COMPUTED BY: EaC
DATE: 1/13/16

CHECKED BY: JRM
DATE: 1/13/16

West Medway II

Medway, Massachusetts

BEALS + THOMAS
Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

B+T Drawing No. 142210P035A-001 Date: 1/05/2016 Scale: 1" = 200'

Limit of Work Pre-Developed Conditions

Estimated Annual Phosphorus Loading

Figure

3

West Medway II

Medway, Massachusetts

BEALS + THOMAS
Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

B+T Drawing No. 142210P035A-002 Date: 1/05/2016 Scale: 1" = 200'

Limit of Work Post-Developed Conditions

Estimated Annual Phosphorus Loading

Figure 4

BEALS + THOMAS

Limit of Work Pre-Developed Phosphorus Loading Calculations

Estimated Annual Pre-Developed Total Phosphorus Load Tributary to the Charles River

	Area [Ac]	Estimated Annual TP Loading [lb/yr/ac]	Annual TP Loading [lbs]
Commercial/ Industrial Directly Connected Impervious	0.43	1.78	0.77
Developed Land Pervious Hydrologic Soil Class A	1.58	0.03	0.05
Developed Land Pervious Hydrologic Soil Class D (Wetlands)	0.01	0.37	0.00
Agriculture Pervious	12.36	0.50	6.18
Forest Pervious	2.17	0.13	0.28
	16.55		

Estimated Annual Pre-Developed TP Load [TP_1]: 7.28 lbs

Notes:

1. See attached "Limit of Work Pre-Developed Conditions Estimated Annual Phosphorus Loading," figure for an illustration of tributary areas.
2. Annual TP Loading based upon table 3-1: Average annual distinct phosphorus load (P Load) export rates for use in estimated phosphorus load reduction credits the MA MS4 Permit, Appendix F Attachment 3.
3. Required Percent Reduction in TP Load based upon *Community Annual Stormwater Phosphorus Load Reduction by Permitted, Charles River Watershed,* from Appendix F of the Draft MA MS4 General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts

BEALS + THOMAS

Limit of Work Post-Developed Phosphorus Loading Calculations

Estimated Unmitigated Annual Post-Developed Total Phosphorus Load Tributary to the Charles River

Land Use	Area [Ac]	Estimated Annual TP Loading [lb/yr/ac]	Annual TP Loading [lbs]
Commercial/ Industrial Directly Connected Impervious	5.29	1.78	9.42
Developed Land Pervious Hydrologic Soil Class A	11.26	0.03	0.34
Developed Land Pervious Hydrologic Soil Class D (Wetlands)	0.00	0.37	0.00
Agriculture Pervious	0.00	0.50	0.00
Forest Pervious	0.00	0.13	0.00
	16.55		

Estimated Unmitigated Annual TP Load [TP_U]: 9.75 **lbs**

Notes:

1. See attached "Limit of Work Post-Developed Conditions Estimated Annual Phosphorus Loading," figure for an illustration of tributary areas.
2. Annual TP Loading based upon table 3-1: Average annual distinct phosphorus load (P Load) export rates for use in estimated phosphorus load reduction credits the MA MS4 Permit, Appendix F Attachment 3.
3. Required Percent Reduction in TP Load based upon *Community Annual Stormwater Phosphorus Load Reduction by Permitted, Charles River Watershed,* from Appendix F of the Draft MA MS4 General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts

BEALS + THOMAS

Structural Credits Phosphorus Removal Calculations

Structural BMP Phosphorus Reduction Credits

BMP	Land Use	Area Tributary to BMP [Ac]	Estimated Annual TP Loading [lb/yr/ac]	Annual TP Loading [lbs]	BMP % Phosphorus Load Reduction [% Reduction]	Amount of Phosphorus Removed by BMP = [% Reduction] x [BMP_{Load}]
Infiltration Basin 1 (PDA-04B & PDA-04C)	Commercial/ Industrial Directly Connected Impervious	4.47	1.78	7.96	100%	8.114
	Developed Land Pervious Hydrologic Soil Class A	5.23	0.03	0.16		
Infiltration Basin 2 (PDA-04D)	Commercial/ Industrial Directly Connected Impervious	0.09	1.78	0.16	100%	0.182
	Developed Land Pervious Hydrologic Soil Class A	0.73	0.03	0.02		
Rain Garden 1 (PDA-01A)	Commercial/ Industrial Directly Connected Impervious	0.16	1.78	0.28	89%	0.257
	Developed Land Pervious Hydrologic Soil Class A	0.14	0.03	0.00		

BEALS + THOMAS

Limit of Work Phosphorus Mitigation

Phosphorus Mitigation

	Amount of Phosphorus Removed per Year [lb/yr]
Infiltration Basin 1	8.114
Infiltration Basin 2	0.182
Rain Garden 1	0.257

Total Phosphorus Removed per Year [TP_R]:	8.553	lbs/yr
Estimated Unmitigated Annual TP Load [TP_U]:	9.75	lbs/yr
Post Developed Estimated TP Load [TP_2] = TP_U - TP_R:	1.20	lbs/yr
Estimated Annual Pre-Developed TP Load [TP_1]:	7.28	lbs/yr
Percent Reduction = $((TP_1 - TP_2)/TP_1) \times 100\%$:	**83.5%**	

JOB NO. 1422.1
JOB: West Medway II

COMPUTED BY: E. Cul
DATE: 1/13/16

CHECKED BY: JRM
DATE: 1/13/16

Community	Baseline Phosphorus Load, kg/yr	Phosphorus Load Reduction Requirement kg/yr	Allowable Stormwater Phosphorus Load, kg/yr	Percent Reduction in Stormwater Phosphorus Load (%)
Arlington	111	60	51	54%
Ashland	67	24	43	36%
Bellingham	958	344	614	36%
Belmont	208	94	114	45%
Brookline	1,695	853	842	50%
Cambridge	523	274	249	52%
Dedham	836	355	481	42%
Dover	833	150	683	18%
Foxborough	2	-	2	0%
Franklin	2,367	869	1,498	37%
Holliston	1,555	424	1,131	27%
Hopedale	107	39	68	36%
Hopkinton	293	73	220	25%
Lexington	550	214	336	39%
Lincoln	595	109	486	18%
Medfield	966	297	669	31%
Medway	1,066	337	729	32%
Mendon	29	9	20	31%
Milford	1,654	708	946	43%
Millis	973	261	712	27%
Natick	1,148	429	719	37%
Needham	1,829	852	977	47%
Newton	4,067	2,100	1,967	52%
Norfolk	1,006	244	762	24%
Somerville	653	345	308	53%
Sherborn	848	136	712	16%
Walpole	159	31	128	19%
Waltham	2,985	1,531	1,454	51%
Watertown	1,164	613	551	53%
Wayland	48	17	31	35%
Wellesley	1,506	734	772	49%
Weston	1,193	318	875	27%
Westwood	395	134	261	34%
Wrentham	620	177	443	29%
Mass-DCR	433	97	336	22%

Table F-2: Baseline Phosphorus Load, Phosphorus Reduction Requirement, Allowable Phosphorus Load and Percent Reduction in Phosphorus Load from Charles River Watershed. For use when PCP Area is chosen to be the entire community within the Charles River Watershed.

Regulated Area Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed				
Community	**Baseline Watershed Phosphorus Load, kg/yr**	**Phosphorus Load Reduction Requirement, kg/yr**	**Allowable Stormwater Phosphorus Load, kg/yr**	**Percent Reduction in Phosphorus Load (%)**
Arlington	111	60	51	54%
Ashland	67	24	43	36%
Bellingham	812	304	508	37%
Belmont	208	94	114	45%
Brookline	1,695	853	842	50%
Cambridge	523	274	249	52%
Dedham	836	355	481	42%
Dover	282	67	215	24%
Foxborough	2	-	2	0%
Franklin	2,334	864	1,470	37%
Holliston	1,370	398	972	29%
Hopedale	107	39	68	36%
Hopkinton	280	72	208	26%
Lexington	544	212	332	39%
Lincoln	367	71	296	19%
Medfield	838	289	549	34%
Medway	1,040	328	712	32%
Mendon	10	5	5	50%
Milford	1,528	698	830	46%
Millis	503	171	332	34%
Natick	1,032	402	630	39%
Needham	1,828	852	976	47%
Newton	4,067	2,100	1,967	52%
Norfolk	1,003	244	759	24%
Somerville	653	345	308	53%
Sherborn	203	43	160	21%
Walpole	159	31	128	19%

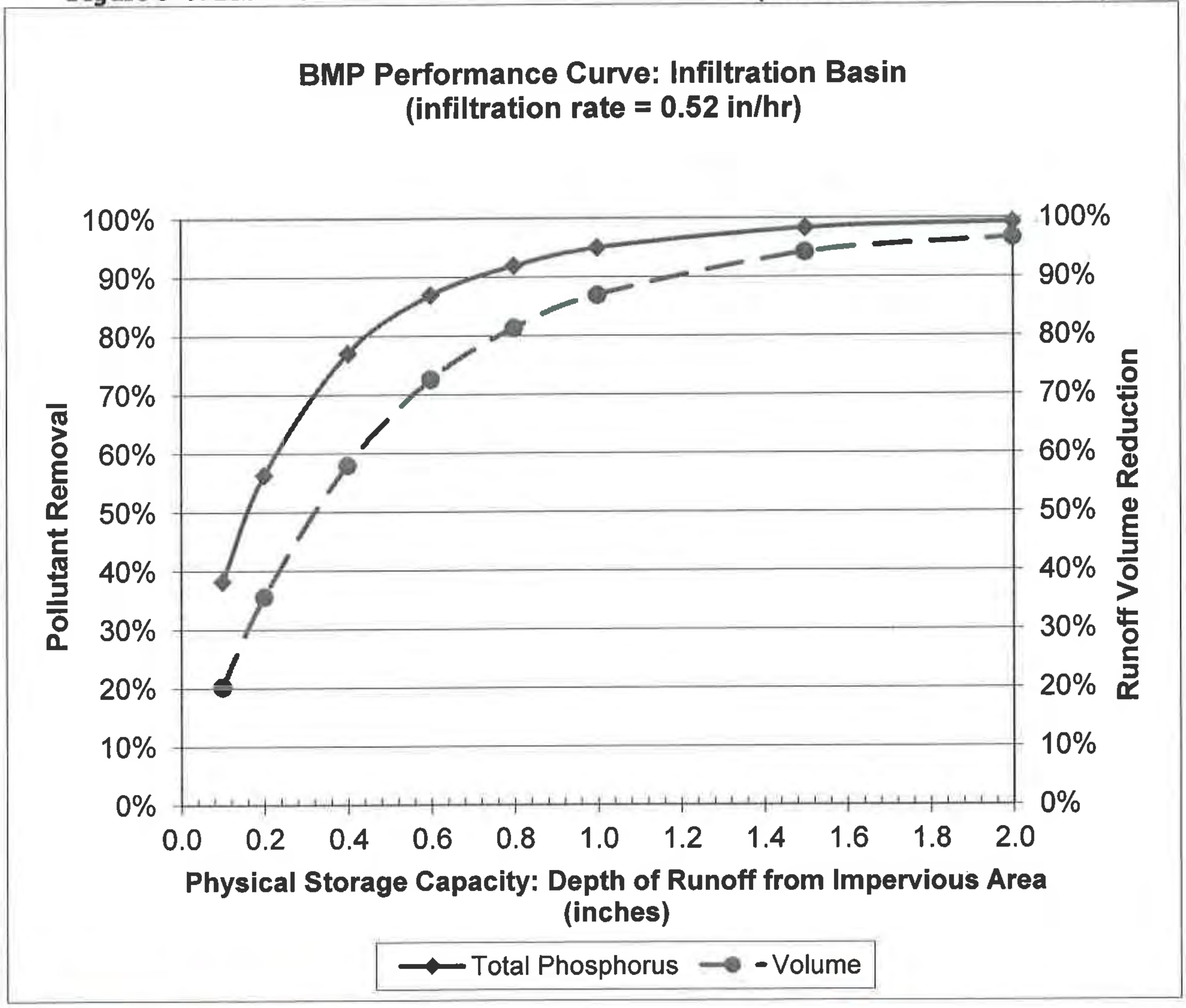
Table 1-2: Proposed average annual distinct P Load export rates for use in estimating P Load reduction credits the MA MS4 Permit

Phosphorus Source Category by Land Use	Land Surface Cover	P Load Export Rate, lbs/acre/year	P Load Export Rate, kg/ha/yr
Commercial (Com) and Industrial (Ind)	Directly connected impervious	1.78	2.0
	Pervious	See* DevPERV	See* DevPERV
Multi-Family (MFR) and High-Density Residential (HDR)	Directly connected impervious	2.32	2.6
	Pervious	See* DevPERV	See* DevPERV
Medium -Density Residential (MDR)	Directly connected impervious	1.96	2.2
	Pervious	See* DevPERV	See* DevPERV
Low Density Residential (LDR) - "Rural"	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Highway (HWY)	Directly connected impervious	1.34	1.5
	Pervious	See* DevPERV	See* DevPERV
Forest (For)	Directly connected impervious	1.52	1.7
	Pervious	0.13	0.13
Open Land (Open)	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Agriculture (Ag)	Directly connected impervious	1.52	1.7
	Pervious	0.5	0.5
*Developed Land Pervious (DevPERV)- Hydrologic Soil Group A	Pervious	0.03	0.03
*Developed Land Pervious (DevPERV)- Hydrologic Soil Group B	Pervious	0.12	0.13
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group C	Pervious	0.21	0.24
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group C/D	Pervious	0.29	0.33
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group D	Pervious	0.37	0.41

Table 3- 12: Infiltration Basin (0.52 in/hr) BMP Performance Table

Infiltration Basin (0.52 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	20.2%	35.6%	58.0%	72.6%	81.3%	86.9%	94.2%	96.7%
Cumulative Phosphorus Load Reduction	38%	56%	77%	87%	92%	95%	98%	99%

Figure 3- 9: BMP Performance Curve: Infiltration Basin (infiltration rate = 0.52 in/hr)



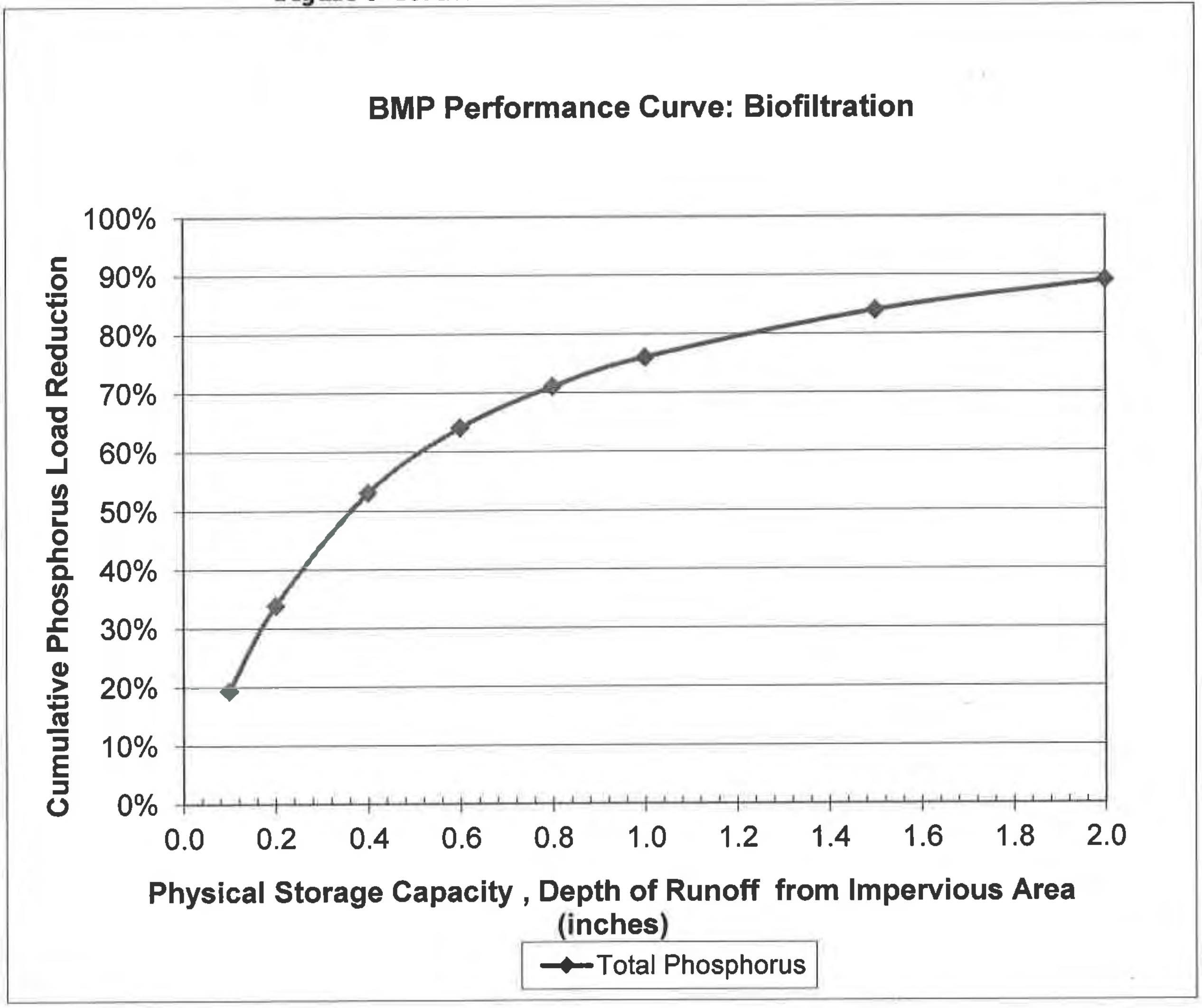
INFILTRATION BASINS 1 & 2 INFILTRATE 100-YR STORM-EVENT. ASSUME 100% REMOVAL

Table 3- 16: Biofiltration BMP Performance Table

Biofiltration BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	19%	34%	53%	64%	71%	76%	84%	89%

←

Figure 3- 13: BMP Performance Curve: Biofiltration



RAW GARDEN-01 W/FILTRATES 7 2-YR STORM EVENT
= 3.20"

Appendix G
Site Owner's Manual

SITE OWNER'S MANUAL

West Medway II

9 Summer Street
Medway, Massachusetts

Prepared for:
Exelon West Medway, LLC and
Exelon West Medway II, LLC
300 Exelon Way
Kennett Square, PA 19348

Presented by:

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

January 15, 2016

142210RP003

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (DEP) Stormwater Handbook. The Manual outlines source control and pollution prevention measures and maintenance requirements of stormwater best management practices (BMPs) associated with the proposed development.

The proposed project is located within the Charles River watershed, which has a final Total Maximum Daily Load (TMDL) issued for nutrients, with the primary concern being phosphorus. Phosphorus is a naturally occurring element in all living things, and it is naturally found in our streams and rivers. Man-made products such as lawn fertilizers, pesticides, deck and siding cleaners, soaps, detergents, oils, lubricants and auto exhaust contain high concentrations of the element. During rainstorms these products end up in the stormwater runoff and drain into nearby stormwater controls, and ultimately into water bodies.

Excessive phosphorus in the Charles River have been attributed to large algae blooms which can cause a number of water quality issues, such as eutrophication and affect the ability to use a body of water for recreation activities. Of particular concern is the blue-green algae species which have been consistently observed in the Charles River. These algae are toxic to many species including humans and pets.

The on-site stormwater management system has been designed to mitigate phosphorous through both structural practices and non-structural good housekeeping measures. The Site Owner's Manual outlines the good housekeeping methods that will reduce the amount of total phosphorus discharged from the site. Source control, pollution prevention measures, and regular maintenance of the on-site stormwater best management practices (BMPs) are proposed to reduce the phosphorus loading from the site.

2.0 SITE OWNER'S AGREEMENT

2.1 Operation and Maintenance Compliance Statement

Site Owner: Exelon West Medway, LLC and Exelon West Medway II, LLC
300 Exelon Way
Kennett Square, PA 19348

Responsible Party: Name of Responsible Party

Exelon West Medway LLC, and Exelon West Medway II or their successors shall maintain ownership of the on-site stormwater management system as well as the responsibility for operation and maintenance during the post-development stages of the project. The site has been inspected for erosion and appropriate measures have been taken to permanently stabilize any eroded areas. All aspects of stormwater best management practices (BMPs) have been inspected for damage, wear and malfunction, and appropriate steps have been taken to repair or replace the system or portions of the system so that the stormwater at the site may be managed in accordance with the Stormwater Management Standards. Future responsible parties shall be notified of their continuing legal responsibility to operate and maintain the BMPs. The operation and maintenance plan for the stormwater BMPs is being implemented.

_____________________________ ____________
Responsible Party Signature Date

2.2 Stormwater Maintenance Easements

There are no off-site areas utilized for stormwater control, therefore no stormwater management easements are required. The Site Owner will have access to all stormwater practices for inspection and maintenance, including direct maintenance access by heavy equipment to structures requiring regular maintenance.

2.3 Record Keeping

The Site Owner shall maintain a rolling log in which all inspections and maintenance activities for the past three years shall be recorded. The Operation and Maintenance Log includes information pertaining to inspections, repairs, and disposal relevant to the project's stormwater management system. The Log is located in Appendix A.

The Operation and Maintenance Log shall be made available to the Conservation Commission and the DEP upon request. The Conservation Commission and the DEP shall be allowed to enter and inspect the premises to evaluate and ensure that the responsible party complies with the maintenance requirements for each BMP.

2.4 Training

Employees involved in grounds maintenance and emergency response will be educated on the general concepts of stormwater management and groundwater protection. The Site Owner's Manual will be reviewed with the maintenance staff. The staff will be trained on the proper course of action for specific events expected to be incurred during routine maintenance or emergency situations.

3.0 LONG-TERM POLLUTION PREVENTION PLAN

In compliance with Standard 4 of the 2008 DEP Stormwater Management Handbook, this section outlines source control and pollution prevention measures to be employed on-site after construction.

3.1 Storage of Materials and Waste

The site shall be kept clear of trash and debris at all times. Certain materials and waste products shall be stored inside or outside upon an impervious surface and covered, as required by local and state regulations.

3.2 Vehicle Washing

No commercial vehicle washing shall take place on site.

3.3 Routine Inspections and Maintenance of Stormwater BMPs

See Section 4.0 Long-Term Operation and Maintenance Plan, for routine inspection and maintenance requirements for all proposed stormwater BMPs.

3.4 Spill Prevention and Response

A contingency plan shall be implemented to address the spill or release of petroleum products and hazardous materials and will include the following measures:

1. Equipment necessary to quickly attend to inadvertent spills or leaks shall be stored on-site in a secure but accessible location. Such equipment shall include but not be limited to the following: safety goggles, chemically resistant gloves and overshoe boots, water and chemical fire extinguishers, sand and shovels, suitable absorbent materials, storage containers and first aid equipment (i.e. Indian Valley Industries, Inc. 55-gallon Spill Containment kit or approved equivalent).

2. Spills or leaks shall be treated properly according to material type, volume of spillage and location of spill. Mitigation shall include preventing further spillage, containing the spilled material in the smallest practical area, removing spilled material in a safe and environmentally-friendly manner, and remediation of any damage to the environment.

3. For large spills, Massachusetts DEP Hazardous Waste Incident Response Group shall be notified immediately at (617) 792-7653 and an emergency response contractor shall be consulted.

4. In the event of a spill care shall be taken to protect all catch basins, areas drains, and water quality inlets from receiving hazardous material.

The proposed fuel containment area is classified as a LUHPPL as it includes the storage of petroleum products. This area has been designed to provide full containment in the event of a spill or tank failure. The berm is proposed to be lined with an impervious core, preventing contamination from seeping into the ground. Stormwater for this area will be directed to a sump within the containment area, which will have a drain pipe with a gate valve left in the closed position. The gate valve will only be opened once maintenance personnel have confirmed that no sheen is present.

3.5 Maintenance of Lawns, Gardens, and other Landscaped Areas

Lawns, gardens, and other landscaped areas shall be maintained regularly by the site owner. Vegetated and landscaped BMPs will be maintained as outlined in Section 4.0.

- Leaf litter shall be removed from the site in the fall and spring each year, at a minimum.
- Special care should be taken to ensure that all vegetation is maintained in accordance with the design specifications for each system (BMP).
- Where possible, use native and drought-resistant vegetation. Vegetation should be irrigated regularly during the establishment phase and if necessary, during excessively dry periods for long-term maintenance.
- Weedy and dead vegetation should be removed regularly to prevent clogging of BMP structures and to encourage the growth of desired vegetation.
- Application of fertilizers, herbicides and pesticides that contain phosphorus at no time exceed local, state, or federal specifications. The use of fertilizers, herbicides and pesticides containing phosphorus shall be minimized.

3.6 Storage and Use of Fertilizers, Herbicides, and Pesticides

All fertilizers, herbicides, and pesticides shall be stored in accordance with local, state, and federal regulations. The application rate and use of fertilizers, herbicides, and pesticides on the site shall at no time exceed local, state, or federal specifications. The use of fertilizers, herbicides and pesticides that contain phosphorus should be minimized.

3.7 Pet Waste Management

Pets are not anticipated to be on-site. Pet owners shall be required to pick up after their animals and dispose of waste in the trash.

3.8 Operation and Management of Septic Systems

The proposed development will be serviced by Town sewer and there are no proposed septic systems.

3.9 Snow and Deicing Chemical Management

Snow removal and use of deicing chemicals at the proposed development shall comply with the following requirements:

- Plowed snow shall be placed in the areas outside of wetland boundaries and stormwater best management practices. The following maintenance measures shall be undertaken at all snow disposal sites:
  - Debris shall be cleared from an area prior to using it for snow disposal.
  - Debris and accumulated sediments shall be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.
- In accordance with the Massachusetts General Laws, Chapter 85, Section 7A, salt and other de-icing chemicals will be stored at an indoor location. Salt and other deicing chemicals shall be stored in accordance with Massachusetts General Law.
- Sand piles shall be contained and stabilized to prevent the discharge of sand to wetlands or water bodies, and, where feasible, covered.
- Salt storage piles shall be located outside of the 100-year floodplain.
- The application of salt on the proposed parking areas and driveway shall at no time exceed state or local requirements.

3.10 Nutrient Management Plan

A nutrient management plan is required if a Total Maximum Daily Load (TMDL) has been developed that indicates that use of fertilizers containing nutrients or other specific pollutants must be reduced. The proposed project is located within the Charles River watershed, which has a final TMDL issued for pathogens and nutrients. The proposed stormwater management plan has been developed to comply with the requirements of the 2008 MA DEP Stormwater Handbook and to goals of the TMDLs.

4.0 LONG-TERM OPERATION AND MAINTENANCE PLAN

This section outlines the stormwater best management practices (BMPs) associated with the proposed stormwater management system and identifies the long-term inspection and maintenance requirements for each BMP.

4.1 Stormwater Management System Components

The following table outlines the type and quantity of the BMPs and their general location. Please reference the site plan(s) provided in the Figures section for exact location. All basins are accessible for maintenance from either the development driveway or parking areas.

BMP Type	Quantity	Location
Catch Basins	x	Throughout paved and gravel areas and within Rain Garden 2.
Water Quality Inlets	3	Within access driveway.
Infiltration Basin	2	South of the proposed development and west of the proposed water tanks.
Rain Gardens	2	East of the Power Block and east of existing containment area.
Area Drains	2	West and east of the proposed fuel gas yard.

4.2 Inspection and Maintenance Schedules

4.2.1 General Maintenance for Mosquito Control

If necessary to minimize mosquito breeding, a licensed pesticide applicator shall apply larvicides, such as Bacillus sphaericus (Bs) to all catch basins sumps, and water quality inlets. Larvicides shall be applied in compliance with all pesticide label requirements, and will be applied during or immediately after wet weather, unless the product used can withstand extended dry periods. Ensure all manhole covers, and inspection ports are secure to reduce the likelihood of mosquitoes laying eggs in standing water.

4.2.2 Deep Sump and Hooded Catch Basins

Catch basins shall be inspected four times per year, including after the foliage season. Other inspection and maintenance requirements include:

- Units shall be cleaned (organic material, sediment and hydrocarbons removed) four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

  - Cleanout shall always occur after street sweeping.
- If any evidence of hydrocarbons is found during inspection, the material shall be immediately removed using absorbent pads or other suitable measures and disposed of legally.
- Remove other accumulated debris as necessary.
- Transport and disposal of accumulated sediment off-site shall be in accordance with applicable local, state and federal guidelines and regulations.

4.2.3 Area Drains and Drop Inlets

Area drains and drop inlets shall be inspected and/or cleaned at least once per year.

4.2.4 Proprietary Separators

Maintenance of proprietary separators shall be performed according the recommendations set forth by the manufacturer (see Appendix C. Proprietary Separator Technical Manual for complete installation, operation and maintenance procedures). Inspection and maintenance procedures for proprietary devices are provided below:

- Units shall be inspected post-construction, prior to being put into service.
- Units shall be inspected not less than twice per year following installation and no less than once per year thereafter.
- Units shall be inspected immediately after any oil, fuel or chemical spill.
- All inspections shall include checking the oil level and sediment depth in the unit.
- Removal of sediments/oils shall occur per manufacturer recommendations.
- A licensed waste management company shall remove captured petroleum waste products from any oil, chemical or fuel spills and dispose.
- OSHA confined space entry protocols shall be followed if entry into the unit is required.

4.2.5 Rain Gardens/ Bioretention Areas

Annual maintenance of all bioretention area components, including plants, soil, and mulch, shall be performed to ensure the overall success. Specific maintenance activities and their required frequency are outlined below:

- Vegetation shall be watered at the end of the day for 14 consecutive days after planting.
- Trash shall be removed from the surface monthly.
- The soil surface shall be inspected on a monthly basis and any observed erosion shall be repaired.

- All void areas within the bioretention area shall be remulched on an annual basis. If the existing mulch layer has deteriorated, it shall be removed prior to applying the new layer.
- All dead and diseased vegetation shall be removed and replaced on an annual basis. Diseased trees and shrubs shall be treated as necessary.
- Inlet and outlet pipes shall be inspected every 6 months and after major storm events (rainfall totals greater than 2.5 inches in 24 hours) for evidence of clogging.
- During and after major storm, the length of time standing water remains in the bioretention area shall be recorded:
    - If the time is greater than 72 hours, thoroughly inspect the basin for signs of clogging.
    - A corrective action plan shall be developed by a qualified professional to restore infiltrative function. The Site Owner shall take immediate action to implement these corrective measures.

4.2.6 Gravel Diaphragm and Grass Filter Strips

Gravel Diaphragms and grass filter strips shall be inspected on a semi-annual basis during the first year after construction, and annually thereafter. Inspection and maintenance requirements include:

- The gravel diaphragm shall be inspected for sediment buildup and accumulated sediment shall be removed from the toe of the slope or level spreader.
- Vegetation shall be inspected for signs of erosion, bare spots, and overall health.
- Mowing shall occur on a regular basis as needed.
- Any sediment that accumulates at the top of the slope shall be removed to maintain the appropriate slope and prevent formation of a berm that would prevent runoff from flowing as sheet flow.

4.2.7 Infiltration Basins

Infiltration basins shall be inspected and maintained after major storm events (rainfall totals greater than 2.5 inches in 24 hours) during the first three months of operation and twice a year and when there are discharges through the overflow spillway thereafter. Additionally, all pretreatment BMPs shall be inspected in accordance with the minimal requirements specified for those practices and after all major storm events. Inspections shall include the following measures:

- During and after major storm events, the length of time standing water remains in the basin shall be recorded.

  - If the time is greater than 72 hours, thoroughly inspect the basin for signs of clogging.
  - A corrective action plan shall be developed by a qualified professional to restore infiltrative function. The Site Owner shall take immediate action to implement these corrective measures.
- Identify areas of sediment accumulation, differential settlement, cracking, and erosion within the basin.
- Inspect embankments for leakage and tree growth.
- Examine the health of the vegetation within the basin and on the embankments.

Corrective measures shall be taken immediately as warranted by the inspections. If any evidence of hydrocarbons is found during inspection, the material shall be immediately removed using absorbent pads or other suitable measures and legally disposed.

Preventative maintenance shall include the following activities:
- Mow the buffer area and basin bottom and side slopes, if vegetated.
- Remove trash, debris, and accumulated organic matter.
- Remove clippings after mowing.
- Remove and replace impacted soils at the bottom of the basin if evidence of clogging is present.

4.2.8 Stormwater Outfalls
Flared end sections and associated riprap spillways shall be inspected at least once per year and after major storm events (rainfall totals greater than 2.5 inches in 24 hours) to ensure that the stability of the outlet area is maintained. The outfall area shall be kept clear of debris such as trash, branches, and sediment. Repairs shall be made immediately if riprap displacement or downstream channel scour is observed.

4.2.9 Shut-Off Valves
Shut-off valves shall be inspected and exercised in accordance with the manufacturer's recommendations. At a minimum each shut-off valve shall be inspected annually and confirmed to be in working condition. Valves shall be repaired and replaced as needed.

4.3 Estimated Operation and Maintenance Budget
An operations and maintenance budget was prepared to approximate the annual cost of the inspections required in compliance with the DEP Stormwater Management Policy. The table below estimates the annual cost to inspect and maintain each proposed BMP, based on the requirements in Section 4.2.

BMP Type	# of BMPS	Annual O&M Cost (per BMP)[1]	Total Cost
Mosquito Control	x	$50-$100	
Catch Basin	x	$200-$400	
Area Drain	2	$50-$100	$100-$200
Water Quality Inlet	3	$100-$300	$300-$900
Bioretention Area	2	$200-$400	$400-$800
Infiltration Basin	2	$200 - $400	$400-$800
Riprap Spillway	5	$50-$100	$250-$500
		Total	

4.4 Public Safety Features

The stormwater management system for the proposed fuel containment area has been designed to provide containment in the event of a spill. The impervious berm will prevent seepage of contaminants and the drainage system will be left in a closed position requiring employees to assess the area prior to allowing stormwater to discharge.

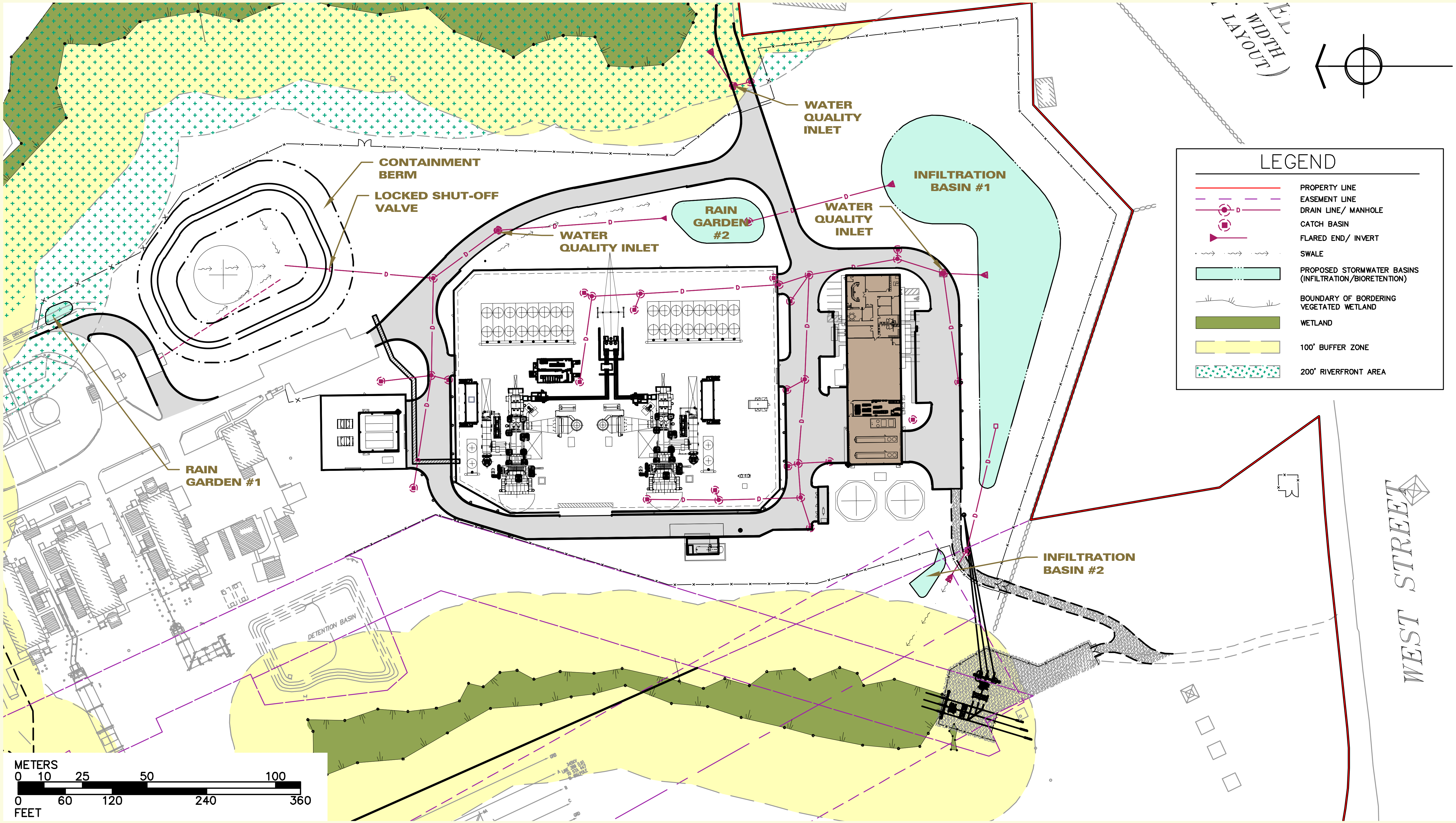
[1] Annual maintenance cost is based on estimate of the cost to complete all inspection and maintenance measures outlined in Section 4.2. For BMPs that require sediment removal at regular intervals (i.e. every 5 or 10 years), the annual cost includes the annual percentage of that cost.

Figures

Figure 1: Site Plan

West Medway II

Medway, Massachusetts



BEALS + THOMAS
Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

B+T Drawing No. 142210P037A-001 Date: 01/15/2016 Scale: 1" = 120'

Stormwater Management System Exhibit

Figure **1.0**

Appendices

Appendix A

Operation and Maintenance Log

OPERATION AND MAINTENANCE LOG

This template is intended to comply with the operation and maintenance log requirements of the 2008 DEP Stormwater Management Handbook. Copies of this log should be made for all inspections and kept on file for three years from the inspection date.

Name/Company of Inspector:
Date/Time of Inspection:
Weather Conditions: (Note current weather and any recent precipitation events)

Stormwater BMP	Inspection Observations	Actions Required

Appendix B

List of Emergency Contacts

List of Emergency Contacts

Exelon
Mr. Jack Hughes
(617) 381-2247

Town of Medway Fire Department
44 Milford treet
Medway, MA 02053
(508) 533-3211

Town of Medway Department of Public Services
155 Village Street
Medway, MA 02053
(508) 533-3275

Massachusetts DEP Hazardous Waste Incident Response Group
(617) 792-7653

Appendix C

Proprietary Separator Technical Manual

Appendix H
Draft Stormwater Pollution Prevention Plan

EPA Construction General Permit

West Medway II

9 Summer Street
Medway, Massachusetts

Prepared for:
Exelon West Medway, LLC and
Exelon West Medway II, LLC
300 Exelon Way
Kennett Square, PA 19348

Presented by:

BEALS + THOMAS
Beals and Thomas, Inc.
Reservoir Corporate Center
144 Turnpike Road (Route 9)
Southborough, MA 01772-2104

January 15, 2016

142210RP002

TABLE OF CONTENTS

LIST OF APPENDICES

1.0 CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 OPERATOR(S)/ SUBCONTRACTORS

Operator(s)

Company:	Owner Name				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

Company:	Contractor Name				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

Subcontractor(s)

Company:	Subcontractor Name				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		
Area of Control:		Site Work Contractor			

24-Hour Emergency Contact

Company:	Text
Name:	Text
Telephone:	Text

1.2 STORMWATER TEAM

SWPPP Preparer

Company:	Beals and Thomas, Inc.				
Name:	Text				
Address:	144 Turnpike Road				
City:	Southborough	State:	MA	ZIP Code:	01772
Telephone:	508-366-0560	Email:	Text		

Personnel Responsible for Installation & Maintenance of Stormwater BMPs

Company:	Text				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

Inspection Personnel

Company:	Text				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

Personnel Responsible for Taking Corrective Actions

Company:	Text				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

2.0 SITE EVALUATION, ASSESSMENT AND PLANNING

2.1 PROJECT/SITE INFORMATION

Project/Site Name:	West Medway II				
Project Street/Location:	9 Summer Street				
City:	Medway	State:	MA	ZIP Code:	02053
County or Similar Subdivision:		Norfolk			

Latitude:	42°08’20”	Longitude:	71°26’43”

Method for Determining Latitude/Longitude:
- ☐ USGS Topographic Map (specify scale: __________)
- ☐ EPA Website
- ☐ GPS
- ☐ Other (please specify): Google Earth

Horizontal Reference Datum:
- ☐ NAD 27
- ☒ NAD 83
- ☐ WGS 84
- ☐ Unknown

Is the project located on Indian country lands, or located on a property of religious of cultural significance to an Indian tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property:

____

Is this project considered a federal facility? ☐ Yes ☒ No

Are you applying for permit coverage as a “federal operator” as defined in Appendix A of the 2012 CGP? ☐ Yes ☒ No

NPDES project or permit tracking number: Text

2.1.1 Emergency-Related Projects

Is this project in response to a public emergency? ☐ Yes ☒ No

If yes, document the cause of the public emergency *(e.g., natural disaster, extreme flooding conditions)*, information substantiating its occurrence *(e.g., state disaster declaration)*, and a description of the construction necessary to reestablish effective public services:

2.2 NATURE AND SEQUENCE OF CONSTRUCTION ACTIVITY

2.2.1 Function of the Construction Activity

To construct a new, highly efficient, fast-starting peaking facility at the existing 94-acre West Medway Generating Station site on Summer Street in Medway, Massachusetts. The new Facility would operate during times of peak energy demand and would run primarily on natural gas, but could also run on ultra-low sulfur distillate ("ULSD") fuel oil as a back-up. The Facility will include two (2) new state-of-the-art, simple-cycle peaking electric combustion turbines (100 megawatts each) with a combined net nominal electrical output of 200 megawatts ("MW").

Function of the construction activity:

☐ Residential ☐ Commercial
☐ Industrial ☐ Road Construction
☐ Linear Utility ☒ Other (please specify): Power Generation

2.2.2 Estimated Project Dates

Estimated Project Start Date: Text
Estimated Project Completion Date: Text

If needed complete a timeline for each phase of the project.

Estimated Timeline of Activity	Construction Activity and BMP Descriptions
Date Start –Date End	***Before any site grading activities begin*** 1. Stake Limit of Construction. Workers shall be informed that no construction activity is to occur beyond this limit at any time. 2. Delineate the limit of the natural buffer to be maintained with flags, tape or other similar device. 3. Clear vegetation as necessary within the limits of construction. 4. Grub the areas where silt fence is required, removing stumps and roots as necessary. The existing ground surface shall be disturbed as little as possible prior to the start of construction. 5. Install silt fence and straw bales as shown on the plans. An adequate stockpile of erosion control materials shall be on site at all times for emergency or routine replacement and shall include materials to repair silt fences, straw bales, or any other devices planned for use during construction. 6. Install storm drain inlet protection. 7. Construct stabilized construction exits. 8. Construct staging and materials storage area. 9. Install temporary sanitary facilities and dumpsters.
Date Start –Date End	***Site grading*** 1. Begin site clearing and grubbing operations. 2. Commence excavation of stormwater management basins to act as temporary sedimentation basins during construction. 3. Commence construction of temporary drainage channels to direct runoff to sedimentation basin(s) during construction. Check dams shall be installed along the temporary drainage channels to reduce velocities and collect sediment. 4. Begin overall site grading and topsoil stripping. 5. Establish topsoil stockpile. 6. Install silt fences around stockpile and cover stockpiles. 7. Disturbed areas where construction will cease for more than 7 days shall be stabilized with erosion controls.

Date Start –Date End	***Infrastructure (utilities, parking lot, etc.)*** 1. Construct temporary concrete washout area. 2. Install utilities, storm drains, sanitary sewers, and water services. 3. Install gutters, curbs, and prepare pavement subgrade.
Date Start –Date End	***Building Construction*** 1. Begin construction of building foundations and structures. 2. Access driveway and parking lot paved, structure exteriors constructed 3. Remove temporary concrete washout area. 4. Implement winter stabilization procedures.
Date Start –Date End	***Final stabilization and landscaping*** 1. Finalize pavement activities. 2. Convert temporary sediment basin(s) to (a) permanent basins. 3. Install infiltration basins, and rain gardens. 4. Remove all temporary control BMPs and stabilize any areas disturbed by their removal with erosion controls 5. Prepare final seeding and landscaping. 6. Monitor stabilized areas until final stabilization is reached.

2.3 SOILS, SLOPES, VEGETATION, AND CURRENT DRAINAGE PATTERNS

Soil types: The Natural Resources Conservation Service (NRCS) lists the on-site soils predominately as Merrimac Fine Sandy Loam Soil, a very deep, gently sloping, and somewhat excessively drained soil. Typically this soil is located in broad areas on plains and on terraces that commonly follow major stream valleys. NRCS classifies this type of soil as hydrologic class A soil.

The developed portions of the site also consist of Udorthents, Sandy Soils. These soils consist of areas where the original soils have been removed for use as roadfill, concrete aggregate, or landfill. The original soils were typically excessively drained to well drained and on glacial outwash plains, terraces, kames, and eskers. Typically, Udorthents, sandy, are the remaining substratum material from Canton, Hinckley, Merrimac, and Windsor soils, after the upper 4 to 40 feet of the soil material was removed. Most areas are stratified sand and gravel to a depth of 60 inches or more, In many areas stones and boulders 10 inches to 10 feet in diameter are scattered randomly on the surface or are in piles. NRCS classifies this type of soil as hydrologic class A soil.

The eastern boarder of the site, along Summer Street, consists of Scarboro and Birdsall Soils. These are deep, nearly level, very poorly drained soils in low, flat areas and in depressions on glacial outwash plains and terraces. Some areas are mostly Scarboro soils, some are mostly Birdsall soils, and some areas consist of both soil. NRCS classifies this type of soil as hydrologic class A/D soils. The hydrologic model assumes the wetland areas area hydrologic soil class D and the remaining areas are hydrologic soil class A.

Slopes: The topography of the site slopes gently from north to south. The property slopes from elevation 210 along the northern property line to elevation 195 along the southern property line.

Drainage Patterns: The Facility Site is located on the hydrologic divided between two tributary streams in the upper reaches of the Charles River watershed. Runoff from the Facility Site drains to the east to Center Brook and to the west toward Hopping Brook. South of the Subject Property, Hopping Brook and Center Brook merge and drain into the Charles River.

Vegetation: The portion of the Subject Property that the proposed project is sited on (the Facility Site) is currently vegetated, primarily by mowed grass fields separated by hedgerows.

2.4 CONSTRUCTION SITE ESTIMATES

Total property area:	94± acres
Total construction site area to be disturbed:	17±acres
Maximum area to be disturbed at one time:	17.0±acres
Percentage impervious area before construction:	Text %
Runoff coefficient before construction:	Text
Percentage impervious area after construction:	Text %
Runoff coefficient after construction:	Text

2.5 DISCHARGE INFORMATION

2.5.1 Description of Receiving Storm Sewer Systems

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☒ Yes ☐ No

2.5.2 Receiving Waters

Name(s) of the first surface water that receives stormwater directly from your site and/or from the MS4 (note: multiple rows provided where your site has more than

one point of discharge that flows to different surface waters)
1. Center Brook
2. Hopping Brook
3. The Charles River

2.5.3 Impaired Waters/ TMDLs

	Is this surface water listed as "impaired"?	If you answered yes, then answer the following:			
		What pollutant(s) are causing the impairment?	Has a TMDL been completed?	Title of the TMDL document	Pollutant(s) for which there is a TMDL
1.	☐ YES ☒ NO		☐ YES ☒ NO		
2.	☐ YES ☒ NO		☐ YES ☒ NO		
3.	☒ YES ☐ NO	Pathogens Nutrients	☒ YES ☐ NO	*Final Pathogen TMDL for the Charles River Watershed* *Total Maximum Daily Load for Nutrients in the Upper/ Middle Charles River, Massachusetts*	Pathogens Nutrients

2.5.4 Tier 2, 2.5, or 3 Waters

	Is this surface water designated as a Tier 2, Tier 2.5, or Tier 3 water? (see Appendix F)	If you answered yes, specify which Tier (2, 2.5, or 3) the surface water is designated as?
1.	☐ YES ☒ NO	
2.	☐ YES ☒ NO	
3.	☐ YES ☒ NO	

2.6 UNIQUE SITE FEATURES AND SENSITIVE AREAS

The eastern portion of the Subject Property contains a section of Center Brook and associated bordering vegetated wetlands. The south western corner and the northern boundary of the Subject Property also contain bordering vegetated wetlands.

2.7 CONSTRUCTION SUPPORT ACTIVITIES

Construction support activities are not required for the project.

2.8 POTENTIAL SOURCES OF POLLUTION

2.8.1 Potential Sources of Sediment

- Clearing and grubbing operations
- Grading and site excavation operations
- Vehicle tracking
- Topsoil stripping and stockpiling
- Landscaping operations

2.8.2 Potential Sources of Non-Sediment Pollutants

- Combined Staging Area — small fueling activities, minor equipment maintenance, sanitary facilities, and hazardous waste storage.
- Materials Storage Area — general building materials, solvents, adhesives, paving materials, paints, aggregates, trash, and so on.
- Construction Activity — paving, curb/gutter installation, concrete pouring/mortar/stucco, and building construction
- Concrete Washout Area

Material/ Chemical	Physical Description	Stormwater Pollutants	Location[1]
Pesticides	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic	Herbicides used for noxious weed control
[2]Fertilizer	Liquid or solid grains	Nitrogen, phosphorous	Newly seeded areas
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	No equipment cleaning allowed in project limits
Asphalt	Black solid	Oil, petroleum distillates	Streets, parking areas, and roofing
Glue/ adhesives	White or yellow liquid	Polymers, epoxies	Building construction
Paints	Various colored liquids	Metal oxides, stoddard solvent, talc, calcium carbonate, arsenic	Building construction
Curing compounds	Creamy white liquid	Naphtha	Curb and gutter, walkways
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium	Timber pads and building construction
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil	Leaks or broken hoses from equipment

Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE	Secondary containment/staging area
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes	Secondary containment/staging area
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates	Secondary containment/staging area
Antifreeze/ coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	Leaks or broken hoses from equipment
Sanitary toilets	Various colored liquid	Bacteria, parasites, and viruses	Staging area

[1] Area where material/chemical is used on-site.
[2] Use of fertilizers containing nitrogen and/ or phosphorus in ratios greater than recommended by the manufacture must be documented.

2.9 SITE PLANS

The Topographic Plan shows the undeveloped site and its current features. The Site Plans show the developed site.

These Site Plans include:

- ☐ Delineation of construction phasing, if applicable
- ☒ Areas of soil disturbance and areas that will not be disturbed
- ☐ Direction(s) of stormwater flow and approximate slopes before and after major grading activities
- ☒ Natural features to be preserved
- ☒ Locations of major structural and non-structural BMPs identified in the SWPPP
- ☐ Location(s) of sediment, soil or other construction materials will be stockpiled
- ☐ Locations of stabilization measures
- ☐ Locations of off-site material, waste, borrow, or equipment storage areas
- ☒ Location of all waters of the U.S., including wetlands on or near the site. Indicate if water bodies are listed as impaired, or are identified as Tier 2, 2.5 or 3 waters.
- ☒ Boundary lines of any natural buffers,
- ☐ Locations where stormwater discharges or allowable non-stormwater to surface water(s)
- ☒ Locations of storm drain inlets and stormwater control measures on the site and in the immediate vicinity of the site

- ☐ Locations of all pollutant-generating activities
- ☐ Locations where polymers, flocculants, or other treatment chemicals will be used and stored
- ☐ Areas of federally-listed critical habitat for endangered or threatened species

See Appendix B: Site Plans

3.0 COMPLIANCE WITH APPLICABLE FEDERAL & STATE REQUIREMENTS

3.1 ENDANGERED SPECIES CERTIFICATION

Are endangered or threatened species and critical habitats on or near the project area?
☐ Yes ☒ No

Describe how this determination was made:
The MASSGIS NHESP Priority Habitat of Rare Species Layer, Updated September, 2008, indicates that no priority habitat of rare species are located within the project site.

If yes, describe the species and/or critical habitat:

If yes, describe or refer to documentation that determines the likelihood of an impact on the identified species and/or habitat and the steps taken to address that impact.

3.2 HISTORIC PRESERVATION

Step 1
Will stormwater controls that require subsurface earth disturbance be installed on the site? ☒ Yes ☐ No

Step 2
If you answered yes in Step 1, have prior surveys or evaluations conducted on the site already determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties?
☐ Yes ☒ No

Step 3
If you answered no in Step 2, has it been determined that the installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties?
☒ Yes ☐ No

The Massachusetts Historic Commission was notified of the project during the MEPA process.

Step 4

If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond within 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties?

☐ Yes ☐ No

If no, no further documentation is required. If yes, describe the nature of their response and include documentation in the Appendix:

☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions.

☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls.

☐ Other:

3.3 SAFE DRINKING WATER ACT UNDERGROUND INJECTION CONTROL REQUIREMENTS

Do you plan to install any of the following controls?

☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☐ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow

☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, attach documentation of contact between you and the applicable state agency or EPA Regional Office responsible for implementing the requirements for underground injection wells in the Safe Drinking Water Act and EPA's implementing regulations at 40 CFR Parts 144-147.

3.4 APPLICABLE STATE OR LOCAL PROGRAMS

This SWPPP complies with the requirements of Standard 8 of the Massachusetts Department of Environmental Protection Stormwater Handbook, which states:

A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plans) shall be developed and implemented.

4.0 EROSION AND SEDIMENT CONTROL BMPS

This SWPPP contains a listing of the erosion and sediment control best management practices (BMPs) that will be implemented to control pollutants in stormwater discharges. The BMPs are categorized under one of the areas of BMP activity as described below:

- Natural Buffers or Equivalent Sediment Controls
- Minimize disturbed area and protect natural features and soil
- Phased construction activity
- Control stormwater flowing onto and through the project
- Stabilize soils
- Protect slopes
- Protect storm drain inlets
- Establish perimeter controls and sediment barriers
- Retain sediment on-site and control dewatering practices
- Establish stabilized construction exits

4.1 NATURAL BUFFERS OR EQUIVALENT SEDIMENT CONTROLS

Are there any surface waters located within 50 feet of your construction disturbances that receive stormwater discharges from the site? ☒ Yes ☐ No

If yes, check the compliance alternative that applies:

☒ A 50-foot undisturbed natural buffer will be maintained. The 50-foot buffer is shown on the attached site plans and will be clearly marked off with flags, tape, or a similar marking device prior to the commencement of earth disturbing activities.

This alternative applies to the majority of the proposed work.

☒ An undisturbed natural buffer of 25-feet will be provided along with supplemental erosion and sediment controls, which in combination achieves the sediment load reduction equivalent to a 50-foot undisturbed natural buffer. The estimated sediment removal calculations are included in the appendixes of this report and have been calculated using the applicable tables included in Appendix G of the 2012 Construction General Permit **or** site-specific calculations were performed to estimate the sediment removal of a 50-buffer zone and the efficiency of the reduced buffer zone and supplemental erosion control measures.

This alternative applies to the proposed work near the Summer Street entrance of the Site, and for the overflow swale for the Infiltration Basin 1.

In addition to maintaining a natural buffer of 25-feet an erosion control barrier consisting of a silt fence and strawbales will be provided to achieve the equivalent sediment removal of a 50-foot undisturbed barrier.

☐ It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore erosion and sediment controls will be implemented that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer. The estimated sediment removal calculations are included in the appendixes of this report and have been calculated using the applicable tables included in Appendix G of the 2012 Construction General Permit or site-specific calculations were performed to estimate the sediment removal of a 50-buffer zone and the efficiency of the reduced buffer zone and supplemental erosion control measures.

☒ The project qualifies for one of the exceptions in Part 2.1.2.1.e. of the 2012 Construction General Permit. Specifically:

- ☐ There is no discharge of stormwater to surface waters through the area between the disturbed portions of the site and any surface waters located within 50 feet of the site. This includes situations where control measures have been implemented such as a berm or other barrier that will prevent such discharges.

- ☐ No natural buffer exists due to preexisting development disturbances, such as impervious surfaces or structures that were constructed prior to the initiation of planning for this project.

- ☒ For a “linear project,” site constraints (e.g., limited right-of-way) make it infeasible for the site to meet any of the CGP Part 2.1.2.1.a compliance alternatives

  This exemption applies to the work associated with the Switchyard. An erosion control barrier consisting of silt fence and strawbales will be installed at the limit of work. Workers shall be informed that no further encroachment into the bordering vegetated wetlands will be permitted beyond the limit of work.

☐ The project qualifies as "small residential lot" construction, and complies with:

- ☐ Alternative 1: A 50-foot buffer, a buffer <50 feet and > 30 has been provided with double perimeter controls buffer less than 30-feet has been provided with double perimeter controls with 7-day site stabilization requirements has been provided.] Provide a description on how the controls will comply with the CGP requirements.

- ☐ Alternative 2: A sediment discharge risk evaluation has been prepared and is included in the appendices of this report.

- ☐ Buffer disturbances are authorized under a CWA Section 404 permit.

- ☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail).

4.2 MINIMIZE DISTURBED AREA AND PROTECT NATURAL FEATURES AND SOIL

4.2.1 Preserve Existing Vegetation

Description:	The preserved area of existing vegetation shall be as identified on the Site Plans and Sitework Specifications.
Installation Schedule:	The preserved area of existing vegetation shall be surrounded with the orange-colored plastic mesh fence, and trees shall be marked before construction begins at the site.
Maintenance and Inspection:	The area shall be inspected weekly to ensure the temporary fence is intact and the trees are clearly marked. During construction, preserved areas of existing vegetation shall be surrounded by the orange-colored mesh fence and clearly marked at all times.

4.2.2 Stockpiling Topsoil

Description:	Topsoil stripped from the immediate construction area shall be stockpiled as identified on the Site Plans and Sitework Specifications or as approved by the SWPPP preparer.
Installation Schedule:	Topsoil stockpiles shall be established during grading activities. The silt fence and temporary erosion controls shall be installed immediately after the stockpile has been established. When practical provide cover over the stockpile or temporary stabilization to avoid direct contract with precipitation and wind.
Maintenance and Inspection:	The area shall be inspected weekly for erosion and immediately after storm events. Areas on or around the stockpile that have eroded shall be stabilized immediately with erosion controls. See

	following Silt Fence section for Maintenance and inspection procedures.

4.3 PHASED CONSTRUCTION ACTIVITY

4.3.1 Phase I

- Describe phase
- Duration of phase (start date, end date)
- List BMPs associated with this phase
- List BMPs associated with this phase
- Describe stabilization methods for this phase (describe any temporary stabilization methods that will be used before final stabilization)

4.3.2 Phase II

- Describe phase
- Duration of phase (start date, end date)
- List BMPs associated with this phase
- List BMPs associated with this phase
- Describe stabilization methods for this phase (describe any temporary stabilization methods that will be used before final stabilization)

4.4 CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT

4.4.1 Grass Drainage Channels

Description:	A grass drainage channel shall be installed as needed to convey runoff to the proposed sediment basins.
Installation Schedule:	The grass drainage channel shall be installed after clearing and grubbing operations are completed at the site.
Maintenance and Inspection:	The channel shall be inspected weekly and immediately after storm events for erosion and structural failures. Before vegetation has been established in the channel, inspect erosion control blankets, embankments, and beds for erosion and accumulation of debris and sediment. Remove debris, sediment, and repair erosion control blankets, fiber rolls and embankments immediately.

Design Specifications

1. The channel shall have a positive drainage to convey runoff to the temporary sediment basins.

4.5 STABILIZE SOIL

4.5.1 Temporary Stabilization

Description:	Initiation of temporary vegetative cover shall occur immediately where construction will cease for more that 7 days. It shall be established using hydroseeding for areas of exposed soil (including stockpiles).
Installation Schedule:	Temporary stabilization measures shall be initiated immediately where construction activities will temporarily cease for more than 7 days.
Maintenance and Inspection:	Stabilized areas shall be inspected weekly and after storm events until a dense cover of vegetation has become established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately.

4.5.2 Mulching

Description:	Hydromulching shall provide immediate protection to exposed soils during short periods of disturbance. Hydromulch shall also be applied in areas that have been seeded for temporary or permanent stabilization.
Installation Schedule:	Hydromulch shall be applied to exposed soils during short periods of construction and seeded areas.
Maintenance and Inspection:	Mulched areas shall be inspected weekly and after storm events to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, the surface shall be repaired, and new mulch shall be applied to the damaged area.

4.5.3 Permanent Stabilization

Description:	Initiation of permanent stabilization measures shall occur immediately after the final design grades are achieved and earth moving activities cease. Native species of plants shall be used to establish vegetative cover on exposed soils. Permanent stabilization shall be completed in accordance with the procedures outlined in the Final Stabilization section of this report.
Installation Schedule:	Portions of the site where construction activities have permanently ceased shall be stabilized, as soon as possible.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately. Care shall be taken to avoid compacting newly placed topsoil. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

4.5.4 Dust Control

Description:	Dust from the site shall be controlled by using a mobile pressure-type distributor truck to apply potable water to disturbed areas. The mobile unit shall apply water at a rate of 300 gallons per acre and minimized as necessary to prevent runoff and ponding.
Installation Schedule:	Dust control shall be implemented as needed once site grading has been initiated and during windy conditions (forecasted or actual wind conditions of 20 mph or greater) while site grading is occurring. Spraying of potable water shall be performed no more than three times a day during the months of May–September and once per day during the months of October–April or whenever the dryness of the soil warrants it.
Maintenance and Inspection:	At least one mobile unit shall be available at all times to distribute potable water to control dust on the project area. Each mobile unit shall be equipped with a positive shutoff valve to prevent over watering of the disturbed area.

4.6 PROTECT SLOPES

4.6.1 Erosion Control Blanket

Description:	Erosion control blankets shall be used to provide stabilization for the slopes in the grass drainage channels and sediment basins, and on slopes greater than 3:1 throughout the site.
Installation Schedule:	The erosion control blankets shall be installed once the slopes of the grass drainage channel and sediment basin have reached final grade.
Maintenance and Inspection:	The erosion control blanket shall be inspected weekly and immediately after storm events to determine if cracks, tears, or breaches have formed in the fabric; if so, the blanket shall be repaired or replaced immediately. Good contact with the soil shall be maintained and erosion shall not occur under the blanket. Any areas where the blanket is not in close contact with the ground shall be repaired or replaced.

4.7 PROTECT STORM DRAIN INLETS

4.7.1 Filter Bags

☐ Permanent ☒ Temporary

Description:	Filter bag manufactured specifically for controlling sediment flow into all storm drain inlets to prevent coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.
Installation Schedule:	Filter Bags shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Storm drain inlet protection shall be inspected weekly and following storms. Clogged filter bags shall be cleaned or replaced. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, you must remove the deposited sediment by the end of the same work day it is found or by the following work day if removal the same day is not feasible. Collected sediments shall NOT be washed into storm drains.

4.8 ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS

4.8.1 Erosion Control Barrier

☐ Permanent ☒ Temporary

Description:	An erosion control barrier, consisting of entrenched straw bales and siltation fencing, shall be installed along the downgradient side of the proposed project to decrease the velocity of sheet flows and intercept and detain small amounts of sediment from disturbed areas.
Installation Schedule:	Erosion Control Barrier shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Erosion Control Barrier shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches, or one-half of the above ground height of the barrier, whichever is less. Deteriorated fencing material shall be replaced. Used fencing shall be properly disposed of.

4.8.2 Silt Fence

☐ Permanent ☒ Temporary

Description:	Entrenched silt fence shall be installed to decrease the velocity of sheet flows and intercept and detain small amounts of sediment from disturbed areas.
Installation Schedule:	Silt fence shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Silt fence shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches. Deteriorated fencing material shall be replaced. Used fencing shall be properly disposed of.

4.9 RETAIN SEDIMENT ON-SITE

4.9.1 Temporary Sediment Basins

☒ Permanent ☒ Temporary

Description:	Temporary sediment basins are located throughout the site between construction and wetland resource areas. These basins provide 3,600 cubic feet of storage per acre drained, as required by the EPA. Refer to the Temporary Sediment Basin Sizing Calculation located in Appendix K. Several temporary sediment basins will be utilized as sediment forebays following construction.
Installation Schedule:	Temporary Sediment Basins shall be installed during grading activities.
Maintenance and Inspection:	Temporary Sediment Basins shall be inspected weekly and following storms. Sediment shall be removed when it reaches a depth of one foot, or half the design capacity whichever is less. Damage to basin embankments and slopes shall be repaired.

4.10 ESTABLISH STABILIZED CONSTRUCTION ENTRANCE/EXIT

☐ Permanent ☒ Temporary

Description:	Temporary gravel or crushed stone construction entrances/exits or other means shall be used to minimize off-site movement of soil with vehicles. Construction access points shall be maintained to minimize tracking of soil onto public roads and existing parking lots to remain. If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected.
Installation Schedule:	Stabilized construction entrance shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Stabilized construction entrances shall be inspected daily. Gravel or crushed stone shall be added if the pad is no longer in accordance with the specifications. If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected. When sediment has been tracked off of the site, it shall be removed by the end of the same working day, or by the end of the next working day if track-out occurs on a non work day. Remove sediment by sweeping, shoveling or vacuuming roadways were sediment has been tracked-out.

4.11 DEWATERING PRACTICES

Description:	All groundwater or stormwater discharged from

	excavations, trenches, foundations, vaults, or other similar point shall be treated by sediment basins, sediment traps, sediment socks, dewatering tanks, tube settlers or filtration systems specifically designed to remove sediment from the excavations. All dewatering practices shall conform to the following: • Visible floating solids or foam shall not be discharged; • An oil-water separator or suitable filtration device (such as a cartridge filter) that is designed to remove oil, grease, or other products if dewatering water is found to contain these materials shall be used; • To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area; • Velocity dissipaters shall be installed at all points where dewatering activities are discharged to the surface. • With backwash water, either haul it away for disposal or return it to the beginning of the treatment process; and • Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.
Installation Schedule:	Install settling or filtration methods prior to commencing dewatering. Engineer is required to approve settling of filtration method design prior to installation.
Maintenance and Inspection:	Settling of filtration controls shall be inspected weekly and following storms. Sediment shall be removed when it reaches a depth of one foot, or half the design capacity whichever is less.

5.0 GOOD HOUSEKEEPING BMPS

This SWPPP contains a listing of the good housekeeping best management practices (BMPs) that shall be implemented to control pollutants in stormwater discharges during construction-related work. The BMPs are categorized below:

- Material Handling and Waste Management
- Establish Proper Building Material Staging Areas
- Designate Washout Areas
- Establish Proper Equipment/Vehicle Fueling and Maintenance Practices
- Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing
- Spill Prevention and Control Plan

5.1 MATERIAL HANDLING AND WASTE MANAGEMENT

Several management procedures and practices are proposed to prevent and/or reduce the discharge of pollutants to stormwater from solid or liquid wastes that will be generated at the site. These measures are grouped into the following categories: (1) solid or construction waste disposal, (2) recycling, (3) sanitary and septic waste, and (4) hazardous materials.

5.1.1 Solid or Construction Waste Disposal

Description:	All waste materials shall be collected and disposed of into metal trash dumpsters in the materials storage area. Dumpsters shall have a secure lid, be placed away from stormwater conveyances and drains, and meet all federal, state, and municipal regulations. Only trash and construction debris from the site shall be deposited in the dumpster. No construction materials shall be buried on-site unless authorized by a program for recycling/beneficial use. All personnel shall be instructed regarding the correct disposal of trash and construction debris. Notices that state these practices shall be posted in the office trailer and the individual who manages day-today site operations shall be responsible for seeing that these practices are followed.
Installation Schedule:	Trash dumpsters shall be installed once the materials storage area has been established.
Maintenance and Inspection:	The dumpsters shall be inspected weekly and immediately after storm events. The dumpsters shall be emptied weekly and taken to an approved landfill or recycling facility. If trash and construction debris are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently.

5.1.2 Recycling

Description:	Wood pallets, cardboard boxes, and other recyclable construction scraps shall be disposed of in a designated dumpster for recycling. The dumpster shall have a secure watertight lid, be placed away from stormwater conveyances and drains and meet all local and state solid-waste management regulations. Only solid recyclable construction scraps from the site shall be deposited in the dumpster. All personnel shall be instructed regarding the correct procedure for disposal of recyclable construction scraps. Notices that state these procedures shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Designated recycling dumpsters shall be installed once the area has been established.
Maintenance and Inspection:	The recycling dumpster shall be inspected weekly and immediately after storm events. The recycling dumpster shall be emptied weekly and taken to an approved recycling center. If recyclable construction wastes are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently.

5.1.3 Sanitary and Septic Waste

Description:	Temporary sanitary facilities (portable toilets) shall be provided at the site throughout the construction phase. The portable toilets shall be located in the staging area, away from concentrated flow paths and traffic flow.
Installation Schedule:	The portable toilets shall be brought to the site once the staging area has been established.
Maintenance and Inspection:	All sanitary waste shall be collected from the portable facilities on a regular basis. The portable toilets shall be inspected weekly for evidence of leaking holding tanks. Toilets with leaking holding tanks shall be removed from the site and replaced with new portable toilets.

5.1.4 Hazardous Materials and Waste

Description:	All hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed shipping containers, within the hazardous materials storage area. Hazardous waste materials shall be stored in appropriate and clearly marked containers and segregated from other non-waste materials. Secondary

	containment shall be provided for all waste materials in the hazardous materials storage area and shall consist of commercially available spill pallets. Additionally, all hazardous waste materials shall be disposed of in accordance with federal, state, and municipal regulations. Hazardous waste materials shall not be disposed of into the on-site dumpsters. All personnel shall be instructed regarding proper procedures for hazardous waste disposal. Notices that state these procedures shall be posted in the office trailer and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Shipping containers used to store hazardous waste materials shall be installed once the site materials storage area has been installed.
Maintenance and Inspection:	The hazardous waste material storage areas shall be inspected weekly and after storm events. The storage areas shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety data sheets, material inventory, and emergency contact numbers shall be maintained in the office trailer.

5.2 ESTABLISH PROPER BUILDING MATERIAL STAGING AREAS

Description:	Construction equipment and maintenance materials shall be stored at the combined staging area and materials storage areas. A watertight shipping container shall be used to store hand tools, small parts, and other construction materials. Nonhazardous building materials such as packaging material (wood, plastic, and glass), and construction scrap material (brick, wood, steel, metal scraps, and pipe cuttings) shall be stored in a separate covered storage facility adjacent to the shipping container. All hazardous-waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed containers under cover within the storage area. All fertilizers, herbicides, insecticides and pesticides shall be stored in accordance with local, state, and federal regulations. At a minimum these materials shall be covered with plastic sheeting or a temporary roof to prevent contact with rainwater. Very large items, such as framing materials and stockpiled lumber, shall be stored in the open in the materials storage area. Such materials shall be elevated on wood blocks to minimize contact with runoff.
Installation	The materials storage area shall be installed after grading and before any

Schedule:	infrastructure is constructed at the site.
Maintenance and Inspection:	The storage area shall be inspected weekly and after storm events. The storage area shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

5.3 DESIGNATE WASHOUT AREAS

5.3.1 Concrete Washout

Description:	A designated temporary, above-grade concrete washout area shall be constructed as detailed on the site plan. The temporary concrete washout area shall be constructed with a recommended minimum length and minimum width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The washout area shall be lined with plastic sheeting at least 10 mils thick and free of any holes or tears. Signs shall be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours shall not be conducted during or before an anticipated storm event. Concrete mixer trucks and chutes shall be washed in the designated area or concrete wastes shall be properly disposed of off-site. When the temporary washout area is no longer needed for the construction project, the hardened concrete and materials used to construct the area shall be removed and disposed of according to the maintenance section below, and the area shall be stabilized.
Installation Schedule:	The washout area shall be constructed before concrete pours occur at the site.
Maintenance and Inspection:	The washout areas shall be inspected daily to ensure that all concrete washing is being discharged into the washout area, no leaks or tears are present, and to identify when concrete wastes need to be removed. The washout areas shall be cleaned out once the area is filled to 75 percent of the holding capacity. Once the area's holding capacity has been reached, the concrete wastes shall be allowed to harden; the concrete shall be broken up, removed, and taken to an approved landfill for disposal or recycled on-site or off-site in accordance with applicable laws. The plastic sheeting shall be replaced if tears occur during removal of concrete wastes from the washout area.

Design Specifications:

1. Temporary concrete washout type Above Grade shall be constructed as shown above, with a recommended minimum length and minimum width of 10 feet.
2. The washout shall be a minimum of 50 feet from storm drain inlets.
3. Plastic lining shall be free of holes, tears, or other defects that compromise the impermeability of the material.

5.3.2 Applicators, Containers and Paint Washout

Description:	A designated temporary, above-grade washout area shall be constructed as needed for the washout and cleanout of stucco, paint, or other non-hazardous construction materials. The temporary washout area shall be a leak-proof container with sufficient volume to contain all liquid and waste generated by washout operations. The temporary washout shall be sited outside of all buffer zones.
Installation Schedule:	The washout area shall be constructed as needed.
Maintenance and Inspection:	The washout areas shall be inspected daily to ensure that all washing is being discharged into the washout area, no leaks or tears are present, and to identify when wastes need to be removed. The washout areas shall be cleaned out once the area is filled to 75 percent of the holding capacity. Liquid wastes shall be disposed of in accordance with applicable Federal and State requirements and shall not be discharged into drainage systems.

5.4 ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

Description:	Several types of vehicles and equipment will likely be used on-site throughout the project, including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes, and forklifts. All major equipment/vehicle fueling and maintenance shall be performed outside of wetland buffer zones. When vehicle fueling must occur on-site, the fueling activity shall occur in the staging area. Only minor equipment maintenance shall occur on-site. All equipment fluids generated from maintenance activities shall be disposed of into designated drums stored on spill pallets in accordance with the Material Handling and Waste Management Section. Absorbent, spill-cleanup materials and spill kits shall be available at the combined staging and materials storage area. Drip pans shall be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

Installation Schedule:	BMPs implemented for equipment and vehicle maintenance and fueling activities shall begin at the start of the project.
Maintenance and Inspection:	Inspect equipment/vehicle storage areas weekly and after storm events. Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately, using dry cleanup measures where possible and eliminating the source of the discharge. Problem vehicle(s) or equipment shall be removed from the project site. Keep ample supply of spill-cleanup materials on-site and immediately clean up spills and dispose of materials properly. Do not clean surfaces by hosing-down the area

5.5 ALLOWABLE NON-STORMWATER DISCHARGES AND CONTROL EQUIPMENT / VEHICLE WASHING

Description:	All equipment and vehicle washing shall be performed off-site, except as required for wheel washes and concrete washout areas.
Installation Schedule:	N/A
Maintenance and Inspection:	N/A

5.6 SPILL PREVENTION AND CONTROL PROCEDURES

Description:	i. Employee Training: All employees shall be trained as detailed in the Inspection and Maintenance section of this report. ii. Vehicle Maintenance: Vehicles and equipment shall be maintained off-site. All vehicles and equipment including subcontractor vehicles shall be checked for leaking oil and fluids. Vehicles leaking fluids shall not be allowed on-site. iii. Hazardous Material Storage: Hazardous materials shall be stored in accordance with this report and federal and municipal regulations. iv. Spill Kits: Spill kits shall be kept within the materials storage area. Spills: All spills shall be cleaned up immediately upon discovery. Spent absorbent materials and rags shall be hauled off-site immediately after the spill is cleaned up for disposal at an approved landfill. Spills large enough to discharge to surface water shall be reported to the National Response Center at 1-800-424-8802 and MA DEP at 617-792-7653. v. Material safety data sheets: A material inventory and emergency contact information shall be maintained at the on-site project trailer.
Installation	The spill prevention and control procedures shall be implemented once

Schedule:	construction begins on-site.
Maintenance and Inspection:	All personnel shall be instructed the correct procedures for spill prevention and control. Notices that state these practices shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.

5.7 FERTILIZER DISCHARGE RESTRICTIONS

Description:	Discharges from fertilizers containing nitrogen and phosphorus shall be minimized. Fertilizers shall be applied at rates and amounts consistent with the manufacture's specification, and shall at no time exceed local, state, or federal specifications. See project landscape specifications for acceptable fertilizers that can be used for the project.
Installation Schedule:	Fertilizers shall be applied at an appropriate time of year, timed to coincide as closely as possible to the period of maximum vegetation uptake and growth. Avoid applying fertilizers before heavy rains. Do not apply fertilizers to frozen ground or stormwater conveyance channels flowing with water.
Maintenance and Inspection:	N/A

5.8 ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

Any changes in construction activities that produce other allowable non-stormwater discharges shall be identified, and the SWPPP shall be amended and the appropriate erosion and sediment control shall be implemented.

The following is a list of allowable non-stormwater discharges:

- Water Used to Control Dust
- Uncontaminated Excavation Dewatering
- Landscape Irrigation
- Fire Hydrant Flushing
- Firefighting
- Waterline Flushing
- Building/Pavement Wash-Down
- Non-Detergent Laden Vehicle Wash Water
- Foundation or Footing Drains

6.0 POST-CONSTRUCTION BMPS

6.1 INFILTRATION BASIN

Description:	Final excavation of the infiltration basin shall not be constructed until after the areas are no longer used for sediment basins. Riprap spillways shall be constructed as detailed on the site plan.
Design Specifications:	Install according to sitework specifications and details.
Installation Schedule:	Infiltration basins shall be excavated during earthwork construction.
Maintenance and Inspection:	The basins shall be inspected weekly and after storm events greater than 0.5 inches during construction. The area shall be checked for signs of erosion, seepage, and structural damage. Erosion, seepage, and structural damage shall be repaired immediately. Immediately after the completion of construction, the plant material shall be watered for 14 consecutive days unless there is sufficient natural rainfall. The area shall be monitored until final stabilization is reached. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

6.2 BIORETENTION AREA

Description:	Final excavation of the bioretention areas shall not commence until the proposed areas are no longer used for equipment staging. . ioretention areas shall be protected from stormwater runoff from the disturbed site during construction. Riprap spillways shall be constructed as detailed on the site plan. Riprap spillways shall be constructed, as detailed on the site plan, to reduce runoff velocity before entering the bioretention area.
Design Specifications:	Install according to sitework specifications and details.
Installation Schedule:	Bioretention areas shall be excavated during earthwork construction.
Maintenance and Inspection:	The bioretention area shall be inspected weekly and after storm events during construction. The area shall be checked for signs of erosion, seepage, and structural damage. Erosion, seepage, and structural damage shall be repaired immediately. The outlet shall be checked for any damage or obstructions and any damage found shall be repaired and obstructions removed. Immediately after the completion of construction, the plant material shall be watered for 14 consecutive days unless there

	is sufficient natural rainfall. The area shall be monitored until final stabilization is reached. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

6.3 DEEP SUMP AND HOODED CATCH BASINS AND WATER QUALITY STRUCTURES

Description:	Deep sump and hooded catch basins and water quality structures shall be located throughout paved areas on site. Catch basins and water quality structures shall collect, treat, and convey stormwater runoff from the proposed roadways.
Design Specifications:	Handle and install according to site work specifications. Filter bags shall be installed in all storm drain inlets.
Installation Schedule:	Catch basins and water quality structures shall be installed during utility construction.
Maintenance and Inspection:	Catch basins and water quality structures shall be inspected weekly and after major storm events during construction. See maintenance of Filter Bags for information on maintenance procedures. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

7.0 FINAL STABILIZATION

In compliance with the Construction General Permit, soil stabilization measures must be implemented immediately whenever earth-disturbing activities are temporarily or permanently ceased on any portion of the site. Earth-disturbing activities are temporarily ceased when clearing, grading, and excavation within any area of a site that will not include a permanent structure will not resume for a period of 7 or more calendar days, but such activities will resume in the future.

In the context of this provision, "immediately" means as soon as practicable, but no later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased. The following activities constitute the initiation of stabilization:

- Preparing the soil for vegetative or non-vegetative stabilization;
- applying mulch or other non-vegetative product to the exposed area;
- seeding or planting the exposed area;
- starting any of the activities in listed above on a portion of the area to be stabilized, but not on the entire area; and
- finalizing arrangements to have stabilization product fully installed in compliance with the applicable deadline for completing stabilization.

As soon as practicable, but no later than 7 calendar days after the initiation of soil stabilization measures the following activities are required to be completed:

- For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or
- For non-vegetative stabilization, the installation or application of all such non-vegetative measures.

The following sections detail the management practices proposed to achieve final stabilization of the site.

7.1 PERMANENT SEEDING

Description:	Permanent seeding shall be applied immediately after the final design grades are achieved on portions of the site but no later than 7 days after construction activities have permanently ceased. After the entire site is stabilized, any sediment that has accumulated shall be removed and hauled off-site for disposal at an approved landfill. Construction debris, trash and temporary BMPs (including silt fences, material storage areas, sanitary toilets, and inlet protection) shall also be removed and any areas disturbed during removal shall be seeded immediately. Seeding shall be

	performed in accordance to the Site Plans and Landscape Specifications for the project.
Installation Schedule:	Seeding shall occur at portions of the site where construction activities have permanently ceased shall be stabilized, as soon as possible but no later than 14 days after construction ceases.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities for failure and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

8.0 INSPECTIONS AND MAINTENANCE

8.1 INSPECTIONS

8.1.1 Inspection Schedule and Procedures

Inspections of the site will be performed once every 7 days and within 24 hours of the end of a storm event of 0.25-inch or greater unless otherwise specified. The inspections will verify that all BMPs required are implemented, maintained, and effectively minimizing erosion and preventing stormwater contamination from construction materials.

Inspections shall include all areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation. Inspectors shall look for evidence of, or the potential for, pollutants entering the storm water conveyance system. Sedimentation and erosion control measures identified in the SWPPP shall be observed to ensure proper operation. Discharge locations shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream locations shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may limit the access of inspection personnel to the areas described in the above paragraph. Inspection of these areas could require that vehicles compromise temporarily or even permanently stabilized areas, cause additional disturbance of soils, and increase the potential for erosion. In these circumstances, controls shall be inspected on the same frequencies as other construction projects, but representative inspections may be performed. For representative inspections, personnel shall inspect controls along the construction site for 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the construction site and allows access to the areas described above. The conditions of the controls along each inspected 0.25 mile segment may be considered as representative of the condition of controls along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

For detailed inspection procedures, see Sections 4 and 5.

All inspections shall be coordinated with a representative from Owner Company. An Owner Company representative shall accompany Name of inspector , when possible, during inspections.

Inspection reports are required to be completed within 24-hours of an inspection. If corrective actions are identified by the Inspector during the inspection, he/she shall notify and submit a copy of the inspection report to the Operator(s). For corrective actions identified, the project managers shall be responsible for initiating the corrective action within 24 hours of the report and completing maintenance as soon as possible or before the next storm event. For any corrective actions requiring a SWPPP amendment or change to a stormwater conveyance or control design, the project manager shall notify Owner, as soon as possible, before initiating the corrective action.

For a copy of the inspection report template, see Appendix E.

8.2 REDUCTIONS IN INSPECTION FREQUENCY

Once an area is stabilized, inspections may be reduced to once per month. If construction resumes at the stabilized area the inspection frequency shall increase as outlined in section 8.1.

If earth-disturbing activities are suspended due to frozen conditions inspections can be temporarily suspended until a thaw occurs.

8.3 CORRECTIVE ACTION LOG

The corrective action log describes repairs, replacements, and maintenance of BMPs undertaken as a result of the inspections and maintenance procedures. Additionally remedies of permit violations and clean and proper disposal of spills, releases other deposits should be recorded.

If it is determined the stormwater controls have not been installed as required, or that they are not functioning adequately corrective action is required within 7 calendar days.

See Appendix F – Corrective Action Log.

9.0 RECORDKEEPING AND TRAINING

9.1 RECORDKEEPING

A copy of the SWPPP, along with all inspection reports and corrective action logs are required to be stored at an accessible location at the site, and shall be made available upon request of the EPA, or state or local agency approving stormwater management plans.

The following records shall be kept at the project site and shall be available for inspectors to review. These records shall be retained for a minimum period of at least 3 years after the permit is terminated.

Date(s) when major grading activities occur:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when construction activities temporarily or permanently cease on a portion of the site:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when an area is either temporarily or permanently stabilized:
See Appendix I – Grading and Stabilization Activities Log

9.2 LOG OF CHANGES TO THE SWPPP

The log of changes to the SWPPP is maintained in Appendix G and includes additions of new BMPs, replacement of failed BMPs, significant changes in the activities or their timing on the project, changes in personnel, changes in inspection and maintenance procedures and update to site plans.

9.3 TRAINING

Prior to the commencement of earth-disturbing activities or pollutant-generating activities, whichever occurs first, training on the pollution prevention measures outlined in this SWPPP shall be provided to staff and subcontractors.

9.3.1 Individual(s) Responsible for Training

Company/Organization: Text

Name: Text

9.3.2 Description of Training Conducted

Informal training shall be conducted for all staff, including subcontractors, on the site. The training shall be conducted primarily via tailgate sessions and shall focus on avoiding damage to stormwater BMPs and preventing illicit discharges. The tailgate sessions shall be conducted biweekly and shall address the following topics: Erosion Control BMPs, Sediment Control BMPs, Non-Stormwater BMPs, Waste Management and Materials Storage BMPs, and Emergency Procedures specific to the construction site. (See Appendix J – Training Log)

Formal training shall be provided to all staff and subcontractors with specific stormwater responsibilities, such as installing and maintaining BMPs. The formal training shall cover all design and construction specifications for installing the BMPs and proper procedures for maintaining each BMP. Formal training shall occur before any BMPs are installed on the site. (See Appendix J – Training Log)

10.0 CERTIFICATION AND NOTIFICATION

10.1 SIGNATURE, PLAN REVIEW, AND MAKING PLANS AVAILABLE

A copy of the SWPPP (including a copy of the Construction General Permit, NOI, and acknowledgement letter from EPA shall be retained at the construction site (or other location easily accessible during normal business hours to EPA, a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representatives of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service) from the date of commencement of construction activities to the date of final stabilization. A copy of the SWPPP shall be available at a central location on-site for the use of all those identified as having responsibilities under the SWPPP. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the plan's location shall be posted near the main entrance at the construction site.

A sign or other notice shall be posted conspicuously near the main entrance of the construction site. If displaying near the main entrance is infeasible, the notice will be posted in a local public building such as the town hall or public library. The sign or other notice shall contain the following information:

1. A copy of the completed Notice of Intent as submitted to the EPA Storm Water Notice Processing Center; and

2. If the location of the SWPPP or the name and telephone number of the contact person for scheduling SWPPP viewing times has changed (i.e., is different than that submitted to EPA in the NOI), the current location of the SWPPP and name and telephone number of a contact person for scheduling viewing times.

SWPPPs shall be made available upon request by EPA; a state, trial or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representative of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service to the requestor. The copy of the SWPPP that is required to be kept on-site or locally available shall be made available, in its entirety, to the EPA staff for review and copying at the time of an on-site inspection.

10.2 OWNER CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:___________________________________ Title:_______________________

Signature:________________________________ Date:_______________________

10.3 OPERATOR CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

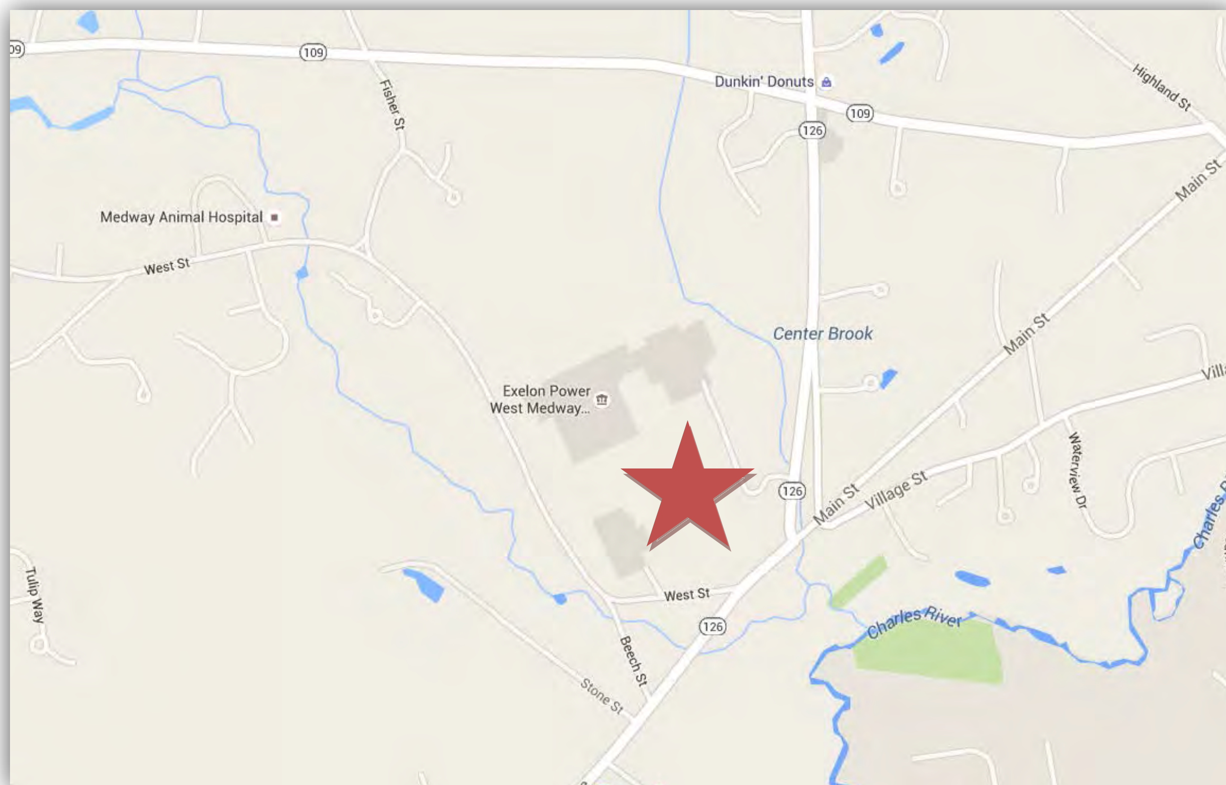
Name:___________________________________ Title:_______________________

Signature:________________________________ Date:_______________________

APPENDICES

Appendix A

General Location Map


Dunkin' Donuts
Highland St
Fisher St
Medway Animal Hospital
West St
Main St
Center Brook
Exelon Power
West Medway...
Main St
Village St
Waterview Dr
Tulip Way
West St
Beech St
Stone St
Charles River
109
126

Locus Map

Appendix B

Site Plans

Appendix C

Construction General Permit

http://www3.epa.gov/npdes/pubs/cgp2012_finalpermit.pdf

Appendix D

NOI and Acknowledgement Letter from EPA

Appendix E

Inspection Reports

Inspections under this SWPPP shall be conducted in accordance with each installed BMPs recommended maintenance requirements. This inspection frequency may be reduced to at least once every month if: a) the entire site is temporarily stabilized, b) runoff is unlikely due to winter conditions (e.g. site is covered with snow, ice, or the ground is frozen), or c) construction is occurring during seasonal arid periods in arid areas and semi-arid areas. If an inspection report is filed according to this modified schedule it shall be noted at the end of the report under the "NOTES" section.

The following five pages should be copied and completed for each inspection. All inspection forms should be compiled in a binder to prove compliance with this SWPPP.

Stormwater Pollution Prevention Plan: Inspection Checklist

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approx. Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title:

____

Signature:____

Date:____________________

Appendix F

Corrective Action Log

Corrective Action Log

Use this form to note the date and activity for accurate record keeping (make additional copies as necessary). Examples include the restaking or reinforcement of the erosion control barrier, site watering to prevent dust erosion, street sweeping, equipment and machinery repair, etc.

Date	Activity Description	Additional Action Items

Appendix G

SWPPP Amendment Log

The SWPPP, including the site plans, shall be amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP.

The SWPPP shall be amended if during inspections or investigations by site staff, or by local, state, tribal or federal officials, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site.

Based on the results of an inspection, the SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) calendar days following the inspection. Implementation of these additional or modified BMPs shall be accomplished as described in Subpart 3.6B of the Construction General Permit (located in Appendix C).

SWPPP Amendment Log

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by (Name(s) and Title)

Appendix H

Subcontractor Certifications/Agreements

Sample Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: ____

Project Title: ____

Operator(s): ____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: ____

Address: ____

Telephone Number: ______________________

Type of construction service to be provided: ______________________________

____

____

Signature: ______________________

Title: ______________________

Date: ______________________

Appendix I

Grading and Stabilization Activities Log

Site Plans in Appendix B should be annotated to indicate areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

The following records are to be kept by each Site Operator throughout the construction period and maintained in the SWPPP. Insert additional documentation for record keeping as necessary.

Grading and Stabilization Activities Log

Date	Location on Property	Description

Appendix J

Training Log

Training Log

Date	Training Topic	Attendee	Signature of Training Coordinator

Appendix K

Delegation of Authority

Sample Delegation of Authority Form

Delegation of Authority

I, _______________________ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the ____________________________________ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

____ (name of person or position)
____ (company)
____ (address)
____ (city, state, zip)
____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: ____

Company: ____

Title: ____

Signature: ____

Date: ____

Appendix L

Endangered Species Documentation

Appendix M

Historic Preservation Documentation

Appendix N

Temporary Sediment Basin Sizing Calculations

Appendix O

Natural Buffer Equivalency Calculations

Technical Appendix E

(Draft) Town of Millis Water Supply and Demand Assessment

DRAFT WATER SUPPLY AND DEMAND ASSESSMENT IN RELATION TO EXELON POWER 'WEST MEDWAY II' PROJECT

FOR
TOWN OF MILLIS, MA

REVISION 1: DECEMBER 15, 2015

KLEINFELDER
Bright People. Right Solutions.

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A Report Prepared for:

Mr. Charles Aspinwall
Town Administrator
Town of Millis
900 Main Street
Millis, MA 02054

DRAFT WATER SUPPLY AND DEMAND ASSESSMENT
IN RELATION TO
EXELON POWER 'WEST MEDWAY II' PROJECT

REVISION 1

Kleinfelder Project Number: 20162545.001A

Prepared by:

____________________	____________________
Kirsten Ryan Principal Hydrogeologist	William Copithorne, PE Project Engineer

Reviewed by:

____________________	____________________
Betsy Frederick, LEED AP Project Manager	Michael Cunningham, PE Principal Engineer

KLEINFELDER
215 First Street, Suite 320
Cambridge, MA 02142
Phone: 617.497.7800
Fax: 617.498.4630

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EXECUTIVE SUMMARY

Purpose

Kleinfelder was retained by the Town of Millis (Town) and Exelon West Medway II, LLC (Exelon) to complete an assessment of the feasibility of the Town providing potable water supply to the proposed Exelon West Medway II Project by selling water from Millis to the Town of Medway.

Summary of Major Findings

Kleinfelder's assessment with regards to water demand and supply for the proposed West Medway II Project focused on assessing the adequacy of the Town of Millis' water system. All findings are discussed in detail in this evaluation report and are summarized below. See Section 1.1.4 for definitions of the terms used in this summary.

Exelon Water Needs (see Section 2.3.2)

The Exelon water needs used for this analysis differ somewhat from those used in Kleinfelder's analysis for the Town of Medway. The Exelon water needs used for this current analysis are updated volumes based on data presented in the *Draft Environmental Impact Report (*Epsilon, 2015) or provided directly by Exelon's representatives. The estimated average annual water use for the proposed Exelon facility is 95,206 gallons per day (gpd) or 0.095 million gallons per day (MGD) with a three-year rolling average of 68,880 gpd (0.069 MGD) according to the *Draft Environmental Impact Report*. Exelon will supply 51,840 gpd using an on-site well, therefore, the proposed Exelon facility should require an average daily supply of 43,366 gpd (0.043 MGD) from the Town of Millis. Based on information provided by Exelon representatives, Exelon is also requesting a 10% safety factor (T. Sanford, 2015). Therefore for the purposes of this evaluation, the average daily demand of the proposed Exelon facility is 47,703 gpd (0.048 MGD). According to Exelon representatives, the highest daily maximum facility water use is 190,000 gpd (0.190 MGD), which was utilized for Kleinfelder's assessment of maximum demand as a worst case scenario (for example if the well was out of service). However, in general it is anticipated that the on-site well at the proposed facility will supply 51,840 gpd to the proposed facility, and the proposed Exelon facility will require a maximum daily demand of 138,160 gpd (0.138 MGD) from the Town of Millis.

Available Supply from the Town of Millis (see Section 2.2)

The Town of Millis draws drinking water from six local groundwater supply wells. The Town has discretion to pump these wells in any combination to meet system demands, provided the following three requirements from the Town's current (2010) Water Management Act (WMA) permit are met:

1. The maximum average daily withdrawal volume from all six wells combined is less than or equal to 0.80 MGD over the course of a calendar year;
2. No groundwater sources are pumped above their safe yields shown in Table ES-1 at any time.
3. The Town of Millis must cease use and operation of Wells 5 and 6 when stream flow in the Charles River falls to 0.21 cubic feet per section per square mile (13.80 cubic feet per second) as measured at the USGS gauge #01103280, except when selling water to the upstream municipalities located in the Charles River Basin.

The WMA permit annual average withdrawal limit of 0.80 MGD is for "Period 1", the initial 5-year term of the Permit.[1]

The sum of the individual wells' safe yield provides the maximum total daily withdrawal available of 4.33 MGD to the Town should it need to meet atypical peak or emergency demands (i.e. firefighting) on a short term basis. It is also important to note that anytime the Town pumps above the permitted average daily withdrawal limit, enough corresponding days where pumping is below the average will be necessary to ensure that the annual average of 0.80 MGD is met.

The Town's available water supply is summarized in Table ES-01 using the terms Normal Daily Output (NDO) and Maximum Daily Output (MDO). It is important to note that these terms are a measure of the capacity of the wells to perform, not the current demand of the water system.

Normal Daily Output values represent what the wells currently reliably produce during a time of elevated (but not maximum) demand. NDO values were derived from summer daily pumping records provided by the Town of Millis Public Works (J. McKay, November 18, 2015). The values were derived from the average of actual daily pumping rates in 2015 for summer period (July – September) at each well, with the exception of Well 4. Well 4 was out of service during most of the summer of 2015 (it was restored to service in September 2015). 2014 values were used for Well 4 as they were more representative. These values have been assumed to be the average daily supply for the Town of Millis for the purposes of Kleinfelder's assessment.

Maximum Daily Output (MDO) values are often derived from flow tests to rate the well's current maximum 24-hour capacity. However, most wells did not have recent well inspection and flow test reports available. Accordingly, MDO values for the wells (provided by the Town of Millis Public Works) were derived from recent data on daily total withdrawal and total run time at each well. These values are assumed to be the maximum daily supply for the Town of Millis for the purposes of Kleinfelder's assessment. Kleinfelder recommends that these values be confirmed by flow testing via a licensed well contractor. The Town is limited to pumping the permit maximum of 4.33 MGD.

[1] The WMA permit annual average withdrawal limit for "Period 2" is 0.99 MGD. The WMA permit further states that access to water withdrawals for Period 2 and beyond is contingent upon MassDEP completing a 5-Year Review or a permit amendment. MassDEP has stated its intent to complete the 5-year review in 2017.

Table ES-01: Available Water Supply			
Source Name	WMA Permit Maximum Daily Withdrawal (MGD)	Available Supply (MGD)	
		Maximum Daily Output[2]	Normal Daily Output[3]
Well 1	0.72	0.677	0.187
Well 2	0.50	0.383	0.107
Well 3	0.75	0.936	0.302
Well 4	0.86	0.842	0.146
Well 5 / Well 6	1.50[1]	2.120[4]	0.142[4]
Total	**4.33**	**4.958**	**0.884**

Notes:
WMA: Water Management Act
MGD: million gallons per day

(1) Wells 5 and 6 have a maximum wellfield capacity of 1.50 MGD and the operation of the wells is restricted by streamflow in the Charles River.
(2) Maximum Daily Output values were provided by the Town of Millis (J. McKay, December 2, 2015; J. McKay, December 3, 2015).
(3) Normal Daily Output was calculated from summer 2015 daily pumping records provided by the Town of Millis (J. McKay, November 18, 2015). Summer 2014 was used for Well 4.
(4) The WMA permit provides a combined Maximum Authorized Daily Volume for Wells 5 and 6; therefore, the values for Maximum Daily Output and Normal Daily Output for Wells 5 and 6 are combined for consistency.

The Town of Millis operates four Water Treatment Facilities (WTF) with a total capacity of 4.10 MGD as summarized in Table ES-02. Water pumped from Wells #1 and #2 is treated at the George D'Angelis WTF, which utilizes air stripping for volatile organic compounds and chemical injection for disinfection using sodium hypochlorite and fluoridation using sodium fluoride. Water pumped from Well #3 is treated at the Village Street WTF and water pumped from Well #4 is treated at the South End Pond WTF. Both the Village Street WTF and South End Pond WTF use chemical injection for pH control using sodium hydroxide and fluoridation using sodium fluoride, with emergency provisions for disinfection using sodium hypochlorite. Wells #5 and #6 are treated at the Paine WTF, which uses chemical injection for pH control using sodium hydroxide, fluoridation using sodium fluoride, and disinfection using sodium hypochlorite.

Table ES-02: Water Treatment Facility Capacity[1]			
Source Name	**WTF**	**WMA Permit Maximum Daily Withdrawal (MGD)**	**WTF Capacity (MGD)**
Well 1	George D'Angelis WTF	0.72	1
Well 2		0.50	
Well 3	Village Street WTF	0.75	0.74
Well 4	South End Pond WTF	0.86	0.86
Well 5	Paine WTF	1.50[2]	1.5
Well 6			
	Total	**4.33**	**4.10**

Notes:
WMA: Water Management Act
WTF: Water Treatment Facility
MGD: million gallons per day

(1) Information obtained from Town of Millis, *Water System Master Plan* (W&C, 2010), unless otherwise noted.
(2) Wells 5 and 6 have a combined Maximum Authorized Daily Volume of 1.50 MGD and the operation of the wells is restricted by streamflow in the Charles River.

Demand Projections (see Section 2.3)

Near Term Demand Projections- Average Day: The Town of Millis' average daily demand (ADD) has trended downward from 2003 to 2008 and remained fairly flat during the past six years. Based on the 2015 daily pumping records through September, Kleinfelder has estimated that ADD for 2015 will be approximately 0.688 MGD. This estimate is conservative because it includes higher demand summer period and does not include lesser demand of October through December. To estimate the Town's near term future (2018) ADD, the demands for development projects provided by Millis were added, assuming that all would be online by 2018 prior to Exelon being online, with the exception of the downtown reserve (40,000 gpd). Millis' 2018 projected demand is shown in Table ES-03.

Table ES-03: Estimated Current & Near Term Future Millis ADD Exclusive of Exelon West Medway II	
Source	**ADD (MGD)**
Millis Estimated 2015 ADD	0.688[1]
Development Projects (not including downtown reserve)	0.136[2]
Total Projected Millis 2018 ADD	**0.824**

Notes:
ADD: Average Daily Demand
MGD: million gallons per day

(1) Average 2015 ADD to date (January 1st to September 26th) based on daily pumping records (J. McKay, November 18, 2015)
(2) Demands associated with development projects were provided by the Town of Millis (C. Aspinwall, 2015) and represent 50% of the Title V estimates. Based on information from the Town of Millis, the Downtown Reserve is a reserve of water for potential future developments in the downtown area. This reserve does not reflect a development which has already been permitted. Therefore, for the purposes of our assessment the Downtown Reserve was not accounted for in the projected 2018 ADD.

The requested supply for Exelon (0.048 MGD) has the potential to raise the Millis ADD to 0.872 MGD. As this demand is not anticipated until 2018, the projected near term demand including Exelon is referred to as the 2018 ADD in this document.

<u>Near Term Demand Projections- Max Day:</u> Estimated Millis maximum daily demand (MDD) for 2018 (including pending and proposed residential developments, but excluding Exelon) is 1.524 MGD. The addition of Exelon's demand would raise the MDD up to 1.662 MGD (with Exelon on-site well online) or up to a worst case maximum of 1.714 MGD (Exelon well off-line). With Wells 5 and 6 offline, the available maximum daily output from the Town of Millis system is reduced from 4.958 MGD to 2.838 MGD. Therefore, with its largest sources (Wells 5 and 6) offline the Town of Millis can still meet its current MDD.

<u>Longer Term Supply ADD Projections:</u> Kleinfelder used population projection information from a variety of industry standard sources to develop a water needs forecast for Millis in accordance with the Massachusetts Water Resources Commission (WRC) 2009 Water Needs Forecast current methodology. All of the population projections predict a significant decline in Millis population due to various factors including an aging population and migration trend data. The available forecast data indicate an average of an 8% decline in Millis population between 2020 and 2035 (the latest year for which predictions available).

Using these population projections, the range of projected future demand is shown below in Table ES-04. This table presents both WRC Scenario 1 (most optimistic) and WRC Scenario 4 (most conservative):

Table ES-04: Summary of ADD (2020-2035) under 2009 WRC Scenario 1 & 4

Description	Year	ADD (mgd)	Sale to Medway (Exelon) ADD (mgd)	Total ADD (mgd)
Scenario 1: Future Water Use at current (2014) residential water use rate (57 GPCD) and future unaccounted for water at current value (7%)	2020	0.738	0.048	**0.786**
	2025	0.733	0.048	**0.781**
	2030	0.715	0.048	**0.763**
	2035	0.699	0.048	**0.747**
Scenario 4: Future Residential Water Use at 65 GPCD and future unaccounted for water at 10%	2020	0.823	0.048	**0.871**
	2025	0.817	0.048	**0.865**
	2030	0.797	0.048	**0.845**
	2035	0.777	0.048	**0.825**

Scenario 4 results in a maximum ADD (including Exelon) of 0.871 for 2020, decreasing to 0.825 by 2035. The conservative estimate from Scenario 4 was used to evaluate supply adequacy.

<u>Supply Adequacy (see Section 2.4)</u>

Assuming normal daily output (NDO) rates, Millis' supply availability (0.884 MGD) to meet the projected 2018 ADD (including proposed new residential development and Exelon) of 0.872 and future (2035) ADD of 0.825 appears to be adequate. The margin of adequacy will be slim if most of the predicted Town development projects come online before 2020. The adequacy of the supply to meet the predicted demand will rely on the regular maintenance of the wells to maintain current NDO levels.

Assuming maximum daily output (MDO) rates for 24 hours per day, using all six of their wells running, Millis' supply availability (4.958 MGD) is adequate to meet the projected 2018 MDD (including development and Exelon) MDD of 1.714 as well as the projected future MDD (2035) of 1.63 MGD. Confidence in the conclusions of adequacy would be increased by performance of well inspection and flow testing. Recommendations to maintain supply adequacy are provided in Section 4.

Assessment of Permitted Supply (see Section 2.5; Section 3.1)

Millis' WMA Permit authorizes sufficient water withdrawal to meet the estimated 2015 ADD but not the projected 2018 ADD (including proposed new residential development and Exelon). Millis will need to access the Period Two volume of 0.99 MGD specified in its Permit as part of the 5-Year review process. However, with a projected decrease in population, Millis' WMA Permit may authorize sufficient water withdrawal to meet the future (2035) ADD (including development and Exelon).

Evaluation of Storage Adequacy (see Section 2.6)

The Town of Millis has two active storage tanks with a total capacity of 1.54 MG. Based on the Town of Millis, *Water System Master Plan* (W&C, 2010) the water storage was determined to be inadequate for peak hour equalization storage, at appropriate elevations, in the two tanks under current and projected 2030 water demands. However, Woodard & Curran (W&C, 2010) determined that the Town's storage tanks, in conjunction with well pumps, would be able to maintain pressures in the distribution system and adequate tank levels during peak hourly demand. Although current and future demand estimates included in this assessment differ slightly from the values included in the Water System Master Plan, Kleinfelder anticipates that water storage in conjunction with well pumps is still adequate within this minor variation in estimates. This should be evaluated again in the Town's next Water System Master Plan update.

Water Distribution Assessment (see Section 2.7)

Kleinfelder utilized the Town's existing water distribution system hydraulic model to evaluate the impacts to fire flow availability throughout the Town under the scenario of water being provided to the proposed Exelon peaking station project, via the Town of Medway's water distribution system. In addition, Kleinfelder utilized the model to identify the preferred interconnection location with Medway's system.

Available Fire Flow Analysis: Kleinfelder modeled the Present Day demand, 2018 demand (both with and without Exelon), and 2035 demand (both with and without Exelon) to determine whether available fire flow (AFF) may be impacted by the additional Exelon demand. Overall, AFF was found to remain relatively constant from the Present Day simulation to the 2018 simulation without Exelon, and actually improved to some degree due to the water main upgrade anticipated on Orchard Street. The addition of Exelon in 2018 also had very minor impacts, with a single node dropping from an AFF greater than 1,000 gpm to below this threshold. The model simulations for 2035 actually predict improvements relative to 2018, as population is projected to decrease over this period. As such, Kleinfelder's preliminary determination is that the requested Exelon demand will have little impact to the water distribution system's hydraulics and that no new fire flow deficiencies will be created.

The water system hydraulic model, as provided to Kleinfelder, did not include information for Needed Fire Flow (NFF). NFF indicates how much flow is required to a specific site (node) and is calculated in accordance with Insurance Services Office, Inc. (ISO) guidelines, which considers factors including but not limited to site use, building size, and occupancy limits. When modeled AFF is found to be less than NFF, it indicates that insufficient fire flow is available at that location. As NFF data was unavailable, and the determination of NFF was beyond the scope of this evaluation, Kleinfelder did not determine if there are any locations for which AFF is less than NFF.

<u>Interconnection with Medway:</u> The potential interconnection location at Main Street in Millis is served by an 8" water main that dead ends at a valve just prior to the town line with Medway. This area of Main Street in Millis has historically been identified as having deficient AFF and these low flows were confirmed via on-site fire flow testing and further modeling analysis completed by Kleinfelder as part of this evaluation. On the Medway side of the town line, Main Street is served by dual 6" and 12" diameter water mains. The potential interconnection location at Village Street in Millis is served by a 12" water main from the east and a 10" water main from the north. This redundancy and increased water main diameter results in an increased AFF at the interconnection, which was confirmed via fire flow testing and further modeling analysis completed by Kleinfelder. In Medway, Main Street is served by a 6" water main at this potential interconnection location. Modeling analysis of the 6" water main in Medway indicates that flow correlating to the peak Exelon demand of 250 gpm can be introduced to this main without adversely impacting the Medway distribution system.

Kleinfelder has preliminarily identified Village Street as the more favorable interconnection location, as it appears the Millis distribution system is able to provide a more reliable volume of water to this location under all system demand conditions. The Millis water model did not identify deficient fire flows in the vicinity of the Village Street interconnection under any of the peak hour demand scenarios evaluated. In summary, an interconnection between the two systems at Village Street appears to be feasible, provided that certain improvements are made, as discussed below.

<u>Booster Station:</u> In order for Millis to provide water to the Medway distribution system, a booster pumping station will be required. This was determined by analyzing the existing water storage facilities in each town. As both the Millis and Medway distribution systems operate in a single pressure zone and maintain two storage tanks, the hydraulic grade line (HGL) of each system is equal to the water elevation in the water tanks, with the maximum HGLs being equal to the overflow elevations of the tanks in each town. In Millis, the overflow elevation of the two tanks is ~294 feet, with the base elevations of the two tanks being 206 feet and 236 feet respectively. In Medway, the overflow elevation of the two tanks is ~366 feet, and the base elevation of the two tanks is 286 feet. As such, barring the unlikely scenario that both tanks in Medway are nearly empty (no storage), the HGL in Medway will almost always be greater than that in Millis, meaning that water will naturally flow from the Medway system to Millis without the presence of a booster pumping station.

<u>Water Compatibility Evaluation</u>: Kleinfelder noted that the chemical dosing and the operational pH range varied between the Millis and Medway water distribution systems. The Millis system maintains a lower target pH and chlorine dosing than Medway. The Medway system also treats its water with a polyphosphate chemical for sequestration and corrosion protection while Millis does not. Based on these differences, the introduction of water from Millis into Medway will effectively dilute the water in Medway when the booster station is operational. In order for Medway to retain its system's current finished water properties, adjustments to the treatment parameters may be needed. Options to accomplish this may include either 1) adjustments to the chemical dosing at the production wells/treatment plants in Millis, 2) inclusion of a chemical feed system at the booster station that will be required at the eventual Millis/Medway system

interconnection, or 3) another engineered option. While the connection is considered feasible, additional information is needed to determine the extent of the additional chemical dosing requirements and the cost to implement necessary controls.

Implementation Considerations (Section 3)

In order for Millis to provide potable water to Medway, permanent infrastructure improvements will be required at the Village Street interconnection. In particular, a booster pumping station and appurtenances would be required for water from Millis to overcome the higher hydraulic grade line of the Medway system. The chemical dosing and operational pH range varies between the Millis and Medway water distribution systems. Further evaluation into the water properties of the resultant “blended” water is recommended (Section 4).

The only apparent regulatory requirement would be the need for a system modification permit from MassDEP for adding the booster station. When receiving water from Millis, Medway would still be required to meet all of its current requirements as a Public Water System (PWS) including maintenance of the distribution system and water quality monitoring and reporting. An Inter-Municipal Agreement (IMA) should be used to define and detail the distribution of responsibilities between Medway and Millis for operations, maintenance and billing.

Conclusions & Recommendations (Section 4)

The Town of Millis’ supply appears to be adequate to meet the projected near term (2018) ADD which includes foreseeable developments and supply to Exelon. In order to safely and reliably meet projected ADD, the following steps are recommended for Millis:

- Continue to manage demand to maintain residential use and unaccounted for water at or below current standards.
- Institute and fund a comprehensive program of annual well inspection, testing, maintenance (cleaning) and recordkeeping.
- Closely track water quality at Well #4 and consider implementing iron and manganese controls (e.g. sequestering) or other treatment as needed to maintain reliable use of the source.

Kleinfelder recommends the following steps to implement an interconnection between Millis and Medway:

- Complete further analysis of the water quality blend that will occur with the mixing of the Millis water into the Medway system so as to determine additional treatment requirements (if any).
- Design and construction of a booster station for the interconnection between the two Towns as described in Section 3.
- Establishment of an Inter-Municipal Agreement between Millis and Medway, to include identification of flow and flow rates to be delivered to Medway, water quality targets to be maintained by each town, additional treatment requirements, determination of responsible party for operation and maintenance of the required booster pumping station, etc.
- Complete planned water main replacement in Orchard Street in Millis, from Walnut Street to Grove Street with a larger diameter water main. The model used for this analysis assumes the implementation of this replacement project.

While not critical to the interconnection, the following additional improvements are highly recommended:

- Replacement of existing 6” diameter water main on Village Street in Medway with a larger diameter water main (8” minimum) from the proposed booster pumping station to Island Road.
- Further investigation of locations with deficient or suspected deficient AFF values in Millis to determine the need for system improvements.
- Prioritization of 6” diameter water main replacement projects to larger diameter mains (8” minimum) in both Millis and Medway as part of future water main replacement programs, to align with current MassDEP guidance for new water mains.

1. INTRODUCTION

Kleinfelder was retained by the Town of Millis (Town) and Exelon West Medway II, LLC (Exelon) to complete an assessment of the feasibility of the Town providing potable water supply to the proposed Exelon West Medway II Project.

The West Medway II Project is a proposed expansion of the West Medway Station, owned by Exelon Corporation. The expansion will include the construction of a new energy peaking facility, south of the existing facility, to be operated during times of peak energy demand. Exelon requests water from the Town of Millis for the proposed facility, mainly for process needs. The Draft Environmental Impact Report (Epsilon, 2015) proposes water be purchased from the Town of Millis and transported through an existing emergency connection between the Town of Millis and the Town of Medway to the current Exelon facility along Summer Street. Municipal water is proposed to be used for potable water (plumbing), service water, and fire suppression at the proposed facility. Also, the proposed facility will have a 500,000 gallon raw water storage tank and a 450,000 gallon finished water storage tank to store water required for processing needs and a dedicated volume for fire suppression.

It should be noted that Kleinfelder's findings in this report are solely based on its review of available information as provided by the Town, Exelon and its representatives, and from other sources of information as described herein. For this assessment, Kleinfelder utilized the average daily demand for the proposed Exelon facility as presented in Table 7-1 in the *Draft Environmental Impact Report (*Epsilon, 2015) and the peak day demand as presented by Tammy Sanford of Exelon during an October 26, 2015 meeting (T. Sanford, 2015).

1.1 Background

1.1.1 Town of Millis Background

The Town of Millis is approximately 12.2 square miles in size and is located in Norfolk County; bordered by Sherborn, Holliston, Medway, Norfolk, and Medfield (see Figure A1 in Appendix A). The Charles River forms the majority of the Town's southern border and all of the Town's eastern border. All of Millis lies within the Charles River major basin. Millis has a population of approximately 7,891 (2010 US Census), which is currently expected to remain flat or decrease (MAPC, 2014).

1.1.2 Town of Millis Water System

The Town of Millis provides drinking water to residents and businesses via six local groundwater supply wells installed in sand and gravel aquifer deposits (Table 1-1). The distribution system consists primarily of a single pressure zone, with the exception of a small boosted pressure system on Walnut Street. The distribution system is served by 42 miles of 2-inch to 12-inch diameter water mains and two (2) active water storage standpipes with a combined usable capacity of 1.54 million gallons.

Table 1-1: Existing Wells, Town of Millis, Massachusetts[1]

Well #	Location	Year Constructed	Screen Diameter (inches)	Depth (feet)	Pump (Hp)	Water Management Act Permit Maximum Daily Rate (MGD)
1	7 Water St.	1952	24	60	15	0.72
2	7 Water St.	1961	24	50	10	0.50
3	Birch St.	1972	24	60	40	0.75
4	Orchard St.	1983	24	53	50	0.86
5	Norfolk Rd.	1999	24	57	40	1.50[2]
6	Norfolk Rd.	1999	24	62	60	
					Total	**4.33**

Notes:
Hp: horsepower
MGD: million gallons per day
(1) Unless otherwise noted, information was obtained from the Town of Millis Water System Master Plan (W&C, 2010). Design capacity information was not available.
(2) The WMA permit provides a combined Maximum Daily Rate for Wells 5 and 6; therefore, the values for Maximum Daily Output and Normal Daily Output for Wells 5 and 6 are combined for consistency.

Millis has a current WMA Permit annual maximum raw water withdrawal limit (registration + permit volume) of 0.80 million gallons per day (MGD) on an average daily basis, which is discussed in further detail in Section 2.

The Town has system interconnections with three communities available for use during emergencies; the Towns of Medway, Medfield, and Franklin. For more detailed information regarding the Millis water system, refer to the Town of Millis, *Water System Master Plan* (W&C, 2010).

1.1.3 Regional Water Basin Description

Figure A-1, in Appendix A, illustrates the major water basins in the vicinity of the Town of Millis. The Town of Millis' source groundwater wells are located in two separate subbasins within the Charles River Basin (Bogastow Brook sub-basin and Charles Chicken Brook to Stop River sub-basin). The subbasins have been categorized under the Water Management Act Regulations (310 CMR 36.00) as Groundwater Withdrawal Categories 4 and 5, respectively, which requires that the Town minimize existing impacts to the greatest extent feasible, making conservation and water loss reduction in this area important priorities. The Town of Millis sources and associated subbasins are summarized in Table 1-2.

Table 1-2: Millis Supply Well & Subbasin Summary		
Well #	**Location**	**Charles River Subbasin Name & Subbasin ID #**
1	7 Water St.	Bogastow Brook, #21123
2	7 Water St.	Bogastow Brook, #21123
3	Birch St.	Chicken Brook to Stop River, #21133
4	Orchard St.	Bogastow Brook, #21123
5	Norfolk Rd.	Chicken Brook to Stop River, #21133
6	Norfolk Rd.	Chicken Brook to Stop River, #21133

1.1.4 Definitions

Kleinfelder utilizes several different key terms in this assessment which are defined in this section.

1.1.4.1 Water Management Act (WMA) Permit

The WMA became effective in March 1986. The WMA regulates the quantity of water withdrawn from both groundwater and surface water sources. Any proposed withdrawal in excess of an annual average of 100,000 gallons per day (gpd), or 9 million gallons in any three month period must apply for a permit.

The Town of Millis owns and operates its water supply and distribution system under the requirements of WMA Permit #9P4-2-20-187.03. The WMA permit was issued to The Town of Millis on March 1, 2010. The WMA permit establishes allowable withdrawal limits over a 20-year period, divided into four 5-year Periods. The specific limits made by this permit are discussed in this assessment.

1.1.4.2 Sustainable Water Management Initiative (SWMI)

The SWMI is a policy framework developed by the Massachusetts Executive Office of Energy and Environmental Affairs, which informs and guides the development of future WMA permits. SWMI is intended to balance the need to provide water to Massachusetts communities, while also recognizing the need for ecological health and promoting economic development. The framework for the SWMI was published in November 2012. MassDEP has begun to incorporate the SWMI principles into its WMA permitting process by conducting several rounds of pilot projects with communities in the Commonwealth.

1.1.4.3 Safe Yield

The term safe yield is often used to describe the total volume of water that may be withdrawn from a source without causing failure. Safe yield is also used to describe the maximum authorized daily withdrawal that is available from an individual groundwater supply. This limit is defined in the Town of Millis' WMA permit. For the purposes of Kleinfelder's evaluation, safe yield is the latter definition and specifically applies to maximum daily withdrawals (raw water pumped from the wells). This is a theoretical safe yield based on aquifer and well characteristics. Actual well yield depends on operational considerations and current well conditions and are described by normal and maximum daily output (see below).

1.1.4.4 Average Daily Demand (ADD)

The term average day demand is used throughout this evaluation and is abbreviated by ADD. The ADD is the total water supplied to a service area in the period of one year and divided by 365 days. The total water provided includes any water used for maintenance, hydrant flushing and any unaccounted for water that may not be used directly by the end user. Daily pumping data for the estimation of 2015 ADD was provided by James McKay, the Town of Millis Public Works/Highway Department Deputy Director/Chief of Operations (J. McKay, November 18, 2015).

1.1.4.5 Maximum Daily Demand (MDD)

The term maximum day demand is used throughout this evaluation and is abbreviated by MDD. The MDD is the maximum water demand over a 24-hour period in the course of one year.

When evaluating the adequacy of supply sources to meet water demand it is critical to account for MDD. The Town of Millis' system should be capable of meeting the MDD each year without relying on system storage. Storage should be reserved to meet demands during periods of peak consumption and should provide the volume of water required for fire protection.

1.1.4.6 Normal Daily Output (NDO)

NDO values represent a measure of well performance capacity and for this analysis are defined as what the wells can currently reliably produce during a time of elevated (but not maximum) demand, represented by summer pumping volumes.

1.1.4.7 Maximum Daily Output (MDO)

MDO represents a measure of well performance capacity and is the reported maximum operational capacity for a well pumping at 24 hours per day.

1.1.4.8 Peaking Factor

The peaking factor is unit-less and calculated as a ratio of MDD to ADD and represents the relationship between MDD and ADD for the given community for water supply.

1.1.4.9 Peak Hour Demand

All community water systems experience a peak hour demand due to events like water main breaks, and fires. Peak hourly flows are supplied from storage constructed at appropriate locations within the distribution system and not from the design capacity of the sources of supply.

1.2 Information Sources Reviewed

Kleinfelder's scope of review was limited to documents provided by the Town of Millis and Exelon and its representatives. Specifically, those documents that relate to water supply and demand were reviewed for this study, as summarized below.

1. American Water Works Association, *Distribution System Requirements for Fire Protection*, Fourth Edition, 2008.
2. C. Aspinwall, 2015 (email communication, *Projects*, November 5).
3. E. Las, 2015 (email communication, Maximum Facility Demand, November 23).

4. Epsilon Associates, Inc. (Epsilon), 2015, *Draft Environmental Impact Report*, September 30.
5. J. McKay, (November 18, 2015). Town of Millis Daily Pumping Records for 2011, 2012, 2013, 2014, and 2015.
6. J. McKay, 2015 (email communication, Maximum Daily Output for Wells Multi 1, 3, and 4, December 2).
7. J. McKay, 2015 (email communication, Maximum Daily Output for Wells 1, 2, 5, and 6, December 3).
8. Kleinfelder, 2015, *Water Supply & Demand Assessment in Relation to Exelon Power 'West Medway II' Project*, Town of Medway, MA, October 5.
9. Massachusetts Department of Environmental Protection (MassDEP), 2010, *Final 20 Year Permit Renewal*, Millis, Massachusetts, February 26.
10. *MassDEP, 2014, Guidelines for Public Water Systems,* Chapters 1-12, April.
11. MassDEP, 2004 - 2015, *Public Water System Annual Statistical Report Reporting Years 2003 through 2014*, Millis Water/Sewer Department, Millis, Massachusetts.
12. Metropolitan Area Planning Council (MAPC), 2014, *Population and Housing Demand Projections for Metro Boston, Regional Projections and Municipal Forecasts, Executive Summary*, January.
13. T. Reardon, 2015 (email communication, Inquiry – Town of Millis Population Projections, December 4).
14. H. Renski, 2010, *Economic, Demographic and Housing Trends in 495/MetroWest Region.*
15. T. Sanford, (October 26, 2015). Comments made during meeting on the West Medway II Project. Millis, Massachusetts.
16. S. Strate, 2015 (email communication, Inquiry – Town of Millis Population Projections, December 4).
17. M. Stone, 2015 (email communication, Millis – Medway- Exelon questions, December 7).
18. UMass Donahue Institute, 2013, *Long-term Population Projections for Massachusetts Regions and Municipalities*, November.
19. Woodard & Curran (W&C), 2010, *Water System Master Plan*, June.

2. WATER SYSTEM ADEQUACY

2.1 Approach

The ability of a water system to meet the water demand in the system must be evaluated from: (A) the adequacy of its supplies; (B) the adequacy of its treatment; (C) the adequacy of its storage; and (D) the adequacy of its distribution system to deliver the supply.

A. Water supply adequacy is evaluated based on how the supply is permitted and how the water system operates. In most cases, one of these two factors (permit limits or operational limits) is what determines the actual available supply.

    1. Compare the actual operational capacity of the sources with water demand (current and future) in the system.
    2. Compare the permitted withdrawal amount for the sources with water demand in the system.

B. Treatment adequacy is evaluated by comparing the available treated supply to current and future demands.

C. Storage adequacy is evaluated by comparing storage capacity to current and future demands.

D. Water distribution system adequacy is evaluated by determining the impacts of the proposed Exelon development to the Town of Millis' distribution system and its ability to supply adequate fire flow during peak hour demand in the system while maintaining adequate service pressure to customers.

2.2 Available Supply from the Town of Millis

As discussed in Section 1.1.2, the Town of Millis draws drinking water from six local groundwater supply wells. The groundwater withdrawals are permitted through the established WMA safe yield for each individual groundwater source. An evaluation of Millis' available permitted groundwater withdrawal is discussed in Section 2.5.

2.2.1 Safe Yield

The groundwater sources utilized by the Town of Millis include six local supply wells (Wells #1 through #6). The Town has discretion to pump these wells in any combination to meet their system demands, provided the following three requirements from the Town's WMA permit are met:

1. The maximum average daily withdrawal volume from all six wells combined is less than or equal to 0.80 MGD over the course of a calendar year;
2. No groundwater sources are pumped above their safe yields shown in Table 2-1 at any time.
3. The Town of Millis must cease use and operation of Wells 5 and 6 when stream flow in the Charles River falls to 0.21 cubic feet per section per square mile (13.80 cubic

feet per second) as measured at the USGS gauge #01103280, except when selling water to the upstream municipalities located in the Charles River Basin.

As was previously defined, “safe yield” is the maximum daily withdrawal that can be made at an individual groundwater source as set by the WMA permit so as to ensure that neither the well nor the aquifer contributing to it, are ever overstressed. As such, the sum of each well’s safe yield provides the maximum total daily withdrawal available to the Town should it need to meet atypical peak or emergency demands (i.e. firefighting) on a short term basis. The safe yield for each groundwater source as well as the total maximum daily withdrawal are presented in Table 2-1. Note that the safe yield considers the effects of pumping during drought conditions and is therefore lower than the design capacity of the sources. It is also important to note that anytime the Town pumps above the permitted average daily withdrawal limit, enough corresponding days where pumping is below the average will be necessary to ensure that the annual average of 0.80 MGD is met.

Table 2-1: Safe Yield – Groundwater Sources

Source	WMA Permit Approved Max Daily Withdrawal (MGD)
Well 1	0.72
Well 2	0.50
Well 3	0.75
Well 4	0.86
Well 5	1.50[1]
Well 6	
Total	**4.33**

Notes:
WMA: Water Management Act
MGD: million gallons per day

(1) Wells 5 and 6 have a maximum wellfield capacity of 1.50 MGD and the operation of the wells is restricted by streamflow in the Charles River.

Actual well yields depend on operational considerations and current well conditions and are described by normal and maximum daily output (see below).

2.2.2 Supply Availability

In order to determine the Millis wells supply availability and their potential to meet an increased demand, the Normal Daily Output (NDO) and Maximum Daily Output (MDO) volumes were estimated and are summarized in Table 2-2. It is important to note that these terms are an estimate of the current capacity of the wells to perform, and are not based on historic demand of the water system.

NDO values represent what the wells currently reliably produce during a time of elevated (but not maximum) demand. NDO values were derived from daily pumping records provided by the Town of Millis (J. McKay, November 18, 2015). The values were derived from the average of actual daily pumping rates in 2015 for the summer period (July – September) at each well, with the exception of Well 4. Well 4 was out of service during most of the summer of 2015 (it was restored to service in September 2015). 2014 summer daily pumping volumes were used for Well 4. These values have been assumed to be the average daily supply for the Town of Millis for the purposes of Kleinfelder's assessment.

MDO represents a measure of well performance capacity and is the reported maximum operational capacity for a well pumping at 24 hours per day. Ideally, these values are obtained by a licensed well contractor conducting flow testing of the well at various rates up to a maximum rate. MDO values for the wells were provided by the Town of Millis (J. McKay, December 2, 2015; J. McKay, December 3, 2015). These values were derived from recent daily total withdrawal and total run time at each well. These values are assumed to be the maximum daily supply for the Town of Millis for the purposes of Kleinfelder's assessment.

Table 2-2: Available Water Supply

Source Name	WMA Permit Maximum Daily Withdrawal (MGD)	Available Supply (MGD)	
		Maximum Daily Output[2]	Normal Daily Output[3]
Well 1	0.72	0.677	0.187
Well 2	0.50	0.383	0.107
Well 3	0.75	0.936	0.302
Well 4	0.86	0.842	0.146
Well 5 Well 6	1.50[1]	2.120[4]	0.142[4]
Total	**4.33**	**4.958**	**0.884**

Notes:
WMA: Water Management Act
MGD: million gallons per day

(1) Wells 5 and 6 have a maximum wellfield capacity of 1.50 MGD and the operation of the wells is restricted by streamflow in the Charles River.
(2) Maximum Daily Output values were provided by the Town of Millis (J. McKay, December 2, 2015; J. McKay, December 3, 2015). It is noted that these are the maximum well yields and that the Town's SCADA system limits the wells so that the Permit Daily Maximums are not exceeded.
(3) Normal Daily Output was calculated from summer 2015 daily pumping records provided by the Town of Millis (J. McKay, November 18, 2015). Summer 2014 was used for Well 4.
(4) The WMA permit provides a combined Maximum Daily Rate for Wells 5 and 6; therefore, the values for Maximum Daily Output and Normal Daily Output for Wells 5 and 6 are combined for consistency.

The actual available supply is limited by permit limits and operational infrastructure factors which prevent the Town of Millis from maximizing withdrawals, not the individual safe yield for each well as established by the WMA permit or available supply. Limitations on supply due to water treatment considerations are discussed below in 2.2.3. Limitations of the WMA permit on average daily withdrawal is discussed below in Section 2.5.

2.2.3 Supply Treatment Limitations

Based on information presented in the Town of Millis, *Water System Master Plan* (W&C, 2010), the Town of Millis operates four Water Treatment Facilities (WTF) with a total capacity of 4.10 MGD as summarized in Table 2-3.

Water pumped from Wells #1 and #2 is treated at the George D'Angelis WTF, which utilizes air stripping for volatile organic compounds and chemical injection for disinfection using sodium hypochlorite and fluoridation using sodium fluoride. Water pumped from Well #3 is treated at the Village Street WTF and water pumped from Well #4 is treated at the South End Pond WTF. Both the Village Street WTF and South End Pond WTF use chemical injection for pH control using sodium hydroxide and fluoridation using sodium fluoride, with emergency provisions for disinfection using sodium hypochlorite. Water from Wells #5 and 6 is treated at the Paine WTF, which uses chemical injection for pH control using sodium hydroxide, fluoridation using sodium fluoride, and disinfection using sodium hypochlorite.

Table 2-3: Water Treatment Facility Capacity[1]

Source Name	WTF	WMA Permit Maximum Daily Withdrawal (MGD)	WTF Capacity (MGD)
Well 1	George D'Angelis WTF	0.72	1
Well 2		0.50	
Well 3	Village Street WTF	0.75	0.74
Well 4	South End Pond WTF	0.86	0.86
Well 5	Paine WTF	1.50[2]	1.5
Well 6			
	Total	**4.33**	**4.10**

Notes:
WMA: Water Management Act
WTF: Water Treatment Facility
MGD: million gallons per day

(3) Information obtained from Town of Millis, *Water System Master Plan* (W&C, 2010), unless otherwise noted.
(4) Wells 5 and 6 have a maximum wellfield capacity of 1.50 MGD and the operation of the wells is restricted by streamflow in the Charles River.

Based on the Town of Millis Water System Master Plan (W&C, 2010) and information provided by the Town of Millis, manganese levels at Well #4 are close to the MassDEP Secondary Maximum Contaminant Level of 0.05 mg/l. Therefore, the Town limits the operation of Well #4 to avoid any potential issues or customer complaints. Treatment may need to be required if the concentrations of manganese at Well #4 became a water quality issue.

2.3 Demand Projections

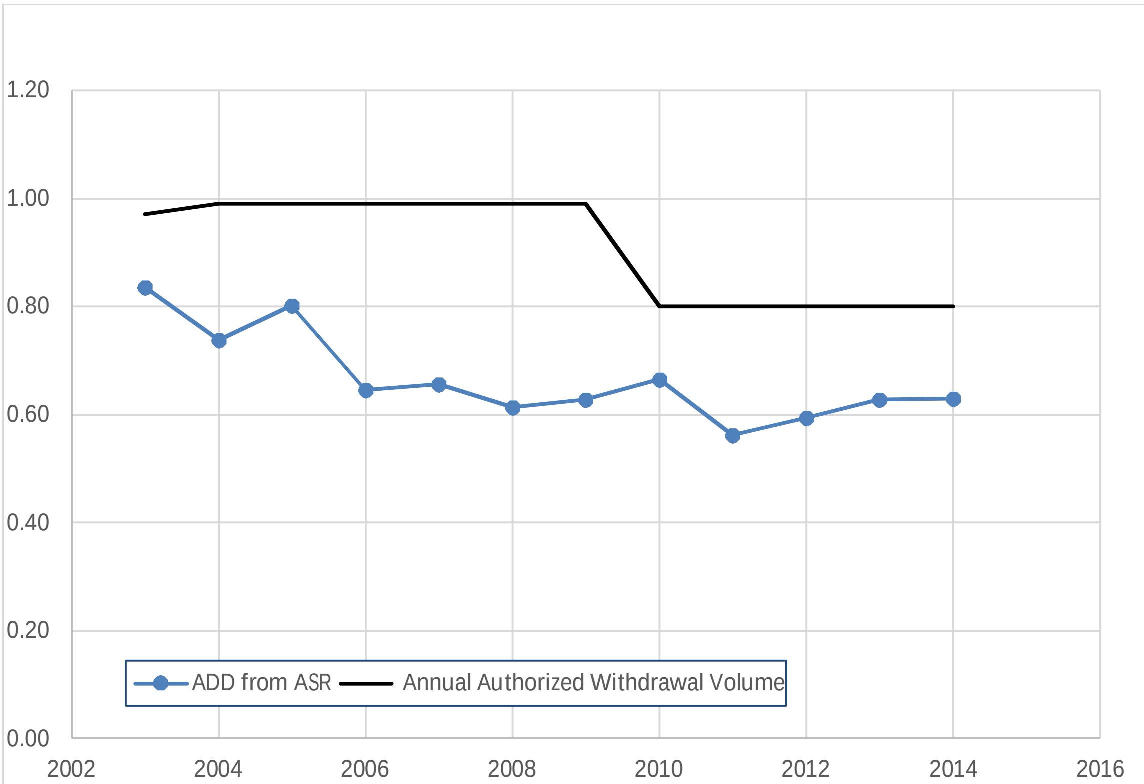
2.3.1 Town of Millis Water Demand

Water demands presented in this section specifically deal with historical and projected water demand for existing and future Town of Millis users, not including the proposed Exelon facility. The projected water demand for the proposed Exelon facility is discussed in Section 2.3.2.

2.3.1.1 Millis Current Average Daily Demand

A compilation of ADD based on a review of *Public Water System Annual Statistical Reports* for the Town of Millis since 2003 is shown below in Figure 1, along with the Town's WMA Permit limits. Based on Figure 1, ADD has trended downward from 2003 to 2008 and remained fairly flat during the past six years. Millis has reported residential gallons per capita use rates at below the state standard of 65 for the past five years. Millis has also reported unaccounted for water percentages below the 10% standard for the past 4 years.

Figure 1: Historic Demands and Authorized Withdrawal Volumes (MGD), Town of Millis



In order to estimate current ADD and MDD values for 2015, Kleinfelder utilized the Town's average production value for the year 2015 to date, from January 1st to September 27th (J. McKay, November 18, 2015). Based on this information, the estimated ADD value for 2015 is 0.688 MGD. While this ADD value is assumed to be representative of the current Town of Millis' water system, it is noted that the value accounts for the high-demand summer season yet not the fall and early winter when demands tend to decrease. As such, it is anticipated that the Town's final ADD for 2015 might actually decrease below 0.688 MGD. However, since this is speculative, the ADD of 0.688 MGD was viewed as a more conservative figure and it has been utilized for evaluation purposes in this report.

2.3.1.2 Millis' Near Term Future (2018) Average Daily Demand (ADD)

Having estimated the 2015 ADD, it was then necessary to identify system demands when Exelon actually begins using water at the requested flows. As construction of the project will take some time if approved, Kleinfelder has assumed that the Exelon demands will be in effect during 2018. Therefore, in order to project a near term future (2018) ADD value for Millis that accounts for possible development in the Town, Kleinfelder added the demand for several proposed development projects to the estimated 2015 ADD. As summarized in Table 2-4, these demands included mainly residential developments which have been permitted or for which a water reserve has been established by the Town of Millis.

Table 2-4: Town of Millis Future Development Water Demands and Water Reserves[1]		
Future Developments or Reserves	**Permitted or Reserved Future Demand[2] (gpd)**	**Future Demand For Evaluation[3] (gpd)**
Hickory Hill (including Acorn & Farm)	40,000	20,000
McDonough (Spring Street)	660	330
Roche (Spring Street)	2,640	1,320
South End Farm	11,440	5,720
Rockville Meadows	600	300
JOPA	5,000	2,500
Glenn Ellen	65,108	65,108
Glenn Ellen amenities	37,000	37,000
Dmytrck	2,640	1,320
Kensington Pl.	4,000	2,000
Downtown Reserve	40,000	40,000
Total	**208,088**	**175,598**

Notes:
gdp: gallons per day

(1) Demands associated with development projects were provided by the Town of Millis (C. Aspinwall, 2015).
(2) Based on information from the Town of Millis, the permitted or reserved future demand values were based on Title V, with the exception of Downtown Reserve. The future reserve for Downtown Reserve is an estimate based on a full buildout of retail and housing (C. Aspinwall, 2015).
(3) For the purposes of our evaluation, half of the permitted or reserved future demands were utilized, with the exception of Downtown Reserve, Glenn Ellen amenities, and Glen Ellen, Based on information from the Town of Millis, the permitted or reserved future demand for Glen Ellen amenities and Glen Ellen reflect a discounted value using Title V for senior housing (C. Aspinwall, 2015).

Table 2-5 below summarizes the current demand for Millis, including these development projects. The “Downtown Reserve” demand was excluded from this calculation as no permitted project is yet in place and it is not likely to be constructed prior to the completion of the new Exelon facility. The projected near term ADD value for 2018 for the Town of Millis, including pending and proposed developments is 0.824 MGD.

Table 2-5: Estimated Current & Near Term Future Millis ADD Exclusive of Exelon West Medway II	
Source	**ADD (MGD)**
Millis Estimated 2015 ADD	0.688[1]
Development Projects (not including downtown reserve)	0.136[2]
Total Projected Millis 2018 ADD	**0.824**

Notes:
ADD: Average Daily Demand
MGD: million gallons per day

(1) Average 2015 ADD to date (January 1st to September 26th) based on daily pumping records (J. McKay, November 18, 2015)
(2) Demands associated with development projects were provided by the Town of Millis (C. Aspinwall, 2015). Based on information from the Town of Millis, the Downtown Reserve is a reserve of water for potential future developments in the downtown area. This reserve does not reflect a development which has already been permitted. Therefore, for the purposes of our assessment the Downtown Reserve was not accounted for in the projected 2018 ADD.

2.3.1.3 Town of Millis Current and Future Maximum Daily Demand (MDD)

As shown in Table 2-6, the MDD in the Town of Millis system averaged 1.28 MGD from 2008 through 2014 based on a review of the *Annual Statistical Reports* for the Town of Millis. As discussed in Section 2.3.1.4, the projected Town of Millis future MDD is estimated to be 0.777 MGD by 2035. As discussed in Section 2.3.1.2, Kleinfelder estimated Millis' near term ADD to be 0.824 MGD in 2018. A peaking factor of 1.85, which is the average peaking factor reported in the *Public Water System Annual Statistical Reports* between 2008 and 2014, was used to calculate a current MDD of 1.524 MGD. The peaking factor (1.85) was also applied to the ADD for 2035 to calculate a projected MDD of 1.44 MGD.

Table 2-6 summarizes the historic and projected water use by the Town of Millis, as well as the source of the information.

Table 2-6: Historic and Projected Town of Millis Water Demand, Exclusive of Exelon				
Year	**ADD (MGD)**	**MDD (MGD)**	**Peaking Factor (MDD/ ADD)**	**Data Source**
2008	0.61	1.16	1.89	Public Water System Annual Statistical Reports
2009	0.63	1.42	2.26	
2010	0.66	1.38	2.08	
2011	0.56	2.00	3.56	
2012	0.59	1.02	1.71	
2013	0.63	0.99	1.58	
2014	0.63	1.01	1.60	
Average 2008 – 2014	0.62	1.28	1.85[1]	
2015	0.688	1.28	1.85	Average 2015 ADD to date (J. McKay, November 18, 2015)
2018	0.824	1.524	1.85	Kleinfelder projection including new development projects (excluding Exelon demand)

Table 2-6: Historic and Projected Town of Millis Water Demand, Exclusive of Exelon				
Year	**ADD (MGD)**	**MDD (MGD)**	**Peaking Factor (MDD/ ADD)**	**Data Source**
2035	0.777	1.44	1.85	Kleinfelder projection as outlined in Section 2.3.1.4

Notes:
MGD: million gallons per day
ADD: Average Daily Demand
MDD: Maximum Daily Demand

(1) The peaking factor from 2011 was not included in the calculation of the average peaking factor between 2008 and 2014.

2.3.1.4 Millis Longer Term Water Needs Projections

Kleinfelder used population projection information from a variety of industry standard sources to develop a water needs forecast for Millis in accordance with the Massachusetts Water Resources Commission (WRC) 2009 Water Needs Forecast current methodology. All of the population projections predict a significant decline in Millis population due to various factors including an aging population and migration trend data. The available forecast data indicate an average of an 8% decline in Millis population between 2020 and 2035 (the latest year predictions available). The full analysis is presented below in this Section.

Future water demands were calculated using the Massachusetts Water Resources Commission Policy for Developing Water Needs Forecasts for Public Water Suppliers and Communities and Methodology for Implementation, 2009. WRC uses forecasts of water needs to justify changes in permitted withdrawals under the Water Management Act (WMA) to “ensure an adequate volume and quality of water for all citizens of the Commonwealth, both present and future.” The forecast methodology takes into consideration historic and existing water-use patterns, population projections, employment projections, and is consistent with water-use efficiency and conservation standards outlined in the Massachusetts Water Policy (EOEA 2004) and the Water Conservation Standards (EOEA and WRC 2006).

Current Use

The current water use is a sum of estimated residential or household use, non-residential use (ie: commercial or industrial use), and losses due to treatment plant processing or unaccounted for water (ie: water main breaks, leaks, unmetered water). Current water usage data was obtained from the Annual Statistical Reports (ASR) provided to MassDEP by Millis.

Population Data and Trends

Projections of water use are determined based on projected changes in population, development, and water-use efficiency. Kleinfelder completed a review of available population data and projection models, and estimated projected population based on the data available (Figure 2). Data sources include two projections from a widely-cited regional planning agency, Metropolitan Area Planning Council (MAPC), and two projections from UMass Donahue Institute’s Population Estimation Program. Kleinfelder compiled available data and used an average of these projections to estimate the population in Millis from 2015-2035, excluding Town census and ASR data, as it has the potential to overestimate population because out-migration requires the removal of duplicate or outdated records.

MAPC uses broad trends in Massachusetts and the local region to estimate population under two scenarios, Status Quo and Stronger Region. The Status Quo projection accounts for recent regional trends in birth rate, mortality rate, and housing occupancy to estimate future population from 2010-2040. The Stronger Region scenario is based on, from 2010-2040, a population growth rate of 12.6% (compared to 6.6%), a 24% increase in the demand for housing (compared to 17%), and a 6.9% increase in the size of the labor force (compared to 0.4%). It should be noted that although the region is projected to grow under this model, municipal trends will be affected by local patterns and policies, including restrictive zoning, an aging population, and decreased preference among millennials for suburban living, all of which may translate to declines in population over time in both MAPC scenarios.

The UMass Donahue Institute Main Projection Series uses a similar framework as MAPC, analyzing recent regional trends to estimate future populations in the main projection series. Municipal-level trends are analyzed using Cohort-Change Ratios (CCR), an iterative method, which estimates rates of change in population for age-sex groups over five-year intervals based on historic data. Rapid population growth trends in Millis pre-2000 leveled off from 2000-2010, and current projections also take into account state-wide and regional trends of decreased in-migration. As shown in the CCR projections (Figure 3), the only age groups increasing in the town from 2015 forward are those over age 60. The Town of Millis' aging population contributes to a decline in the projected fertility rate and an increase in the mortality rate over the projected timeframe. Migration trends, fertility rate, and mortality rate all contribute to a decline in population from 2015-2035.

Figure 2: Town of Millis – Population Trends and Projections (1990-2040)

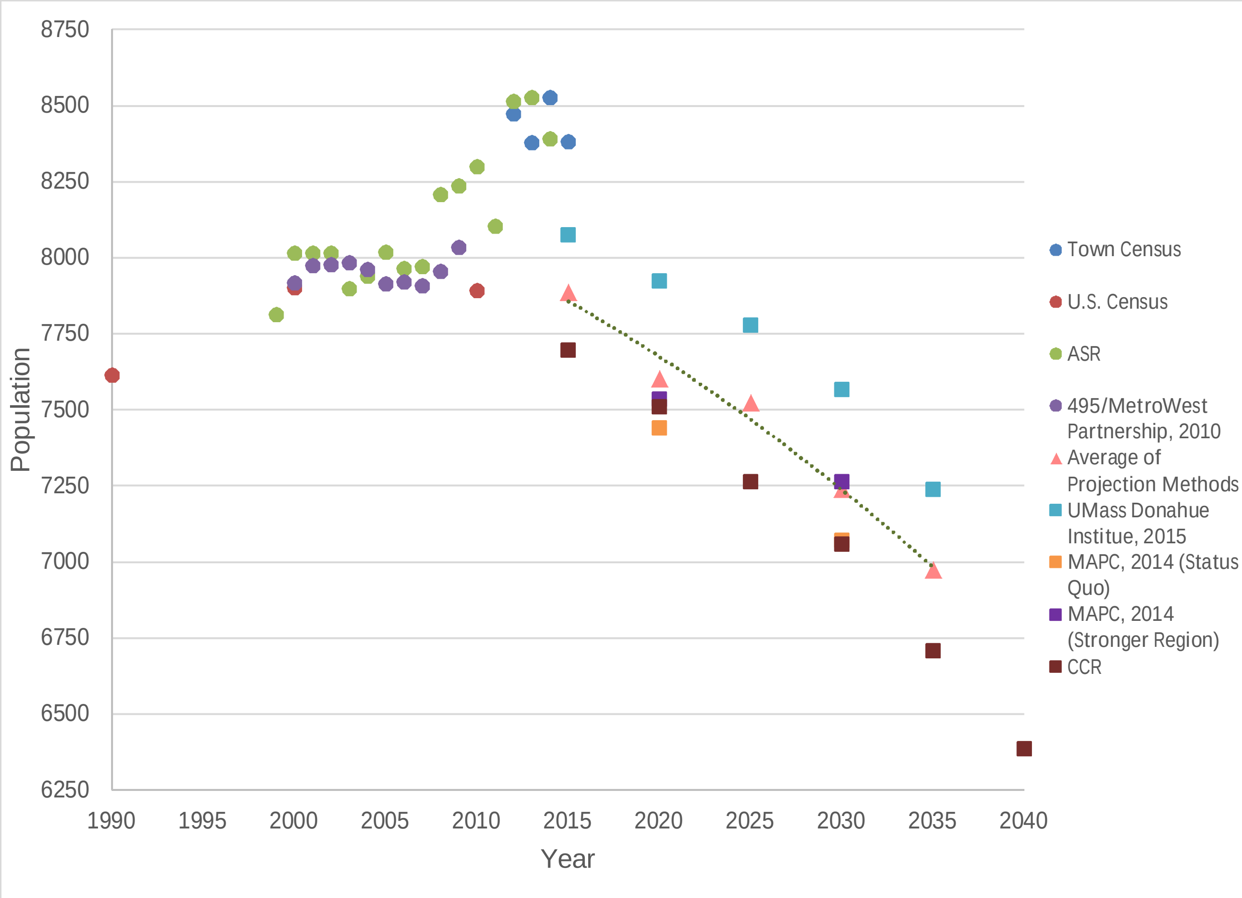
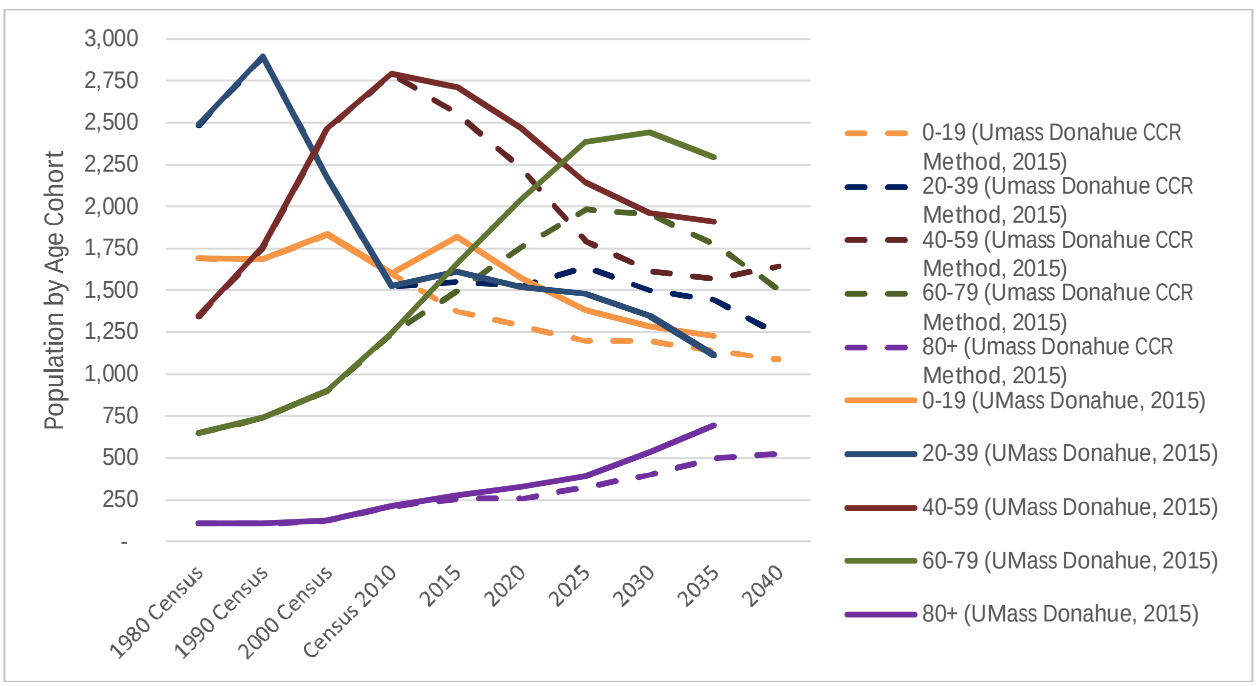


Figure 3: Town of Millis – Population by Age



Projected Use

This evaluation takes into consideration the average daily demand for the projects that are currently permitted by the Town of Millis, and assumes that all projects listed in Table 2-4 will be online by 2020, for a future additional ADD of 0.175 MGD for new development. For the forecast period (2015-2035), Kleinfelder used the average of four population projection models shown in Figure 2: UMass Donahue Institute Population Estimation Program's main series and CCR projections, and MAPC's Status Quo and MAPC Stronger Region projections.

Water-use efficiency is modeled in four scenarios, per WRC methods, to project how changes in unaccounted for water (UAW) and residential water use in gallons per capita per day (GPCD) impact ADD over time. As shown in Table 2-7, the first scenario assumes residential water use and UAW are constant over time at 2014 levels, 57 GPCD and 7.21% respectively, as reported by the 2014 ASR. With these assumptions, the future total ADD is projected at 0.738 MGD (2020), 0.733 MGD (2025), 0.715 MGD (2030), and 0.699 MGD (2035).

The second scenario assumes UAW is 10% and residential water use is constant over time at 2014 levels. This scenario is used by WRC for public water suppliers which exceed the 10% UAW limit. The Town of Millis has been proactive in leak detection and repairs, and has maintained UAW rates under the 10% limit in recent years. Based on this historic data, provided that the Town of Millis continues to take steps to reduce UAW, it is possible that these assumptions would overestimate demand.

The third scenario assumes UAW constant at 2014 levels and residential water use at the 65 GPCD water conservation standard. This scenario assumes that public water suppliers which have not met the 65 GPCD residential water use limit will decrease their residential water use to the standard, and in particular is for communities in a basin with higher levels of stress. Based on this historic data and provided that the Town of Millis continues to take steps to increase residential water use efficiency and implement water conservation policies, this scenario would overestimate demand. The fourth scenario assumes UAW is 10% and residential water use is 65 GPCD. This scenario is for suppliers which exceed both UAW and residential water use limits. Based on ASR data from 2012-2014, Millis does not fall into this category for the justifications described above, however, this scenario provides a conservative estimate of demand and it sets upper limits based on water use standards.

Table 2-7: Summary of ADD (2020-2035) under 2009 WRC Scenario 1 & 4				
Description	**Year**	**ADD (mgd)**	**Sale to Medway (Exelon) ADD (mgd)**	**Total ADD (mgd)**
Scenario 1: Future Water Use at current (2014) residential water use rate (57 GPCD) and future unaccounted for water at current value (7%)	2020	0.738	0.048	**0.786**
	2025	0.733	0.048	**0.781**
	2030	0.715	0.048	**0.763**
	2035	0.699	0.048	**0.747**
Scenario 4: Future Residential Water Use at 65 GPCD and future unaccounted for water at 10%	2020	0.823	0.048	**0.871**
	2025	0.817	0.048	**0.865**
	2030	0.797	0.048	**0.845**
	2035	0.777	0.048	**0.825**

Based on the first forecast scenario, assuming both UAW and residential water use under the limits and no additional water use from development, ADD will peak in 2020 at 0.738 MGD and will decrease until 2035 due to a decrease in population; however, a conservative estimate from the fourth scenario should be used to evaluate supply adequacy (Section 2.4). Under Scenario 4, assuming water sales to Medway for the Exelon project (an additional 0.048 MGD), the ADD will peak in 2020 0.871 MGD and decrease to 0.825 MGD by 2035.

The Town of Millis requested a 50-year projection for this assessment. The planning period for feasibility studies is typically 20 years, which is represented in our evaluation provided. Extending the planning period beyond 20 years poses several challenges, particularly due to the uncertainty associated with the percent and duration of projected annual population decline in the Town of Millis. Parameters associated with population projection are complex and rely upon both demographics and economic development activity, among others. Although a complete build-out scenario can be determined on the basis of existing zoning, the period over which build-out would be achieved could not. Kleinfelder did not feel that we could provide meaningful projections as far out as the 50 years requested by the Town because the uncertainty on infrastructure demands would be so large.

2.3.2 Exelon Facility

2.3.2.1 Average Daily Demand (ADD) and Maximum Daily Demand (MDD)

The Exelon water needs used for this analysis differ somewhat from those used in Kleinfelder's analysis for the Town of Medway. The Exelon water needs used for this current analysis are updated volumes based on data presented in the *Draft Environmental Impact Report (*Epsilon, 2015) or provided directly by Exelon's representatives. The estimated average water use for the proposed Exelon facility is 95,206 gallons per day (gpd) or 0.095 million gallons per day (MGD) with a three-year rolling average of 68,880 gpd (0.069 MGD) according to the *Draft Environmental Impact Report (*Epsilon, 2015). Exelon will supply 51,840 gpd using an on-site well, therefore, the proposed Exelon facility should require an average daily supply of up to 43,366 gpd (0.043 MGD) from the Town of Millis. Based on information provided by Exelon representatives, Exelon is also requesting a 10% safety factor (T. Sanford, 2015). Therefore for the purposes of this evaluation, the average daily demand of the proposed Exelon facility is 47,703 gpd (0.048 MGD).

According to Exelon representatives, the highest daily maximum facility water use is 190,000 gpd (0.190 MGD), which was utilized for Kleinfelder's assessment of maximum demand as a worst case scenario (for example if the Exelon well was out of service). However, in general it is anticipated that the on-site well at the proposed facility will typically supply 51,840 gpd to the proposed facility, and the proposed Exelon facility will require a maximum daily demand of 138,160 gpd (0.138 MGD) from the Town of Millis.

If required, this demand would result in a total Millis MDD of approximately 1.662 MGD. Without the supply from the on-site well, the MDD of the proposed facility (0.190 MGD) would result in a total Millis MDD of approximately 1.714 MGD.

Table 2-8: Summary of Projected Town of Millis and Exelon Demands

User	Projected 2018 Demand[1] (MGD)		Projected 2035 Demand[2] (MGD)	
	ADD	MDD	ADD	MDD
Town of Millis System	0.824	1.524	0.777	1.44
Proposed Exelon Facility[3]	0.048	0.190	0.048	0.190
Total	**0.872**	**1.714**	**0.825**	**1.63**

Notes:
MGD: million gallons per day
ADD: Average Daily Demand
MDD: Maximum Daily Demand

(1) The Town of Millis System ADD and MDD are the projected 2018 values, which represent the addition of known development projects (excluding Exelon demand) as discussed in Sections 2.3.1.2 and 2.3.1.3.
(2) The Town of Millis System ADD and MDD values for 2035 are based on Kleinfelder's projections as discussed in Section 2.1.3.4.
(3) The Exelon facility ADD values assume the on-site well would provide the estimated volume of water (51,840 gpd) to the Exelon facility as identified in the *Draft Environmental Impact Report (*Epsilon, 2015). The Exelon facility MDD values does not include the estimated volume of water (51,840 gpd) supplied from the on-site well to the Exelon facility.

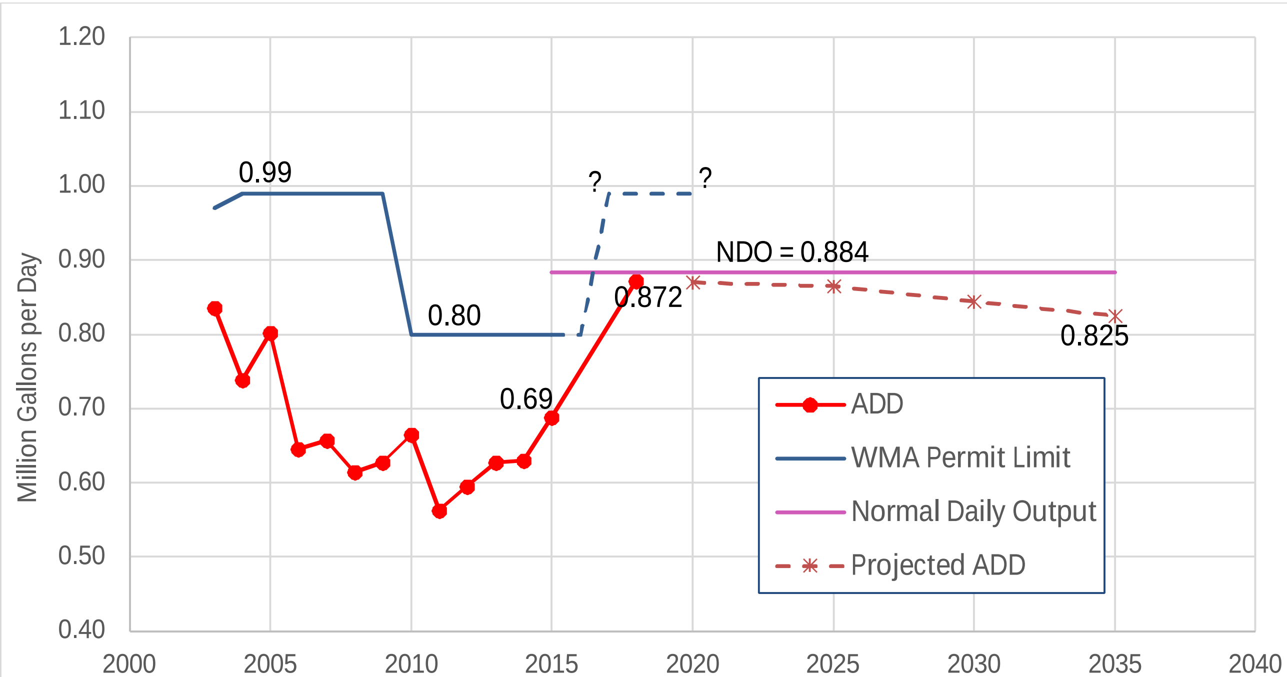
2.4 Evaluation of Supply Adequacy

The current available supply from the Town of Millis was discussed in Section 2.2. Estimates of existing and future demand for the Town of Millis and the proposed Exelon facility were discussed in Section 2.3. This section presents the comparison between available supplies in relation to projected demands (including the Exelon facility). WMA Permit limits are discussed in more detail in Section 2.5.

2.4.1 Supply Adequacy to Meet Average Day Demand (ADD)

Figure 4 graphically summarizes Millis' supply in comparison with average day demand. Permit limits are also presented for reference. The system adequacy evaluation has been based on estimated normal and maximum daily output capacities of the wells as derived from the Town of Millis daily pumping records (Table 2-2).

Figure 4: Historic and Projected ADD Compared with Supply and Permit Limits (MGD), Town of Millis



Note: 2015 ADD value is estimated from 2015 daily pumping records between January 1st and September 27th; the 2018 value represents the addition of known development projects and Exelon demand. 2035 ADD was a projection calculated by Kleinfelder, which includes known development projects and Exelon demand.

As seen on Figure 4, assuming normal daily output (NDO) rates, Millis' supply availability (0.884 MGD) to meet the projected 2018 ADD (including proposed new residential development and Exelon) of 0.872 and future (2035) ADD of 0.825 appears to be adequate. However, the margin of adequacy will be slim if most of the predicted Town development projects come online before 2020.

The adequacy of the supply will rely on the regular maintenance of the wells to maintain current NDO levels. Elevated levels of manganese in Well 4 reportedly limit its use, which could be a potential problem. Recommendations to maintain supply adequacy are discussed in Section 4.

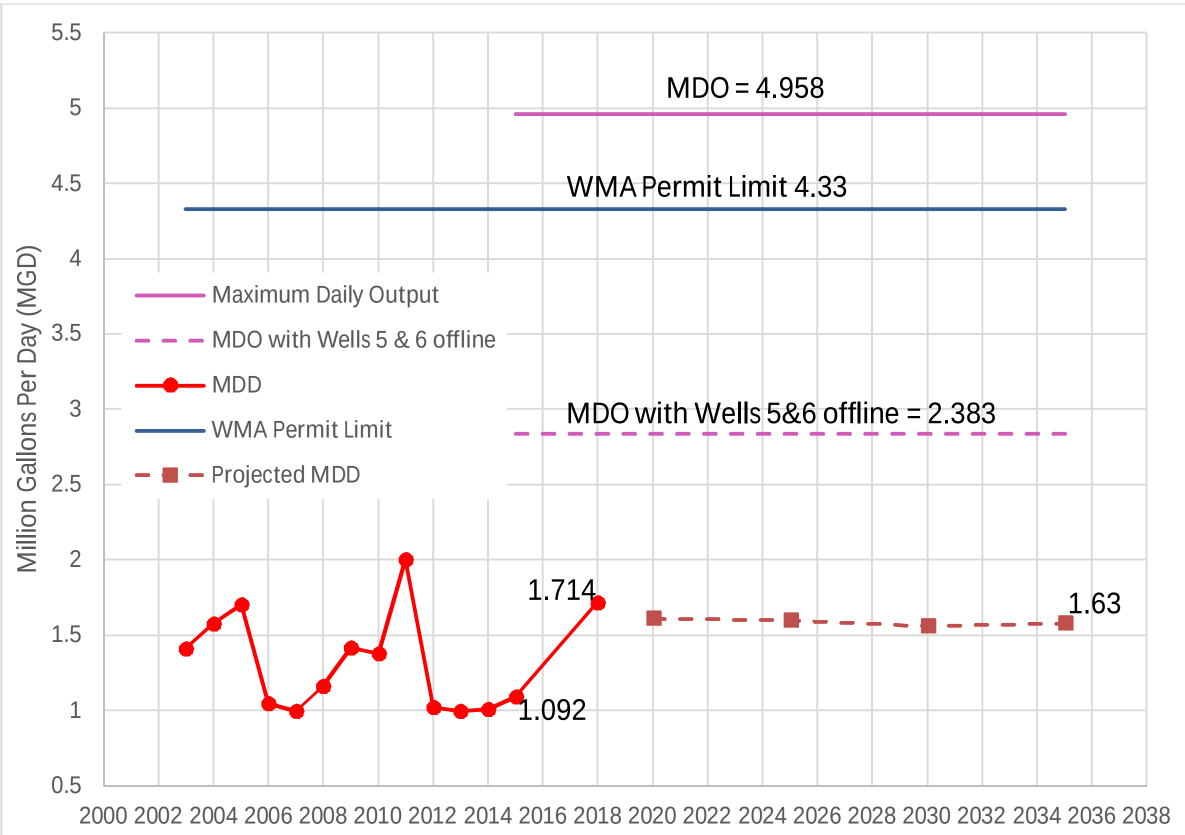
2.4.2 Supply Adequacy to Meet Maximum Day Demand (MDD)

Figure 5 below illustrates Millis' supply in comparison to MDD. Assuming maximum daily output (MDO) rates for 24 hours per day, using all six of their wells running, Millis' supply availability (4.958 MGD) is adequate to meet the projected 2018 MDD (including development and Exelon) MDD of 1.714 as well as the projected future MDD (2035) of 1.63 MGD. Confidence in the conclusions of adequacy would be increased by performance of well inspection and flow testing to verify the MDO values. Recommendations to maintain supply adequacy are provided in Section 4.

When performing this type of water supply analysis it is typical to evaluate adequacy with the case of the single, largest source offline, so as to provide a factor of safety. The MassDEP "Guidelines and Policies for Public Water Systems" and the American Water Works Association (AWWA) "Distribution System Requirements for Fire Protection Manual" describe that "[with] any pump out of service, the remaining pump or pumps shall be capable of providing the maximum daily pumping demand of the system".

In the case for the Town of Millis, the largest source is the combination of Wells 5 and 6, because they collectively have the highest permitted withdrawal volume (1.50 MGD) and highest reported MDO (2.12 MGD). With Wells 5 and 6 offline, the available maximum daily output from the Town of Millis system is reduced from 4.958 MGD to 2.838 MGD. Therefore, with the Wells 5 and 6 offline the Town of Millis can still meet its current or future MDD.

Figure 5: Historic and Projected MDD Compared with Supply and Permit Limits (MGD), Town of Millis



Note: 2015 MDD value is estimated from 2015 daily pumping records between January 1st and September 27th; the 2018 value represents the addition of known development projects and Exelon demand. 2035 MDD was a projection calculated by Kleinfelder, which includes known development projects and Exelon demand

2.5 Comparison of Demand to Permitted Withdrawal Limits

The Town of Millis' WMA permit dated March 2, 2010, covers a 20-year term. The permit term is divided into four 5-year periods and permits average daily withdrawal rates on an annual basis during each period (MassDEP, 2010). The permitted average daily withdrawals are summarized in Table 2-9. The WMA permit annual average withdrawal limit of 0.80 MGD is for "Period 1", the initial 5-year term of the Permit. The WMA permit annual average withdrawal limit for "Period 2" is 0.99 MGD. The WMA permit states that access to water withdrawals for Period 2 and beyond is contingent upon MassDEP completing a 5-Year Review or a permit amendment. It is anticipated that MassDEP will complete the 5-year review in 2017.

Table 2-9: Summary of WMA Permitted Daily Withdrawal Limits			
Period	**Date Range**	**Daily Withdrawal (MGD)**	**Annual Withdrawal (MGY)**
1	3/1/10 – 2/28/14	0.80	292.00
2[1]	3/1/14 – 2/29/19	0.99	361.35
3[1]	3/1/19 – 2/28/24	0.99	361.35
4[1]	3/1/24 – 2/28/29	0.99	361.35

Notes:
MGD: million gallons per day
MGY: million gallons per year

(1) Permitted volumes are contingent upon MassDEP completing a 5-year review or permit amendment.

As seen in Table 2-10, the projected ADD exceeds the WMA Permitted Withdrawal Limit in 2018, with the inclusion of proposed developments and Exelon. Therefore, Millis may need to request an increase in its current WMA Permit limit to accommodate the projected 2018 demand. However, the future ADD (2035) is projected to be below the current WMA Permitted Withdrawal Limit of 0.80 MGD.

Table 2-10: Comparison of Demand and Permitted Withdrawal Limits				
	Projected (2018) Demand (MGD)[1,3]		**Future (2035) Demand (MGD)[2]**	
User	**ADD**	**MDD**	**ADD**	**MDD**
Town of Millis System	0.824	1.524	0.777	1.44
Proposed Exelon Facility	0.048	0.190	0.048	0.190
Total	**0.872**	**1.714**	**0.763**	**1.63**
Permitted Withdrawal Limit	0.80	4.33	0.80[4]	4.33
Volume Above Permitted Withdrawal	**0.072**	**0**	**0**	**0**

Notes:
MGD: million gallons per day
ADD: Average Daily Demand
MDD: Maximum Daily Demand

(1) The Town of Millis System ADD and MDD are the projected 2018 values, which represent the addition of known development projects (excluding Exelon demand) as discussed in Sections 2.3.1.2 and 2.3.1.3.
(2) The Town of Millis System ADD and MDD values for 2035 are based on Kleinfelder's projections as discussed in Section 2.1.3.4.
(3) The Exelon facility ADD values assume the on-site well would provide the estimated volume of water (51,840 gpd) to the Exelon facility as identified in the *Draft Environmental Impact Report (*Epsilon, 2015). The Exelon facility MDD values does not include the estimated volume of water (51,840 gpd) supplied from the on-site well to the Exelon facility.
(4) The current WMA Permit Withdrawal Limit was assumed for comparison purposes only. The current WMA Permit extends through 2/28/2029 and the Town's average daily permit withdrawal limit has not increased to 0.99 MGD (Period Two volume) because it was prepared under an interim methodology and will need to undergo MassDEP review and or permit amendment first, which is anticipated for 2017. Therefore, the WMA Permit Withdrawal Limit for 2035 may be different from the current WMA Permit Limit.

The implications of Millis' Water Management Act Permit limits in the context of the 5-year review and the new Water Management Act regulation requirements for minimization and mitigation are discussed in further detail in a separate document supplemental to this report.

2.6 Storage Adequacy Evaluation

Based on the Millis Water System Master Plan (W&C, 2010), the Town of Millis has two active storage tanks. The Farm Street Tank has a capacity of 0.99 MG and the Walnut Hill Tank has a capacity of 0.55 MG. Based on the Town of Millis, *Water System Master Plan* (W&C, 2010) the water storage was determined to be inadequate for peak hour equalization storage, at appropriate elevations, in the two tanks under current and projected 2030 water demands. However, Woodard & Curran (W&C, 2010) determined that the Town's storage tanks, in conjunction with well pumps, would be able to maintain pressures in the distribution system and adequate tank levels during peak hourly demand. Although current and future demand estimates included in this assessment differ slightly from the values included in the Water System Master Plan, Kleinfelder anticipates that water storage in conjunction with well pumps is still adequate within this minor variation in estimates. It should be evaluated again in the Town's next Water System Master Plan update.

Based on available supply, the Town of Millis' system should be capable of meeting MDD each year without relying on system storage. Storage should be reserved to meet demands during periods of peak consumption and should provide the volume of water required for fire protection.

2.7 Water Distribution System Adequacy

Kleinfelder utilized the Town of Millis' existing water distribution system hydraulic model to evaluate the impacts to fire flow availability throughout the Town should Millis provide water to the proposed Exelon peaking station project, via an interconnection with the Town of Medway's water distribution system. In addition, Kleinfelder utilized available distribution system data and the Town of Millis' hydraulic model to identify the preferred interconnection location to Medway's system.

Kleinfelder's analysis was completed using WaterGemsV8i hydraulic modeling software by Bentley. The Town's water distribution system model was developed by Woodard and Curran and was provided to Kleinfelder for the purpose of analyzing the system hydraulics with and without the proposed demand from the Exelon development. Per the scope of Kleinfelder's analysis, it was assumed that the model accurately reflects the Town's existing distribution system.

2.7.1 Available Fire Flow Modeling Analysis

The intent of the hydraulic analysis completed by Kleinfelder was to determine if providing water to the Medway distribution system following the construction of the Exelon project will significantly reduce Available Fire Flow (AFF) in any areas of the Town. AFF provides a representation of how much sustainable flow is available at a specific location in a distribution system and is considered representative of the overall system "strength" at that location. To evaluate Exelon's impact, Kleinfelder conducted simulations for five modeling scenarios:

1. *Present Day*: This scenario simulated AFF under current demand conditions to determine if any problem areas already exist.

2. *2018 Future Day*: This scenario simulated AFF under future projected demand conditions for the year 2018 to determine if any new problem areas occur without the introduction of the Exelon demand. This scenario introduced additional water demands that were provided by the Town for development projects that are under construction or permitted, and likely to be completed by the time the Exelon project is operational (circa 2018). Per discussions with the Town, the 2018 *Future Day* simulation also reflects the replacement of the existing 8" water main on Street (from Walnut Street to Grove Street) with a 12" water main to accommodate the proposed Glen Ellen development. As base demand in the Town has remained relatively flat in recent years, the 2018 projections maintained the same ADD as used for the *Present Day* simulation.
3. *2018 Future Day with Exelon*: This scenario simulated the impact of Exelon on AFF, assuming the 2018 Future Day demand conditions with the Exelon demand included.
4. *2035 Future Day*: This scenario simulated AFF under future projected demand conditions for the year 2035, to determine if any new problem areas occur without the introduction of the Exelon demand. This scenario introduced one additional development project provided by the Town; the "Downtown Reserve". While development is anticipated in the Downtown Reserve area, no permitted project is yet in place and as such it was not included in the 2018 simulations. The base demand was also increased using a multiplier based on future 2035 population projections. It should be noted that the 2035 model simulations assumed that the Town will maintain the system in its current condition (pipes, pumps, tanks, etc.). As such, the pipe (C-factor) conditions and all pump and tank controls from the Base and 2018 projections were retained for the 2035 modeling.
5. *2035 Future Day with Exelon*: This scenario simulated the impact of Exelon on AFF assuming the 2035 Future Day demand conditions with the Exelon demand included.

2.7.1.1 Millis Distribution System Model Conditions

The existing model as created by Woodard and Curran distributed average daily water demands throughout the water system. In order to analyze the impact of the Exelon project on AFF under the most conservative conditions, Kleinfelder updated the model to reflect peak hour demands under both present day and future day model scenarios. This was accomplished by multiplying ADD under both present and future conditions by a peaking factor that Kleinfelder established in accordance with TR-16 guidance recommendations (TR-16, 2011). The guidance is commonly used for relating average wastewater flow to peak wastewater flow based on service population, but can be reasonably applied to drinking water systems to approximate peak flow. Furthermore, for the two model scenarios that evaluated the presence of Exelon, it was assumed that Exelon was also operating at its peak demand. Based on the information provided by Exelon and its representatives, Kleinfelder understood that the facility's peak demand will be 250 gpm and it will occur when Exelon is filling its on-site water storage tanks.

In addition to the previously described changes to water demand, Kleinfelder adjusted the model scenarios to account for the operational limitations of the Town's distribution system. In particular, it was noted that Wells #5 and #6 have seasonal operating restrictions tied to the water level in the Charles River. As such, there are times in the year when these wells are prohibited from operating. Therefore, all model simulations assumed these wells were offline because they cannot be relied upon for supply throughout the year. Lastly, Insurance Services Office, Inc. (ISO) and AWWA guidelines dictate that water distribution system modeling simulations shall assume that the single largest water source is offline so as to provide a conservative estimate of a system's redundancy and ability to deliver adequate flow under peak demand conditions. As such, Well #4 was considered to be offline in all model simulations, based on it having the highest remaining permitted withdrawal limit. With these restrictions in place, the model simulations represent the water distribution system with only Wells #1, 2 and 3, and both storage tanks operational.

2.7.1.2 Modeling Scenario Results

The water system hydraulic model, as provided to Kleinfelder, did not include information for Needed Fire Flow (NFF). NFF indicates how much flow is required at a specific site (node) and is calculated in accordance with ISO guidelines, which consider factors including but not limited to site use, building size, and occupancy limits. When simulated AFF is found to be less than NFF, it indicates that insufficient fire flow is available at that location. As NFF data was unavailable, and determination of NFF was beyond the scope of this evaluation, Kleinfelder was not able to determine all locations in the water system model where fire flow is insufficient. However, ISO guidelines provide a minimum threshold at which AFF is considered deficient for all types of development. This threshold is 500 gpm and any model locations with simulated AFF below this amount were noted as deficient. Additionally, AFF values of less than 1,000 gpm may be deficient for denser residential development and some levels of commercial development. Consequently, Kleinfelder was able to identify model locations that did not meet this threshold as locations of possible fire flow deficiency. However, further analysis would be required to definitively identify the adequacy of all locations within the Town's model that exhibited AFF greater than 500 gpm under any of the demand scenarios previously noted. For this modeling analysis, Kleinfelder's review was therefore limited to identifying whether or not a location was adversely impacted (i.e. AFF reduced) by the introduction of new system demands, including Exelon. A description of the results of this analysis follows.

Utilizing the distribution system conditions noted in the preceding sections, each of the five modeling scenarios were simulated and the resultant AFF values were tabulated for each of the model's 1,111 nodes (locations within the water distribution system representing junctions along a system's water mains). Analysis of the *Present Day* simulation indicated that the lowest AFF values were generally found in the northwest corner of the Town in the vicinity of the Walnut Hill Storage Tank and Orchard Street, with a modeled AFF of 500 gpm or less at a total of 14 nodes in the area. These low AFF values are primarily due to the high relative elevations of the nodes. Lower AFF values were also noted in a number of locations where water mains dead end without any looping, including but not limited to Main Street near the Millis-Medway town line, Main Street near the Millis-Medfield town line, Dover Street, Ridge Street near Curve Street, and Dean Street near the Millis-Norfolk town line. Altogether 50 nodes (~4.5% of all nodes) were identified as having an AFF of 500 gpm or less under the *Present Day* simulation.

AFF was found to remain relatively unchanged from the *Present Day* simulation to the *2018 Future Day* simulation, despite the addition of the Exelon development water demand. In some instances, the AFF estimates actually improved due to the water main upgrade anticipated on Orchard Street. While AFF improved along this stretch of Orchard Street, lower values continued to be simulated at the other remaining locations that were observed during the *Present Day* simulation as follows:

- Overall, AFF tended to drop slightly excluding the improvements along Orchard Street, with an average decrease of 3% noted across all other nodes and a maximum decrease of 9%.
- Altogether 39 nodes (~3.5% of all nodes) were identified as having an AFF of 500 gpm or less under the *2018 Future Day* simulation, which is 11 fewer deficient nodes than in the *Present Day* simulation.

The addition of Exelon for the *2018 Future Day with Exelon* simulation resulted in minor additional reductions to AFF and lower AFF values continued to be simulated in the same locations that were observed during the *Present Day* simulation as follows:

- Overall, AFF decreased approximately 5% on average across all nodes (excluding the increases related to the water main improvements on Orchard Street) and a maximum decrease of 16% at one node when compared to the *Present Day* simulation.
- As with the base *2018 Future Day* simulation, 39 nodes were identified as having an AFF of 500 gpm or less under the *2018 Future Day with Exelon* simulation, while one additional node dropped from an AFF greater than 1,000 gpm to below this threshold.

Both the *2035 Future Day* and the *2035 Future Day with Exelon* model simulations actually predicted system improvements in regard to AFF when compared to the respective 2018 Future Day simulations, as Kleinfelder projected that overall base water demand will decrease based on a correlating decrease in population projections over this period. When compared against the *Present Day* simulation, the 2035 model simulations indicated the following:

- AFF tended to decrease at a reduced rate than what was predicted for the 2018 model simulations, with an average reduction of 2% (excluding Orchard Street).
- A maximum AFF decrease of 8% for the *2035 Future Day* simulation at one node.
- An average AFF reduction of 4% (excluding Orchard Street) and a maximum decrease of 13% for the *2035 Future Day with Exelon* simulation.
- As with the 2018 model simulations, 39 nodes were identified as having and AFF of 500 gpm or less under both 2035 simulations, and lower AFF values continued to be observed at the same locations that were observed in the Present Day simulation.

The model simulations discussed in the preceding paragraphs indicate that water demands related to future development projects in the Town, as well as the demand from Exelon will cause AFF to decrease within the Town's distribution system. However, the overall decrease in AFF is projected to be relatively small, with the largest average decrease projected at 5% via the *2018 Future Day with Exelon* simulation. Further, the addition of the future development project demands and the Exelon demand did not result in any new locations having a calculated AFF of 500 gpm or less. Given that these limited impacts were observed during peak hour demand simulations, it is Kleinfelder's opinion that the addition of the Exelon demand does not adversely impact the Town's water distribution system.

2.7.1.3 Available Fire Flow Modeling Analysis – One Tank Operational

The Farm Street water storage tank (0.99 MG capacity) is currently out of service as it is being rehabilitated by the Town. As such, the Town's distribution system is currently operating with only the Walnut Hill Tank (0.55 MG capacity) and Wells #1, 2, and 3 online. While this does not represent typical operations for the Town, Kleinfelder completed model simulations to identify the impact to AFF of having the Farm Street Tank offline for the same five scenarios described in the preceding section.

The model results indicate that having the Farm Street Tank offline greatly impacts overall AFF in the distribution system. Comparing the simulations under *Present Day* conditions, AFF was projected to be approximately 33% less on average system wide with only one tank operational, with a maximum reduction of 78% projected for one node. Introducing the projected development projects under the *2018 Future Day* conditions further reduces AFF, with an average 45% reduction projected system wide and a maximum reduction of 85% for one node when compared to *Present Day* conditions. The introduction of the Exelon demand under the *2018 Future Day with Exelon* scenario reduces AFF yet again, with an average 56% reduction projected system wide and a maximum reduction of 90% for one node when compared to *Present Day* conditions. As was the case in the analysis of the Town's system with two tanks online, AFF improved slightly for the *2035 Future Day* scenario when compared to the respective *2018 Future Day* scenario.

The reduction to AFF noted in the simulations completed with the Farm Street Tank offline predict that a significant number of locations will have AFF values of less than 1,000 gpm. Under *Present Day* conditions, with both tanks online, 183 nodes (17% of all nodes) were projected to have AFF values of 1,000 gpm or less. With only one tank online, this number increases to 210 (19% of all nodes), jumps to 752 (68% of all nodes) under *2018 Future Day* conditions, and increases further to 827 (75% of all nodes) under *2018 Future Day with Exelon* conditions. Further, under the *2018 Future Day with Exelon* conditions, with one tank online, 56 total nodes are projected to have AFF values of 500 gpm or less, which is 17 more than the 39 nodes identified under the same conditions with both tanks online.

Based on these results, Kleinfelder recommends that the Town minimize the duration of time that either of the two water storage tanks remains out of service to the extent possible, to ensure that the distribution system can provide an adequate supply of fire flow should it be needed. The Town may also want to consider having additional emergency measures in place, such as the ability to readily connect to or open interconnections with adjoining towns, or to be prepared to increase well run times for the duration a tank is offline.

2.7.2 Interconnection Location

Based on the physical orientation of the Millis and Medway water distribution systems, two locations were identified as possible system interconnections: Village Street and Main Street. The analysis of these two locations included a review of the physical properties of the distribution systems in each town and the modeling results under present day conditions for the Town of Millis.

The potential interconnection at Main Street in Millis is served by an 8" water main that dead ends at a valve just prior to the town line with Medway. This area of Main Street has historically been identified as having deficient AFF. These lower AFF values were also identified by the modeling analysis discussed previously and via fire flow testing completed by Kleinfelder as part of this evaluation. On the Medway side of the town line, Main Street is served by dual 6" and 12" diameter water mains.

The potential interconnection at Village Street in Millis is served by a 12" water main from the east and a 10" water main from the north. This redundancy and increased water main diameter results in an increased AFF at the interconnection, which was confirmed via fire flow testing and further modeling analysis completed by Kleinfelder. In Medway, Main Street is served by 6" and 8" water mains. A 12" water main is present approximately 2,500 LF from the town line.

Kleinfelder has identified Village Street as the more favorable interconnection location, as it appears the Millis distribution system is able to provide a more reliable volume of water to this location under all system demand conditions. The Millis water model did not identify deficient fire flows in the vicinity of the Village Street interconnection under any of the five peak hour demand scenarios evaluated [*Present Day*, *2018 Future Day* (with and without Exelon), *2035 Future Day* (with and without Exelon)].

On the Medway side of the town line at Village Street, the system is served by a 6” water main from the town line, west to Island Road. Analysis of the Medway distribution system hydraulic model indicated that water velocities within the 6” water main will be within the acceptable limits of 2 to 7 feet/second with the addition of the 250 gpm demand (Exelon peak flow). The model also identified a high head loss over one segment of the 6” water main that carries the full flow received from Millis. However, this segment of 6” water main is short and the total head loss that occurs in the area as a whole is low. As such it does not negatively impact fire flow in the area of the water system served by this 6” water main and is therefore of minimal concern due to the overall system strength. Based on this analysis, Kleinfelder does not foresee the need to upsize the 6” water main along Village Street in order for Millis to provide the water to fulfill the Exelon demand. However, as MassDEP guidance requires that all new water mains intended to provide fire flow have a minimum diameter of 8”, it is recommended that this existing 6” water main be included for consideration in any future water main replacement planning by the Town of Medway.

2.7.3 Booster Station

In order for Millis to provide water to the Medway distribution system, a booster pumping station will be required. This was determined by analyzing the existing water storage facilities in each town. As both the Millis and Medway distribution systems operate in a single pressure zone and maintain two storage tanks, the hydraulic grade line (HGL) of each system is equal to the respective water elevations in each Town’s tanks, with the maximum HGL being equal to the tank overflow elevations. In Millis, the overflow elevation of the two tanks is approximately 294 feet, with the base elevations of the two tanks being 206 feet and 236 feet respectively. In Medway, the overflow elevation of the two tanks is approximately 366 feet, and the base elevation of the two tanks is 286 feet. As such, the HGL in Medway is greater than that in Millis, meaning that water will flow by gravity from the Medway system to Millis without the presence of a booster pumping station.

A booster pump station will also provide control of the flow rate and volume of water transferred from the Millis system to the Medway system. The pump station can be designed to provide the necessary rate and volume over a desired duration with metering and options for remote control if needed. Design of the booster station and determination of the desired flow rate and control mechanism by which water will be transferred was not investigated further as part of this analysis and should be negotiated during the drafting of an Inter-municipal Agreement between Millis and Medway.

2.7.4 Water Compatibility Evaluation

Kleinfelder noted that the chemical dosing and the operational pH range varied between the Millis and Medway water distribution systems. The Millis system maintains a lower target pH (7.00 to 7.20) and sodium hypochlorite disinfection dosing concentration (0.30 to 0.65 mg/L) than Medway (pH target of 7.50 and sodium hypochlorite dosing of 0.80 to 1.0 mg/L respectively). The Medway system also treats its water with a polyphosphate chemical for sequestration and corrosion protection while Millis does not. Based on these differences, the introduction of water from Millis into Medway will effectively dilute the water in Medway when the booster station is operational. In order for Medway to retain its system’s current finished water properties, adjustments to the treatment parameters may be needed. Options to accomplish this may include either 1) adjustments to the chemical dosing at the production wells/treatment plants in Millis, 2) inclusion of a chemical feed system at the booster station that will be required at the eventual Millis/Medway system interconnection, or 3) another engineered option. Further investigation will be required to determine the extent of the additional chemical dosing requirements and the cost to complete such work. This investigation should also be negotiated during the drafting of an Inter-municipal Agreement between Millis and Medway.

3. IMPLEMENTATION CONSIDERATIONS

3.1 Interconnection with Medway

Millis has two interconnections with Medway which are currently utilized as emergency interconnections only. There is no record of either interconnection being recently utilized, although Millis does have established Standard Operating Procedures for activating the connection, as provided in its 2010 Water Master Plan. In order for Millis to provide potable water to Medway, permanent infrastructure improvements would be required at the Village Street interconnection, as was discussed in Section 2.7. In particular, a booster pumping station would be required for water from Millis to overcome the higher HGL of the Medway system. In addition to the booster station itself, short lengths of water main will need to be installed, as well as related appurtenances, including but not limited to isolation valves, check valves, and flow meters. Some of the variables that Kleinfelder foresees will need to be negotiated further by Millis and Medway in the form of an Inter-Municipal agreement include: the location of the station, the responsible party for operation and maintenance of the station, and the total flow and typical flow rate of water to be pumped from Millis to Medway on a daily basis.

The booster pumping station would have to be sized to be capable of delivering the peak Exelon demand. Assuming the station will be an underground, precast unit consisting of two pumps (one “running”, one “standby”), controls, a backup power generator, flow metering, and chemical monitoring, Kleinfelder estimates that the cost for construction may range from $200,000 to $350,000, excluding engineering services, but including a 30% contingency for supplemental water main piping, valves, and other appurtenances. This estimate assumes that there is town land (if needed) available for the booster station to be installed upon or near the interconnection location. Cost may increase depending on the results of negotiations between Millis and Medway.

In addition to the physical and operational considerations required for implementation noted in the preceding paragraph, the two towns will also need to come to an agreement as to the water quality parameters of the water to be pumped from Millis to Medway. As was discussed in Section 2.7, the chemical dosing and operational pH range varied between the Millis and Medway water distribution systems. In order for Medway to retain its system’s current finished water properties, adjustments to the treatment parameters may be needed. Further investigation into the water properties of the resultant “blended” water that will be present in the Medway distribution system may be necessary. Negotiations for the Inter-Municipal Agreement should identify the desired system water properties for each town, and if necessary, what additional treatment processes may be required, where such systems would be implemented, and who will maintain, operate and pay for such systems.

3.2 Regulatory Requirements for Implementation

Kleinfelder has consulted with MassDEP to determine any new regulatory obligations that may result from an interconnection between Millis and Medway for selling water to Exelon. If Medway’s water supply is supplemented with finished water from Millis, Medway would still be required to meet all of its current requirements as a Public Water System (PWS) including maintenance of the distribution system, and water quality monitoring and reporting. An Inter-Municipal Agreement (IMA) should be used to define and detail the distribution of responsibilities between Medway and Millis for operations, in particular for infrastructure changes including the addition of a booster pumping station. An additional pump station would modify the distribution system and would therefore require a system modification permit from MassDEP.

Similar purchasing arrangements are in place within MassDEP's Central Region. Norfolk purchases water from Wrentham, Charlton purchases water from Southbridge, Westminster purchases water from Fitchburg, Holden and Paxton purchases water from Worcester, and Southborough and Northborough purchase all of their water from the Massachusetts Water Resources Authority (MWRA). At this point, MassDEP has not identified significant regulatory obstacles to this purchasing arrangement (personal communication, Marielle Stone, MassDEP).

Requirements relating to the Water Management Act Permit will be discussed in a separate document.

3.3 Maintenance of Supply Adequacy

As was discussed in Section 2.4, the Town of Millis' supply appears to be adequate to meet the projected near term (2018) average daily demand. However, the margin of supply adequacy will be slim if most of the predicted Town development projects come on line before 2020. In order to maintain supply adequacy at current levels, the Town will need to:

- Continue to manage demand to maintain residential use and unaccounted for water at or below current standards.
- Institute and fund a regular program of well inspection, testing, maintenance, and recordkeeping. This recommendation has also been previously noted by others (Master Plan, 2010).
- Closely track water quality at Well #4 and consider implementing iron and manganese controls (e.g. sequestering) or treatment as needed to maintain use of the source. This recommendation has also been previously noted by others (Master Plan, 2010). A relatively low cost treatability study ($15,000 to $30,000) would provide an alternatives analysis, recommendations for appropriate treatment technology and estimated cost for capital budgeting.

3.3.1 Well Maintenance Program

Complete records of routine well inspection, flow testing, maintenance and cleaning were not readily available in the Town of Millis' records. Similar to recommendations in the 2010 Water Master Plan, it is critical to implement a regular and robust program so that problems can be identified early and addressed before more serious problems develop, leading to extended well down-time. The following actions are recommended:

- Annual Inspection & Flow Testing:
  - Retain a licensed well contractor to conduct well inspection and flow testing as well as motor inspection/testing. Costs are typically less than $700 per well. Track specific capacity results in a running spreadsheet to identify year to year trends in well efficiency indicating possible screen clogging or pump wear.
- Regular Cleaning & Rehabilitation:
  - Recommended good operating practice is to conduct well rehabilitation (pull, inspect and repair pump, conduct TV inspection of screens, clean, and flow test well) about once every 5 years unless water quality and specific capacity results indicate more frequent cleaning required. Operating an inefficient well or pump will increase power costs and regular maintenance will provide significant electrical cost savings. An annual operating budget item of approximately $30,000 to clean

/ rehab one well per year is recommended, if not already in place. It will be particularly important to frequently clean Well #4 due to elevated manganese concentrations.

3.4 Other Recommended Improvements

Kleinfelder does not foresee the need for additional infrastructure improvements beyond those related to the interconnection improvements presented in Section 3.1 in order for Millis to deliver the requested Exelon demand to Medway. However, a number of issues were noted in both Millis and Medway for which infrastructure improvements are recommended in order to enhance distribution system operation:

- Orchard Street from Walnut Street to Grove Street in Millis was identified as having deficient fire flows under *Present Day* conditions. Per discussions with the Town, it is Kleinfelder's understanding that the Glen Ellen Country Club is to be replaced by a housing development and this water main is to be replaced. Modeling analysis indicates that replacement of this water main with a larger diameter main (12") significantly increased AFF. Kleinfelder recommends that this water main be replaced even if development of the area were to stall or not occur.
- Deficient or potentially deficient AFF values were identified in a number of additional "dead-end" locations within the Millis water distribution system, including Main Street at both the Medway and Medfield town lines, Dover Street, Ridge Street near Curve Street, and Dean Street near the Millis-Norfolk town line. The Town should consider alternatives, to improve AFF to these locations in their master planning efforts. Alternatives may include installation of new water main to provide looping, upsizing existing 6" water mains, and rehabilitating aging mains.
- The proposed booster pumping station will connect to an existing 6" water main in Medway. While the model simulations indicate that this water main can handle the additional flow provided by Millis, higher pressure losses were projected for this location than for other spots within the Medway distribution system. In addition, MassDEP guidance requires new water main intended to deliver fire flow to have a minimum diameter of 8". Based on these factors, it is recommended that the Town of Medway consider replacing the existing main with a larger diameter main in any future water main replacement planning.

4. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

This section presents a summary of conclusions as well as recommendations, which are presented as <u>underlined</u>.

4.1 Supply and Demand:

As discussed in Section 2, in relation to average daily demand, the Town of Millis' supply appears to be adequate to meet the projected near term (2018) ADD which includes foreseeable developments and supply to Exelon. However, the margin of adequacy is narrow. In order to safely and reliably meet projected ADD, the following steps are recommended for Millis:

- <u>Continue to manage demand to maintain residential use and unaccounted for water at or below current standards.</u>
- <u>Institute and fund a comprehensive program of annual well inspection and testing, maintenance (cleaning) and recordkeeping. This recommendation has also been previously noted by others (Master Plan, 2010).</u>
- <u>Closely track water quality at Well #4 and consider implementing iron and manganese controls (e.g. sequestering) or other treatment as needed to maintain reliable use of the source. This recommendation has also been previously noted by others (Master Plan, 2010).</u>

If the anticipated Town development projects are constructed, the Town's current Permit limit of 0.80 MGD for annual average day demand will not be sufficient to meet projected ADD for 2018, with the inclusion of proposed developments and Exelon. Therefore, Millis may need to access the 0.99MGD volume slated for the permit 'Period 2' as part of the 5-year permit review process with MassDEP. An analysis of the future demand using the Water Needs Forecasting methodology indicates that population and therefore demand, will decrease about 8% from 2020 through 2035.

With respect to maximum daily demand, the Town's supply appears to be adequate, based on recent reported maximum well pumping rates reported by the Town. Recent flow test records were not typically available, therefore, <u>confirmation of the reported MDO values through flow testing by a well contractor would increase confidence in this conclusion.</u>

4.2 Infrastructure

As was presented in Section 2.7, the analysis of Millis' Water Distribution System resulted in the following findings:

- The model identified locations within the distributions system that have deficient AFF (less than 500 gpm) under existing conditions. Additional locations were identified as possible locations of fire flow deficiencies (AFF less than 1,000 gpm).
- The model indicates that the addition of the Exelon demand results in minor reductions to AFF system wide under both *Future Day* conditions (2018 and 2035), with average decreases of 5% and 4% and maximum decreases at a single node of 16% and 13% respectively compared against *Present Day* conditions. The Exelon demand does not

reduce any additional locations below an AFF of 500 gpm under either scenario. As such, it was determined that the Exelon demand does not adversely impact overall distribution system conditions and operations.

- The model indicates that AFF system wide is impacted significantly when the Farm Street tank is removed from operation. Conditions were particularly impacted under the 2018 *Future Day with Exelon* scenario, with AFF dropping on average by 56% when compared against *Present Day* conditions.
- The Village Street interconnection was identified as the most favorable location due to the relative strength of the Millis distribution system when compared to the location on Main Street.
- An interconnection at Village Street is feasible. A booster pumping station will be required to deliver the needed Exelon demand from the Millis distribution system to the Medway distribution station.
- The finished water targets in Millis and Medway differ in regard to system pH, chlorination dosing, and corrosion control methodologies. Additional treatment processes or adjustments to existing processes may be required by either town if these targets are to be maintained.

Based on these conclusions, as well as additional information that was gathered in regard to the distributions systems in Millis and Medway, Kleinfelder recommends the following steps to implement an interconnection between Millis and Medway:

- <u>Complete further analysis of the water quality blend that will occur with the mixing of the Millis water into the Medway system so as to determine additional treatment requirements (if any). Analysis may include, but not be limited to a review of water quality data from each town (or sampling and laboratory analysis if data is not readily available), computer modeling of the blended water, jar testing, and determination of supplemental treatment methods if needed.</u>
- <u>Design and construction of a booster station for the interconnection between the two Towns as described in Section 3.</u>
- <u>Establishment of an Inter-Municipal Agreement between Millis and Medway, to include identification of flow and flow rates to be delivered to Medway, water quality targets to be maintained by each town, additional treatment requirements, determination of responsible party for operation and maintenance of the required booster pumping station, etc.</u>
- <u>The model used for this analysis assumes the implementation of the replacement of water main replacement in Orchard Street in Millis, from Walnut Street to Grove Street with a larger diameter water main, as indicated by the Town.</u>

While not critical to the interconnection, the following additional improvements are highly recommended:

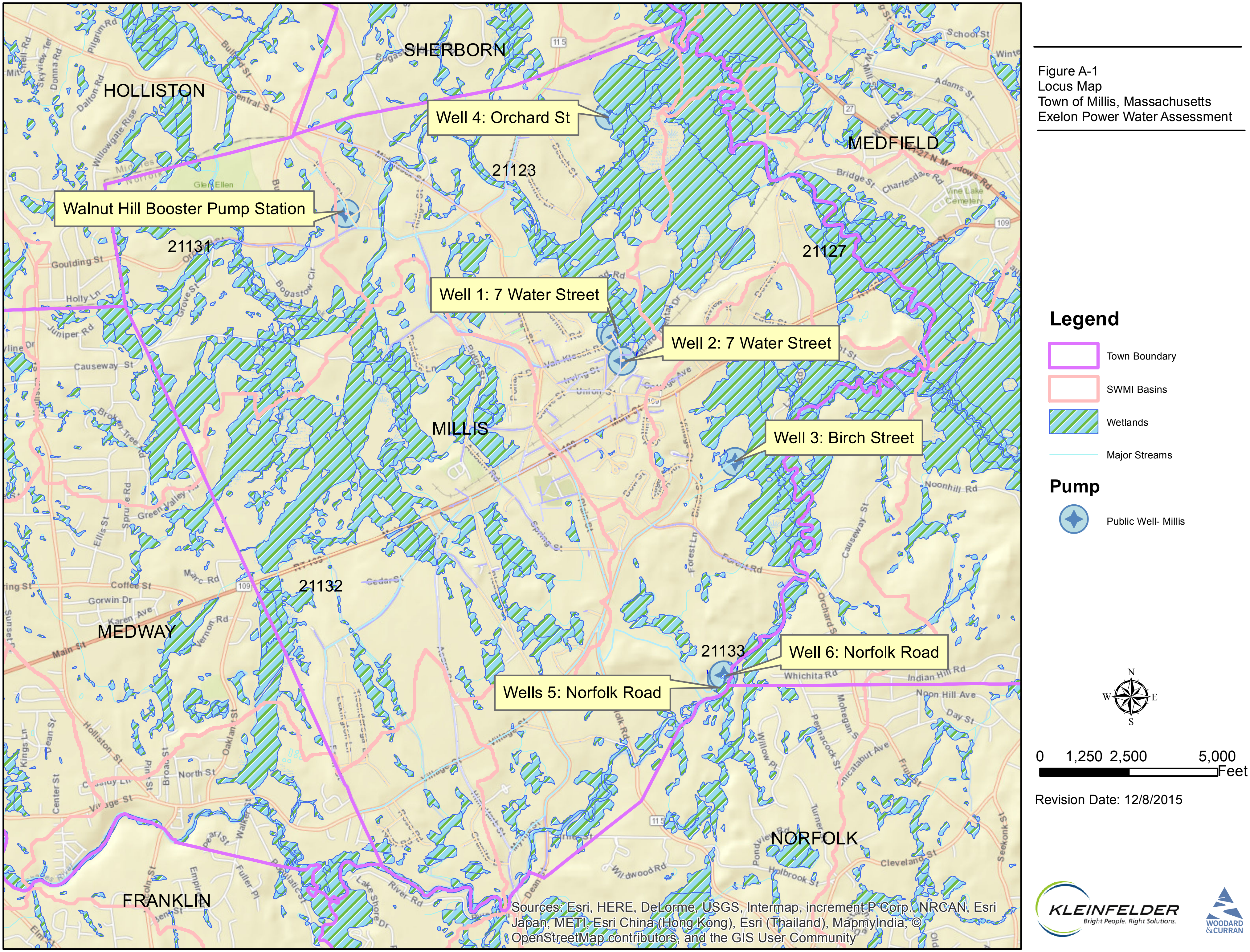
- Replacement of existing 6" diameter water main on Village Street in Medway with a larger diameter water main (8" minimum) from the proposed booster pumping station to Island Road to align with current MassDEP guidance for new water mains.
- Further investigation of locations with deficient or suspected deficient AFF values in Millis to determine the need for system improvements. Projects to improve system pressures and fire flows were recommended in a number of the locations identified in this report in the 2010 Water Master Plan completed by Woodard and Curran as well, including Dover Road and the neighborhood around the Walnut Hill Tank.
- Prioritization of 6" diameter water main replacement projects to larger diameter mains (8" minimum) in both Millis and Medway as part of future water main replacement programs,

to align with current MassDEP guidance for new water mains. Such work was also recommended for the Millis system in the 2010 Water Master Plan by Woodard and Curran and for the Medway system in the 2010 Water Master Plan completed by Weston and Sampson.

APPENDIX A

Figure A-1: Town of Millis Water Supply System

Figure A-1
Locus Map
Town of Millis, Massachusetts
Exelon Power Water Assessment



Revision Date: 12/8/2015

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MINIMIZATION & MITIGATION IMPLEMENTATION ANALYSIS

TOWN OF MILLIS, MASSACHUSETTS

Supplemental Document to:

Draft Water Supply and Demand Assessment
In Relation to Exelon Power "West Medway II" Project, Revision 1: December 15, 2015

JANUARY 2016

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A Report Prepared for:

Mr. Charles Aspinwall
Town Administrator
Town of Millis
900 Main Street
Millis, MA 02054

MINIMIZATION & MITIGATION IMPLEMENTATION ANALYSIS

TOWN OF MILLIS, MASSACHUSETTS

Supplemental Document to:
Draft Water Supply and Demand Assessment
In Relation to Exelon Power "West Medway II" Project Revision 1: December 15, 2015

Kleinfelder Project Number: 20162545.001A

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EXECUTIVE SUMMARY

Background and Purpose

This document has been prepared as a supplement to the *Draft Water Supply & Demand Assessment in Relation to Exelon Power 'West Medway II' Project, Prepared for the Town of Millis* (Kleinfelder, 2015). Kleinfelder conducted an analysis of minimization, mitigation and offset options that may be required of Millis in relation to its public water supply withdrawals in the Charles River basin under the revised Water Management Act (WMA) Regulations. MassDEP will apply the new requirements in accordance with the November 2014 Water Management Act Permit Guidance Document when a water supplier's WMA permit is up for renewal, or when a water supplier requests an increase in withdrawal above an established baseline withdrawal volume.

Millis' groundwater supply wells are located within Charles River subbasins that have been determined to have August net groundwater depletion levels of 25% or greater, which is an indication of negative environmental impacts on streamflow and aquatic habitat according to US Geological Survey studies. Therefore, upon Permit renewal, even if Millis does not request a volume above baseline, under the new WMA regulations Millis will be required to submit a Minimization Plan for reducing environmental impacts of these withdrawals to the greatest extent feasible.

Millis' existing 2010 WMA Permit already includes the setting of a baseline amount. In the Millis 2010 Permit, baseline is defined as the larger of volume withdrawn during 2005, the average between 2003 and 2005, or the registered volume (whichever is highest). Millis' baseline was set at its reported 2005 withdrawal volume, or 0.80 million gallons per day (MGD). The new WMA regulations have revised the definition of baseline to include a 5% 'buffer'. Under the new regulations, Millis' baseline would be set at 0.80 MGD plus 5%, or 0.84 MGD. As described in Millis' existing WMA Permit, Special Condition 10, the first time Millis' water withdrawals exceed baseline for a calendar year, Millis must perform an Offset Feasibility Study which includes a written analysis of the cost effectiveness of following various water management Best Management Practices.

This implementation analysis is intended to address the potential requirements of both the current Permit and the new regulations. It provides a qualitative ranking of options and a planning level cost for the top three minimization options and the top three mitigation options. The analysis is intended to help the Town prioritize implementation of projects that provide the most environmental benefit for the best value if future demands require Millis to withdraw greater than its baseline amount.

WMA Permit Requirements and Millis Projected Demands (Section 2)

Millis' existing WMA Permit approves a total withdrawal volume of 0.80 MGD (292 MGY) for Period 1 (3/1/2010 – 2/28/2014). The WMA permit approves a total withdrawal volume of 0.99 MGD for Period 2 through 4 (2/28/2014 – 2/28/2029). Millis' WMA maximum withdrawal limit, for the final 5 year period (3/1/2024 through 2/28/2029), remains at 0.99 MGD. The Town's permitted withdrawal volume has not increased to 0.99 MGD (Period 2) because it was prepared under an interim methodology and will need to undergo MassDEP review and a permit amendment first, which is anticipated to occur in 2017. There are a number of development projects that may bring additional demand to the Millis water system. As discussed in the Draft *Water Supply and Demand Assessment In Relation to Exelon Power 'West Medway II' Project* (Kleinfelder, 2015), the potential demand of proposed developments and water reserves (which includes the proposed Exelon facility) is estimated to be 0.184 MGD based on information provided by the Town and Exelon.

Minimization and Mitigation Feasibility Study (Section 3)

Kleinfelder utilized background information existing in previously completed studies or otherwise provided by Town staff or other sources to conduct a planning-level analysis. The methodology used was based on the MassDEP Water Management Act Permit Guidance Document dated November 7, 2014. The feasibility evaluation and qualitative ranking of options considered the following factors: Millis' authority to implement the action, feasibility considerations and constraints, estimated volume of offset or water savings, synergy with other regulatory programs, if applicable, and cost to implement. The approach taken in this study was to examine all possible options for potential future credits and possible overlap with other regulatory programs, such as the NPDES MS4 stormwater and TMDL requirements. This analysis could help Millis to plan for future demands that might not be currently known or estimated.

Minimization Options (Section 3.1)

Upon Permit renewal, Millis will be required to submit a Minimization Plan for reducing environmental impacts of its groundwater withdrawals to the greatest extent feasible. Twenty (20) different minimization options from the WMA Guidance Document were evaluated and rated, as summarized in Table 10 of Section 3. The top three minimization options were identified as: Optimization of Existing Resources, Enhanced Non-essential Outdoor Water Restrictions, and Modifying the Survey Method for Leak Detection. Each is described briefly below, and in more detail in Section 3.1.

Optimization of Existing Sources: The minimization approach evaluated would increase summer withdrawals from Wells 1 and 2 while reducing them from Wells 3, 5, and 6, which are in a subbasin with higher groundwater depletion levels. This approach is consistent with the approach recommended by the WMA Guidance Document for desktop optimization analyses.

Enhanced Non-essential Outdoor Water Restrictions: This option would implement new restriction requirements using a calendar based water ban limiting outdoor non-essential watering to 2 days a week (with no watering between 9:00 AM and 5:00 PM).

Modifying the Survey Method for Leak Detection: This option would consist of using existing annual leak detection efforts in a targeted way by prioritizing the system into zones by water main age, material, and break history and focusing efforts in higher priority areas first.

Mitigation Options (Section 3.2)

If Millis exceeds its baseline withdrawal or requests an increase in its baseline, it will be required to develop a plan to mitigate or offset the withdrawal above baseline. The Town of Millis could request an adjustment to the mitigation volume for water efficiency through achieving a higher residential use efficiency and a lower unaccounted for water than stipulated by the WMA Performance Standards. In addition, the Town of Millis could request a potential adjustment for current and future wastewater returns through septic systems. Through these adjustments it is estimated the Town of Millis has the potential to offset a volume of water which is greater than the projected future demand above baseline.

However, if the Town is not able to offset the requested volume above baseline via adjustments, the Town would need to implement mitigation measures. For that reason, Kleinfelder assessed the feasibility of three (3) Direct Mitigation and fourteen (14) Indirect Mitigation options. The top three mitigation options were identified as: Stormwater Recharge Projects, Infiltration/Inflow Removal and the replacement of the Village Street Culvert. Each is described briefly below and in more detail in Section 3.2.

<u>Stormwater Recharge Projects:</u> This Direct Mitigation option would consist of constructing a stormwater infiltration structure on a municipally owned property. A desktop screening analysis using GIS was performed to identify potential areas for both enhancing stormwater recharge and reducing total phosphorus export to waterways. The analysis utilized a scoring and ranking process that quantitatively evaluated sites where Green Infrastructure (GI) could be used to increase stormwater recharge, based on the following criteria: soils, slope, elevation, impervious area, land use type, and impaired water proximity. Parcels within Millis were ranked and Town-owned parcels were evaluated to determine potential suitable locations. This option would have a dual benefit of meeting obligations under both the WMA Permit and the NPDES MS4 stormwater Permit.

<u>Inflow / Infiltration Removal:</u> The Town has completed a number of efforts toward removing and reducing inflow and infiltration of groundwater to its sewer system. Volumes of removal could potentially be recognized as direct mitigation. This option consists of an existing program that the Town is implementing that could be credited towards WMA obligations.

<u>Village Street Culvert Replacement:</u> Culvert replacements, when designed to facilitate wildlife passage or aquatic habitat benefit, are considered Indirect Mitigation efforts. The Town already has plans to replace the Village Street Culvert due to needed repairs. A design that will improve habitat continuity, restore natural hydraulics, or provide a natural streambed in accordance with the Massachusetts Stream Crossing Standards handbook could be eligible for indirect mitigation credits.

1. Introduction & Overview

This document has been prepared as a supplement to the *Draft Water Supply & Demand Assessment in Relation to Exelon Power 'West Medway II' Project, Prepared for the Town of Millis* (Kleinfelder, 2015), Kleinfelder conducted an analysis of minimization, mitigation and offset options that may be required of Millis in relation to its public water supply withdrawals in the Charles River basin under the revised Water Management Act (WMA) Regulations. MassDEP will apply the new requirements in accordance with the November 2014 Water Management Act Permit Guidance Document when a water supplier's WMA permit is up for renewal, or when a water supplier requests an increase in withdrawal above an established baseline withdrawal volume. The Town's existing WMA Permit, Special Condition 10, requires the Town to perform an Offset Feasibility Study if its water withdrawals for a calendar year exceed its Permit established baseline withdrawal of 0.80 MGD. Upon Permit renewal, even if Millis does not request a volume above baseline, under the new WMA regulations Millis will be required to submit a Minimization Plan for reducing environmental impacts of these withdrawals to the greatest extent feasible.

This implementation analysis is intended to meet the offsetting analysis requirements of both the current Permit and the new regulations. It provides a qualitative ranking of options and a planning level cost for the top three minimization options and the top three mitigation options. The analysis is intended to help the Town prioritize implementation of projects that provide the most environmental benefit for the best value if future demands require Millis to withdraw greater than its baseline volume. It should be noted that Kleinfelder's analysis and findings in this report are largely based on a review of available information provided by the Town, Exelon and its representatives, and from other sources as described herein.

1.1 SWMI Framework and WMA Regulations

The SWMI Permitting Framework was developed by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) and its agencies with the objective of helping balance ecological and human water needs through the Water Management Act. The SWMI development process began in 2010 and involved an Advisory Committee, Technical Subcommittee and stakeholders, all of whom were engaged in the development of the Framework. The SWMI Framework document was issued Final, following a public comment period, in November 2012. The Massachusetts Department of Environmental Protection (MassDEP) conducted a Pilot Program with several public water supplier communities to test the Framework under different real world scenarios. MassDEP applied the SWMI Framework to WMA permitting and new WMA Regulations (310 CMR 36.00) were promulgated in the fall of 2014 (see http://www.mass.gov/eea/agencies/massdep/water/watersheds/water-management-act-program.html#4).

1.1.1 Basin Characterization and Categorization

All of the river subbasins in the Commonwealth have been categorized on the basis of the findings of a United States Geological Survey (USGS) study that evaluated streamflow alteration, habitat fragmentation, impervious cover, and water quality in Massachusetts (Weiskel et. al, 2010, SIR2009-5272). The USGS study determined the safe yield for each major river basin, which is the maximum amount of water that may be withdrawn during drought conditions while maintaining sufficient water in streams for environmental protection. The USGS study also established the following parameters for each subbasin:

Biological Category (BC): Five biological categories were established on the basis of relationships between fish abundance and flow, percent impervious cover, and natural basin characteristics. BC-1 would represent the highest quality aquatic habitats, relatively un-impacted by human alteration while BC-5 is the most impacted habitat.

Groundwater Withdrawal Category (GWC): Five categories were established representing the percent alteration of August natural median streamflow due to upstream groundwater withdrawals. GWC-1 is the least impacted (less than 3% of August median flow alteration) while the highest, GWC-5, represents a subbasin with 55% or more alteration of August median flow.

1.1.2 Application of WMA Permit Guidance and Tier Reviews

MassDEP will apply requirements under the November 2014 Water Management Act Permit Guidance Document when a water supplier's WMA permit is up for renewal, or when a water supplier requests an increase in withdrawal above an established baseline withdrawal. Baseline has been defined by MassDEP as the volume of water withdrawn during calendar year 2005 plus 5% or the average volume withdrawn from 2003 through 2005 plus 5%, whichever is higher provided that the baseline is not less than the registered volume or greater than the authorized volume for 2005. Millis' baseline was established during its 2010 Permit renewal and does not include the 5% addition to the 2005 withdrawal. Millis' baseline is discussed further in Section 2.

When volume is requested above baseline, MassDEP will check the request against the existing total basin withdrawals and the overall basin safe yield. Then, the WMA permit will be subject to the following Tier levels and corresponding requirements:

Table 1: Water Management Act Permit Tiers

Tier	Trigger	Requirements
Tier 1	No additional withdrawal request above Baseline- all GWCs	Minimize impacts by achieving the following demand management steps, which apply to all Permits: • 65 RGPCD • 10% unaccounted for water • Institute limitations on nonessential outdoor water use. • Water conservation program for water audits and leak detection, meter repair/replace, water revenue evaluation, public education and outreach
	Additional requirements for groundwater sources in subbasins with an August net groundwater depletion of 25% or more (GWC 4 &5)	Develop and Implement a plan to minimize impacts in 25% or greater August Net Groundwater Depleted subbasins (GWC 4&5

Tier	Trigger	Requirements
Tier 2	Withdrawal request above baseline; which results in no change in subbasin groundwater withdrawal category or biological category	In addition to the Tier 1 requirements, develop a mitigation plan and mitigate impacts commensurate with impact of withdrawal
Tier 3	Withdrawal request above baseline that changes the subbasin groundwater withdrawal category or biological category	In addition to Tier 1 &2 requirements, demonstrate no feasible alternative source that is less environmentally harmful

Note: Further additional requirements apply for sources in subbasins with Coldwater Fish Resources.

Mitigation required under Tiers 2 and 3 can be categorized into three different areas, in decreasing order of preference: demand management, direct mitigation, and indirect mitigation (per the Water Management Act Permit Guidance Document).

Demand Management: These efforts are generally the most cost-effective and environmentally beneficial steps that a water supplier can take and include things like outdoor watering restrictions, public education, retrofitting of plumbing fixtures, etc.

Direct Mitigation: These options represent ways for a credibly estimated volumetric offset to be accounted for. Examples include septic systems or wastewater returns located within the basin, surface water releases, and stormwater recharge.

Indirect Mitigation: These options include actions to improve aquatic habitat through things like dam removal, stream channel restoration or promotion of improved capture, treatment, and infiltration of stormwater through regulatory/administrative controls such as bylaws.

1.2 Town of Millis Background

The Town of Millis is approximately 12.2 square miles in size and is located in Norfolk County; bordered by Sherborn, Holliston, Medway, Norfolk, and Medfield (see Figure 1). The Charles River forms the majority of the Town's southern and eastern borders. All of Millis lies within the Charles River major basin.

1.2.1 Topography, Geology, and Surface Water

Millis' landscape is characterized by generally low and rolling topography with elevations ranging from 243 feet to 113 feet, where the Charles River flows into Sherborn in the northeastern corner of Millis. Agricultural, forested, and wetland areas dominate the landscape of Millis, accounting for approximately 70% of the town's total area. The Great Black Swamp covers a majority of the northwest portion of Millis. Maple Swamp and wetlands along the Charles River and South End Pond cover the majority of the eastern portion of Millis. Much of the wetland area in eastern Millis forms part of the Charles River Valley Natural Storage Area, which is owned and managed by the Army Corps of Engineers for purposes of flood risk management. The Charles River creates the southern and eastern border of Mills and several ponds are located within Millis, including the South End Pond, Bogastow Pond, Richardson's Pond, Walker Pond, and McCarthy Pond. In addition, Bogastow Brook flows through the northern section of Millis and enters wetlands associated with the Charles River near South End Pond. (PCI, 2001)

Figure 1
Locus Map Town of Millis, Massachusetts
1 Inch = 4320 Feet

Data shown on this map is provided for planning and informational purposes only. The municipality and CAI Technologies are not responsible for any use for other purposes or misuse or misrepresentation of this map.

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Figure 2

Town of Millis, Massachusetts
Exelon Power Water Assessment

Legend

Town Boundary

SWMI Basins

Wetlands

Major Streams

Pump

Public Well- Millis

0 1,250 2,500 5,000 Feet

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The landscape has been shaped by the advance and retreat of glaciers during the Pleistocene. The underlying bedrock consists of granite, diorite and granodiorite and the overlying sediments consist of stratified sand and gravel that have been reworked by glacial meltwater streams. In general, soils in Millis are well or moderately drained sands and gravel. The stream valley deposits consist of sands and gravels, with varying amounts of peat and organic swamp deposits.

1.2.2 Land Use and Demographics

Millis' original roots are as an agricultural community in the 17th and 18th centuries, developing into an industrial and manufacturing community fueled by mills, factories, brickyards, and foundries through the mid-twentieth century. With the closing of the mills and factories, Millis has over time maintained some of its rural character and transitioned to a 'bedroom' community where many residents commute for work to other cities and towns. Newer commercial development is focused along Route 109 in commercial plazas. (PCI, 2001). As discussed in Section 2.3.1.4 of the Draft *Water Supply and Demand Assessment In Relation to Exelon Power 'West Medway II' Project* prepared for the Town of Millis (Kleinfelder, 2015) population projections predict a significant decline in Millis' population due to various factors including an aging population and migration trend data.

1.2.3 Water Resources Infrastructure

<u>Wastewater:</u> Over two-thirds of the Town residents are served by the Town sewer system. The system flows to the Charles River Pollution Control District (CRPCD) Waste Water Treatment Plant. The plant discharges treated water to the Charles River at a location near the intersection of Franklin, Medway and Millis, just downstream of Populatic Pond and located at the southwest corner of Millis. The remainder of Town is served by private on-site septic systems.

The Town of Millis is continuously evaluating its sewer system looking for deficiencies and opportunities to address infiltration and inflow (I/I), as a condition of its membership in the CRPCD. Based on information presented in the Phase III – Sewer System Investigations & Repair Summary Status Report (GCG, 2015), the Town of Millis has performed several I/I evaluations and repairs on its overall sewer system between 2008 and 2014 . The Status Report (GCG, 2015) states that through these investigations and repairs, 126,950 gpd of peak I/I have been removed to date and 51,700 gpd of peak I/I are remaining. In addition, the Status Report states that 23,760 gpd of clear flow investigations remain. As funding sources become available, the Town will continue its efforts towards quantifying and removing I/I from its sewer system.

<u>Drinking Water:</u> Millis' drinking water is supplied by six publicly owned and operated wells installed in sand and gravel aquifer deposits. The system consists primarily of a single pressure zone, with the exception of a small boosted pressure system on Walnut Street. The distribution system is served by 42 miles of 2-inch to 12-inch diameter water mains and two (2) active water storage standpipes with a combined usable capacity of 1.44 million gallons. The water system and recommended improvements has been described in detail by the 2010 Water Master Plan (W&C, 2010). According to the Millis Board of Health, there are 222 private wells in the Town.

The Town of Millis operates four Water Treatment Facilities (WTF). Water pumped from Wells 1 and 2 is treated at the George D'Angelis WTF, which utilizes air stripping for volatile organic compounds and chemical injection for disinfection using sodium hypochlorite and fluoridation using sodium fluoride. Water pumped from Well #3 is treated at the Village Street WTF and water pumped from Well 4 is treated at the South End Pond WTF. Both the Village Street WTF and South End Pond WTF use chemical injection for pH control using sodium hydroxide and fluoridation using sodium fluoride, with emergency provisions for disinfection using sodium hypochlorite. Wells 5 and 6 are treated at the Paine WTF, which uses chemical injection for pH control using sodium hydroxide, fluoridation using sodium fluoride, and disinfection using sodium hypochlorite.

The six supply wells are summarized in Table 2:

Table 2: Existing Wells, Town of Millis, Massachusetts

Well #	Location	Normal Daily Output (1) (gpm/ MGD)	Year Installed(2)	Screen Dia.(2) (in)	Depth(2) (ft)	DEP (3) Maximum Daily Rate (MGD)	DEP (3) Maximum Daily Rate (gpm)	Hp	Maximum Daily Output5 (gpm/ MGD)
1	7 Water St.	130 / 0.187	1952	24	60	0.72	500	15	470 / 0.677
2	7 Water St.	74 / 0.107	1961	24	50	0.50	347	10	266 / 0.383
3	Birch St.	210 / 0.302	1972	24	60	0.75	521	40	650 / 0.936
4	Orchard St.	101 / 0.146	1983	24	53	0.86	597	50	585 / 0.842
5	Norfolk Rd.	99 / 0.142	1999	24	57	1.50[4]	1042	40	1,474 / 2.120
6	Norfolk Rd.		1999	24	62			60	
Total Capacity		**614 / 0.884**	**-**	**-**	**-**	**4.33**	**3,007**	**-**	**3,445 / 4.96**
Max Day Demand		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1,154 / 1.66**

Notes:

(1) Normal Daily Output values were calculated from summer 2015 daily pumping records provided by the Town of Millis (J. McKay, November 18, 2015). Summer 2014 was used for Well 4.
(2) Water System Master Plan, Woodard & Curran, June 2010
(3) Water Management Act Withdrawal Permit, Final, March 1, 2010. Permit also specifies an annual withdrawal of 292.00 MGY or a daily average of 0.80 MGD from permitted and registered sources.
(4) Wells 5 and 6 have a maximum wellfield capacity of 1.5 MGD and the operation of the wells is restricted by stream flow in the Charles River.
(5) Maximum Daily Output values were provided by the Town of Millis (J. McKay, December 2, 2015; J. McKay, December 3, 2015)

Millis has a current Water Management Permit maximum withdrawal (registration + permit volume) of 0.80 MGD, which is discussed in further detail in Section 2. In recent years Millis has pumped below this maximum withdrawal volume. Historic water use is discussed in Section 2.

Based on Kleinfelder's Draft *Water Supply & Demand Assessment in Relation to Exelon Power 'West Medway II' Project Prepared for the Town of Millis* (Kleinfelder, 2015), the Town of Millis has adequate supply to meet both near–term (2018) and future (2035) average daily demand and maximum daily demand. Kleinfelder included the additional demand of known development projects, as provided by the Town of Millis and Exelon, in the calculation of the values. However, the near-term (2018) average daily demand exceeds the current WMA permit limit, and the supply adequacy is marginal. Therefore, the Town of Millis is anticipated to need to request an increase in its current WMA permit limit if all known development projects were constructed. The reader is referred to the Kleinfelder 2015 report for further detail regarding the Town's available supply and projected demands.

Stormwater: Millis lies in the Charles River Basin and is subject to the total maximum daily load (TMDL) requirements described in the NPDES Phase II Small MS4 General Permit (MS4). According to the 2014 Draft MA MS4 Permit, Appendix F, the Town is required to decrease phosphorus loading from its stormwater runoff by 27%. This requirement is projected to present a significant capital cost for Millis and the other Upper Charles communities to implement. (HWG & AMEC, 2011). Millis will also be subject to the pathogen reduction requirements described in the 2014 Draft NDPES MS4 Permit to meet the bacteria and pathogen TMDLs for both the Charles River and Bogastow Brook.

2. Water Management Act Regulations and Millis

2.1 Millis' Supply Wells and Existing Water Management Act Permit

The Town has six local groundwater sources permitted under the Water Management Act; the sources and associated subbasins are summarized below in Table 3. Millis' WMA Permit approves a total withdrawal volume (permit + registered volume) of 0.80 MGD (292 MGY) for Period 1 (3/1/2010 – 2/28/2014). The WMA permit approves a total withdrawal volume of 0.99 MGD for Period 2 through 4 (2/28/2014 – 2/28/2029). Millis' WMA maximum withdrawal limit, for the final 5 year period (3/1/2024 through 2/28/2029), remains at 0.99 MGD. The Town's permitted withdrawal volume has not increased to 0.99 MGD (Period 2) because it was prepared under an interim methodology and will need to undergo MassDEP review and a permit amendment first, which is anticipated in 2017.

Table 3: Millis Supply Well & Subbasin Summary

Well #	Location	Subbasin & Subbasin ID #
# 1	7 Water St.	Bogastow Brook, #21123
# 2	7 Water St.	Bogastow Brook, #21123
# 3	Birch St.	Chicken Brook to Stop River, #21133
# 4	Orchard St.	Bogastow Brook, #21123
#5	Norfolk Rd.	Chicken Brook to Stop River, #21133
#6	Norfolk Rd.	Chicken Brook to Stop River, #21133

Millis' existing WMA Permit already includes the setting of a 'Baseline'. In the Millis 2010 Permit, baseline is defined as the larger of volume withdrawn during 2005, the average between 2003 and 2005, or the registered volume (whichever is highest). Millis' baseline was set at its reported 2005 withdrawal volume, or 0.80 MGD (292.56 MGY). The new WMA regulations have since revised the definition of baseline to include a 5% 'buffer'. Under the new regulations, Millis' baseline would be set at 0.80 MGD plus 5%, or 0.84 MGD. As described in the WMA Permit, Special Condition 10, the first time Millis' water withdrawals exceed baseline for a calendar year, Millis must perform an Offset Feasibility Study which includes a written analysis of the cost effectiveness of following various water management Best Management Practices (BMPs). The evaluation in Section 3 is intended to meet this requirement should it be required.

2.2 Summary of Existing Water Use Practices & Trends

In Millis' 2010 Water Master Plan (W&C, 2010), about $7.57 million dollars in system improvements were recommended for the 20 year planning period. In recent years, Millis has undertaken many improvements, including the following:

- Farm Street Tank was cleaned and inspected in 2014.
- Master meter calibrated twice a year.
- Pumps at Well 3 and Well 4 were replaced within the last five years.
- Well 1 was cleaned within the last five years.
- Leak detection surveys are conducted approximately every year and leaks are repaired upon discovery.
- In 2011 a leak was identified in a 6" water main under the Charles and the water main was replaced.
- The Town reviewed all large water meter accounts in 2011 and determined that three laundromats and two car wash businesses had not been incorporated into the Town's billing system after their construction.

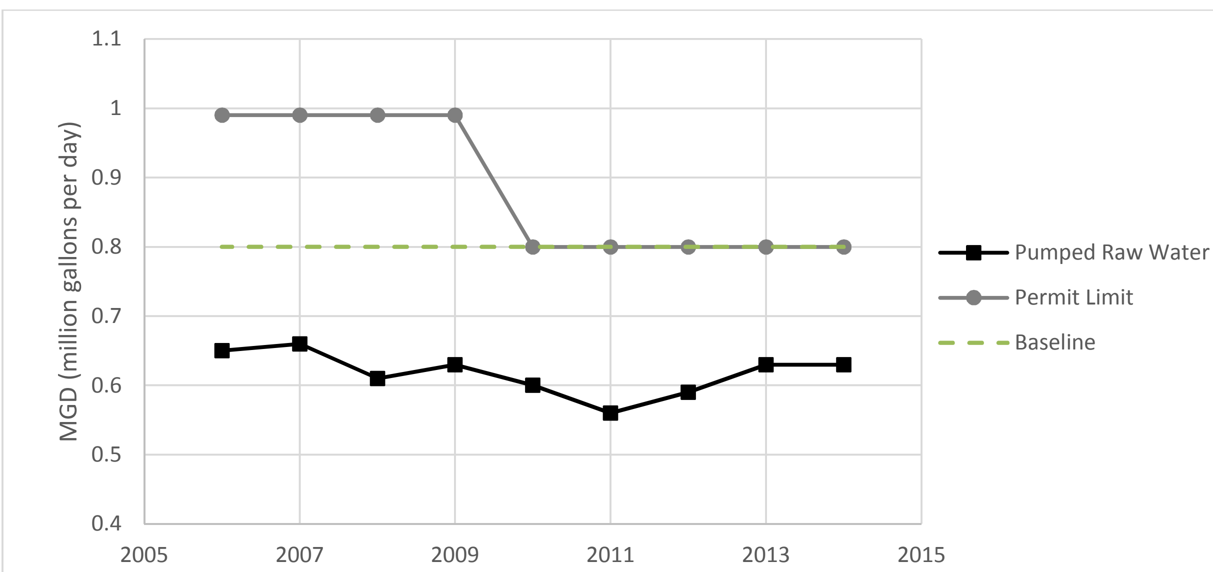
Water use statistics for recent years are summarized below in Table 4 and Figures 3 and 4. As shown in Figure 3 and Table 4, Millis' reported raw water withdrawal has remained relatively stable between 2006 and 2014, with slight fluctuations, between 0.59 MGD and 0.66 MGD. Millis' WMA Permit maximum withdrawal was reduced in 2010, and Millis has consistently been below its maximum limit of 0.80 MGD since 2010. In addition, Millis has historically been below baseline of 0.80 MGD.

Table 4: Millis Water Use Trends

	Raw Water Reported on Annual Statistical Report (MGD) [1]								
Well	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**
Well #1	0.125	0.139	0.146	0.156	0.107	0.112	0.151	0.185	0.132
Well #2	0.074	0.077	0.081	0.084	0.184	0.088	0.102	0.119	0.080
Well #3	0.180	0.173	0.036	0.063	0.152	0.134	0.177	0.210	0.139
Well #4	0.132	0.147	0.149	0.114	0.166	0.009	0.012	0.012	0.081
Well #5	0.152	0.177	0.195	0.176	0.291	0.193	0.197	0.232	0.132
Well #6	0.222	0.218	0.244	0.364	0.206	0.230	0.314	0.000	0.234
TOTAL (MGY)	**229.92**	**229.15**	**216.9**	**205.4**	**217.31**	**228.97**	**223.97**	**239.4**	**235.5**
TOTAL (MGD)	**0.63**	**0.63**	**0.59**	**0.56**	**0.60**	**0.63**	**0.61**	**0.66**	**0.65**
Max. Withdrawal Limit (MGD)	0.8	0.8	0.80	0.80	0.80	0.99	0.99	0.99	0.99
Over Limit (MGD)	Did Not Exceed Withdrawal Limit Between 2006 and 2014								
Over 0.80 Baseline (MGD)	Did Not Exceed Baseline Between 2006 and 2014								
UAW (%)	7.7	9.6	4.6	5.5	15.5	15.5	11.9	17	11.5
RGPCD (gpd)	57	56	56	52	55	53	54.6	58.12	58.5
MDD (MGD)	1.02	1.01	1.02	2.00	1.38	1.43	1.17	1.02	1.05

[1] Information obtained from ASRs between 2006 and 2014

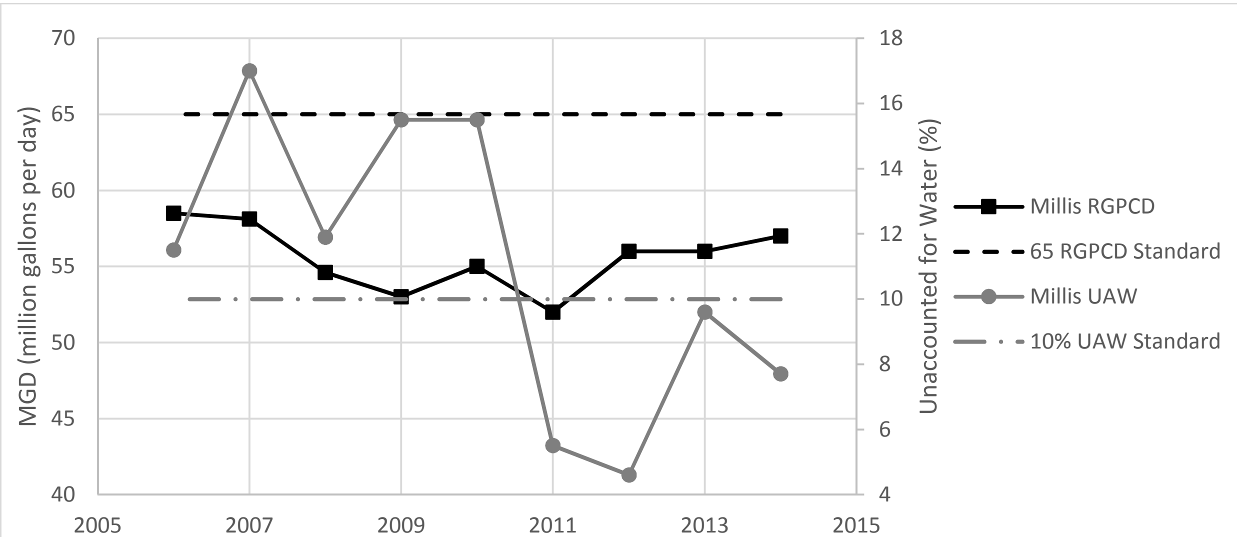
Figure 3: Water Withdrawal in Millis, 2006 - 2014



Millis' maximum authorized withdrawal was established in 2009 by the Department of Conservation and Recreation (DCR) through DCR's Water Needs Forecast methodology. The methodology used Town estimates of future water demands in 2009, the 2008 estimated population (8,208), and the estimated percent served by the water system (which was reported as nearly 100% by Millis) to project service and employment populations through 2029. Millis' maximum withdrawal limit could change following an updated water needs forecast completed by DCR.

As seen below in Figure 4, Millis' reported residential water use has generally remained relatively stable since 2006, with slight fluctuations between 52.0 and 58.5 Residential Gallons Per Capita Per Day Water Use (RGPCD), and has been well below the state standard of 65 RGPCD.

Figure 4: Residential Water Use and Unaccounted-For Water



Conversely, Millis' unaccounted-for water (UAW) exceeded the 10% WMA Permit standard between 2006 and 2010. In 2011, the Town of Millis took several steps to reduce UAW including the repair of a leak in a 6" water main (Pleasant Street bridge water main) under the Charles River and an assessment of the Town's large meter accounts which revealed five businesses not incorporated into the billing system, which was corrected. Since 2010, the UAW has fluctuated below 10% (Figure 4). UAW is a challenging issue for many communities. Measures which may be helpful in maintaining low UAW or reducing UAW are discussed in more detail in Section 3.1.4.1.

As a community, Millis desires to grow its tax base by attracting responsible new development. There are a number of projects that may bring additional demand to the water system (C. Aspinwall, 2015). As discussed in the Draft *Water Supply and Demand Assessment In Relation to Exelon Power 'West Medway II' Project* prepared for the Town of Millis (Kleinfelder, 2015), the potential demand of proposed developments and water reserves (which includes the proposed Exelon facility) is estimated to be 0.184 MGD based on information provided by the Town and Exelon. Therefore, for the purposes of this report and analysis, proposed and potential commercial/residential developments could represent up to 0.184 MGD of additional demand.

Millis has improved its operations with efforts such as meter testing, leak detection, and outdoor water restrictions. Millis' existing and potential additional demand management efforts are described in detail in Section 3.

2.3 Millis Sources and New Water Management Act Requirements

This section summarizes Millis' water supply in relation to the requirements of the current Water Management regulations that were promulgated in November 2014, and in relation to a potential increase in demand due to planned development and a potential sale of water from Millis to the Town of Medway.

As presented above in Table 3, Millis' six supply wells lie in subbasins 21123 and 21133 of the Charles River Basin. Millis' Wells #1 and #2 (located at 7 Water Street) and Well #4 (located on Orchard Street) are located in subbasin 21123. Well #3 (located on Birch Street) and Wells #5 and 6 (located on Norfolk Road) are located in subbasin 21133. The subbasin classifications are summarized below:

Table 5: Subbasin Characteristics (1)

Charles Subbasin & Subbasin ID #	Groundwater Withdrawal Category	Subbasin Biological Category	Millis Sources	August Net Groundwater Depletion	Aug GW withdrawal / unaffected streamflow (%)	Available Withdrawal without changing GWC (MGD)
Bogastow Brook, #21123	4	5	Wells #1, 2, and 4	29.5%	49.9	0.202
Chicken Brook to Stop River, #21133	5	5	Wells # 3, 5, and 6	46.1%	60.3	0

[1] SWMI Interactive Map and WMA Permitting Tool
http://www.mass.gov/eea/agencies/massdep/water/watersheds/sustainable-water-management-initiative-swmi.html

The anticipated requirements of the new WMA Permit process are discussed below. It is indicated in each section, where the requirements are expected to apply to Millis.. Kleinfelder has corresponded with MassDEP regarding these requirements. It should be noted, however, that the details of specific requirements will need to be identified via more in depth consultation with MassDEP.

The Town's sources are located in subbasins that have been categorized as GWC 4 and 5, as shown on Figure 2. Because its sources are located in GWC 4 and 5 subbasins, when the Town's permit is renewed, the Town will be subject to the Tier 1 requirements of minimizing existing impacts to the greatest extent feasible, taking cost into account. **This requirement, as summarized in Table 1, applies regardless of the Town's withdrawal in relation to baseline.** Minimization options are evaluated below in Section 3.1.

As seen in Figure 3, reported water withdrawals have remained relatively stable and historically below baseline. Although current demand may not warrant request for withdrawal above baseline during the upcoming 5-year permit review, potential future development demands (Section 2.2) could push Millis' demand above 0.8 MGD. Adding 0.184 MGD of new demand for proposed developments and water reserves (which includes the proposed Exelon facility) to the 2015 demand is projected to require 0.872 MGD, or 0.072 MGD above the baseline (KLF, 2015).

Withdrawals above baseline would require Millis to meet Tier 2 requirements (Table 1) to mitigate the volume to the maximum extent feasible. A mitigation analysis is presented in Section 3.2.

There are no cold water fisheries identified within the Town of Millis. The nearest cold water fishery resource is Shepard Brook, which is a tributary to the Charles River located in Franklin. Millis will not have to meet additional restrictions relating to cold water fisheries.

3. Millis Minimization and Mitigation Implementation Feasibility Study

A feasibility analysis of the options for minimization and mitigation under the new Water Management Act regulations was conducted for Millis. The analysis used the approach and methodology described in the MassDEP Water Management Act Guidance Document dated November 7, 2014. This study is also intended to meet the requirements outlined in Millis' existing Water Management Act Permit, Special Condition 10 for water withdrawals exceeding baseline. Kleinfelder utilized background information existing in previously completed studies or otherwise provided by Town staff, and assumptions where necessary to conduct a planning-level analysis. The feasibility evaluation and qualitative ranking of options considered the following factors: Millis' authority to implement the action, feasibility considerations and constraints, estimated volume of offset or water savings, synergy with other regulatory programs, if applicable, and cost to implement. The approach taken in this study was to examine all possible options for potential future credits and possible synergy with other regulatory programs, such as the NPDES MS4 and TMDL requirements. This analysis could help Millis to plan for future demands that might not be currently estimated.

As described in Section 1.1.2, Millis will be subject to Tier 1 minimization requirements due to the location of wells within a subbasin with an August net groundwater depletion of 25% or more. Upon renewal of the Town's WMA permit, the Town will be required to develop and implement a plan to minimize impacts as part of the requirements under the WMA permit regulations. The Minimization Plan must be submitted for review and approval by the MassDEP. Therefore, Kleinfelder assessed the feasibility of various minimization options, as discussed in Section 3.1 below.

In addition, Millis could be subject to Tier 2 requirements if Millis requests a withdrawal above its baseline (currently 0.80 MGD). For that reason, following the assessment of minimization options, Kleinfelder assessed the feasibility of various mitigation options, as discussed in Section 3.2 below. When reviewing adjustment and credits, as indicated in the WMA Permit Guidance Document, MassDEP is likely to prioritize mitigation in the following order: demand management, direct mitigation, and indirect mitigation.

3.1 Minimization of Existing Impacts

WMA Permit Guidance minimization options were evaluated for Millis in terms of feasibility of implementation and a planning level cost was developed for the three identified as the most feasible options. The options were qualitatively ranked and are summarized in Section 3.1.5. Each option is discussed in detail below in Section 3.1.1-3.1.6. Minimization options that represent demand management strategies are included in Section 3.2.

3.1.1 Optimization of Existing Resources

All six of Millis' current wells exist in subbasins with a GWC of 4 or 5 (Table 5), which means Millis must submit a plan to minimize existing flow impacts to the greatest extent feasible upon renewal of its WMA Permit. The subbasin 21123 has the potential to be forced into a higher GWC by additional withdrawals. However, this subbasin has approximately 0.202 MGD additional withdrawal capacity without changing from GWC 4 to GWC 5, according to the SWMI Water Management Act Permitting Tool on the MassDEP website. The subbasin 21133 is a GWC 5 with a higher August net groundwater depletion than subbasin 21123 (46.1% versus 29.5%). Additionally, the operation of Wells 5 and 6 in subbasin 21123 is already restricted in summer months by the flow of the Charles River as specified in the Millis WMA Permit. Based on these factors, a minimization approach was evaluated that increased summer withdrawals from subbasin 21123 while reducing them from 21133. This approach is consistent with the approach recommended by the WMA Guidance Document for desktop optimization analyses.

Conceptually, this approach would involve Millis increasing its pumping from Wells 1, 2, and 4 during the typically high demand and lower streamflow summer season since subbasin 21123 has additional capacity and a lower ratio of groundwater withdrawals to August median flow than subbasin 21133. A proposed pumping capacity was established for each well to more fully develop this alternative, as summarized in Table 6. Design capacity for the wells and water treatment facilities, permit limit, and historical and recent pumping records were used to establish the proposed, reasonably achievable pumping rates utilized for this analysis. A detailed discussion of the establishment of normal daily output and maximum daily outputs for the Millis wells was previously presented in the Water Supply and Demand Assessment report (Kleinfelder, 2015).

At the current normal daily output, manganese levels at Well #4 are near the MassDEP Secondary Maximum Contaminant Levels of 0.05 mg/L, therefore a proposed increase in pumping rate at Well #4 is ruled-out. A proposed 68% increased output in Wells # 1 and 2 would maximize withdrawals from subbasin 21123 without altering its GWC, and result in a proposed normal daily output of 0.314 MGD and 0.180 MGD, respectively. The George D'Angelis WTF, which treats the water from Wells # 1 and 2, has a design capacity of 1.00 MGD sufficient to treat both wells pumping at those rates. With increased output from Wells # 1 and 2, there is opportunity to minimize withdrawals from subbasin 21133 by decreasing withdrawals. This optimization pumping scheme evaluated a 45% reduction in pumping rates from Wells 3, 5, and 6, which results in a proposed normal daily output of 0.166 MGD from Well 3 and 0.08 MGD from Wells 5 and 6 combined. There would be no net change in output under this proposed pumping scheme.

Table 6: Proposed Well Pumping Rates

Current			Proposed				Restrictions		
Well	Normal Daily Output		Change in Output		Normal Daily Output		Design Pump Capacity	WMA Max Daily Rate	Basis of Assumption
#	gpm	MGD	%	MGD	gpm	MGD	gpm(1)	gpm	
1	129.9	0.187	68%	0.127	218	0.314	463	500	Ensure additional withdrawals from subbasin 21123 do not exceed 0.202 MGD
2	74.3	0.107	68%	0.073	125	0.180	266	347	
3	209.7	0.302	-45%	-0.136	115	0.166	521	521	GWL 5
4	101.4	0.146	0%	0.000	101	0.146	585	597	Manganese levels near MassDEP Secondary Contaminant Level of 0.05 mg/L
5	98.6	0.142	-45%	-0.064	54	0.08	1042	1042(2)	GWL 5; Operation of wells restricted by streamflow
6									
Sum		0.884		0.000		0.884			

[1] ASR Reported Data

[2] Wells 5 and 6 have a maximum wellfield capacity of 1.50 MGD (1042gpm) and the operation of the wells is restricted by streamflow in the Charles River.

From July through September, Wells # 1 and 2 could theoretically provide a combined 45.44 MG at pumping rates of 218 gpm and 125 gpm, respectively, continuously for 24-hours a day. However, this mode of pumping is undesirable from a well recharge basis and unrealistic from an operational basis, assuming no maintenance shutdowns at all. A more realistic condition assumes an average operating day of 18 hours for each well from July through September. This operational approach would allow the wells to recharge and would also allow for occasional maintenance shutdowns.

At the subbasin level, Millis withdrew 36.29 MG from basin 21123 between July and September 2014 and 31.86 MG from subbasin 21133 during the same time period. While any reduction in withdrawals will be dependent on the magnitude and duration of maximum demand periods as well as operational considerations, we consider it reasonable to assume that the withdrawals from subbasin 21133 could be reduced by approximately 45% by prioritizing 21123 withdrawals during the summer and operating the wells an average of approximately 18 hours a day. That would correspond to a maximum average daily reduction in withdrawals from 21133 of approximately 0.2 MGD from July through September should the proposed pumping rates be implemented.

The proposed operational approach would optimize the withdrawals from the 21123 subbasin to minimize impacts to streamflow in subbasin 21133 during the summer period with some cost differential anticipated due to the increased cost of operating wells 1 and 2 at a higher pumping rate. Renovations to an air stripper associated with the treatment of water from wells 1 and 2 and treatment system upgrades are currently scheduled for late-2016 or 2017. The Town of Millis has full authority to adjust well operations as proposed and has expressed a willingness to minimize impacts through this optimization strategy. Both subbasins are part of the larger Charles River basin, so there will be no net change on the macro basin level. This alternative is considered a viable option to reduce the impact on the GWC5 21133 subbasin during the summer period with moderate costs associated with the renovations and treatment processes. Prior to implementation, this option should be evaluated to ensure no negative impact on the wells and on the water system's flexibility, and to evaluate any infrastructure rehabilitation or repairs that may be needed.

3.1.2 Releases from Surface Water Impoundments

The Town of Millis has three dams that impound surface water. The dams are located at Bogastow Pond, Richardson Pond, and Walkers Pond. South End Pond feeds Bogastow Brook, which leads into the Charles River. The Town is in on-going communication with the owner of the privately held property on which the Bogastow Pond dam is located, with the goal of possibly removing this dam, pending available funding. The dam is currently damaged and allowing significant flow, so could potentially be a candidate for evaluating removal. However, potential unintended consequences should be evaluated carefully. Millis' Well#4 is located on the shore of Bogastow Pond near its inlet. It is likely that the pond's storage provides recharge contributing to Well 4 and may help to buffer the impacts of Well 4 withdrawals on Bogastow Brook. According to Town officials, the other two locations (Richardson and Walker) would probably be poor candidates for dam removal projects.

The minimization alternative examined here calls for the Town of Millis to remove dams, as feasible, to supplement streamflow in the Charles River. Dam removal, while generally welcomed by regulatory agencies and beneficial to streamflow, can be quite costly. The feasibility of dam removal must be evaluated by studying the downstream hydraulic impacts and many other considerations, including sediment characterization and disposal. Feasibility studies and permitting costs are often comparable to the dam demolition costs. The only feasible option is the removal of the Bogastow Pond Dam, which is currently privately owned, so this option is rated as Poor. However, this option could be reconsidered in the future as a minimization option if the Town were to take ownership of the Bogastow Pond Dam.

3.1.3 Enhanced Nonessential Outdoor Water Restrictions

The Town of Millis currently implements calendar-based outdoor water use restrictions that prohibit nonessential outdoor water use between 9am and 5pm during the period between May 1st and September 30th. Under new permit regulations, since the net groundwater depletion in both subbasins in Millis is greater than 25% and household water use is less than 65 RGPCD, Millis will be required to implement additional nonessential outdoor water ban restrictions as follows:

Calendar Option:

- All season (May 1st through September 30th): outdoor water use is allowed a maximum of 2 days per week outside the hours of 9am and 5pm.
- When 7-day low-flow trigger occurs: outdoor water use is allowed a maximum of 1 day per week outside the hours of 9am and 5pm.

Or Streamflow Option:

- When flow is below the Aquatic Base Flow (ABF): outdoor water use is allowed a maximum of 2 days per week outside the hours of 9am and 5pm.
- When 7-day low-flow trigger occurs: outdoor water use is allowed a maximum of 1 day per week outside the hours of 9am and 5pm.

The two options presented above are compared in this minimization alternative.

In accordance with the Town's current WMA Permit, streamflow triggers would take effect if streamflow in the Charles River, as measured at the USGS Survey Gauge 01103280, for three consecutive days falls below the applicable ABF. During the period between May 1 and June 30, the June ABF of 59 cfs applies, and between July 1 and September 30, the August ABF of 20 cfs applies. The streamflow based restriction would remain in-place until streamflow at the gauge meets or exceeds the ABF trigger for seven consecutive days or until a Drought Advisory or higher is declared by the Massachusetts Drought Management Task Force. Both the Calendar and Streamflow Option include the same 7-day low-flow trigger. Therefore, to evaluate the Calendar Option minimization alternative, an analysis was completed to determine how many days the streamflow option would typically restrict use.

Using USGS published streamflow data from 2008 through 2014 at gauge 01103280, Kleinfelder completed an analysis of the potential water savings of a streamflow-based restriction by simulating the implementation of the Streamflow Option based on historic data. Average daily flow statistics from May 1st through September 30th over this 8-year period were examined, and based on historic averages, flow trends were established for dry years (25th percentile), average years (50th percentile), and wet years (75th percentile). Figure 5 compares these flow rates to the appropriate ABF Streamflow Triggers.

For the 75th percentile trend, during the periods between May 1 to June 30 and July 1 to September 30, streamflow remained above the thresholds of 59 cfs and 20 cfs, respectively, which would permit outdoor watering throughout the entire 153 day summer period. At the 50th percentile, streamflow fluctuated on either side of the thresholds throughout the summer, with an estimated 65 days of permitted outdoor watering. For the 25th percentile, streamflow generally remained below each of the thresholds throughout the summer, with the exception of early-mid May when streamflow was at or above ABF. This resulted in approximately 61 permitted days of water. These estimates exclude periods when a 7-day low-flow trigger occurs, which would limit watering to 1-day per week rather than 2-days per week. Should a 7-day low-flow trigger occur during this period, which is likely in drier years, approximately the same number unrestricted days would decrease under either option.

Figure 5: Charles River Summer Streamflow (2008-2014) USGS Gauge 01103280

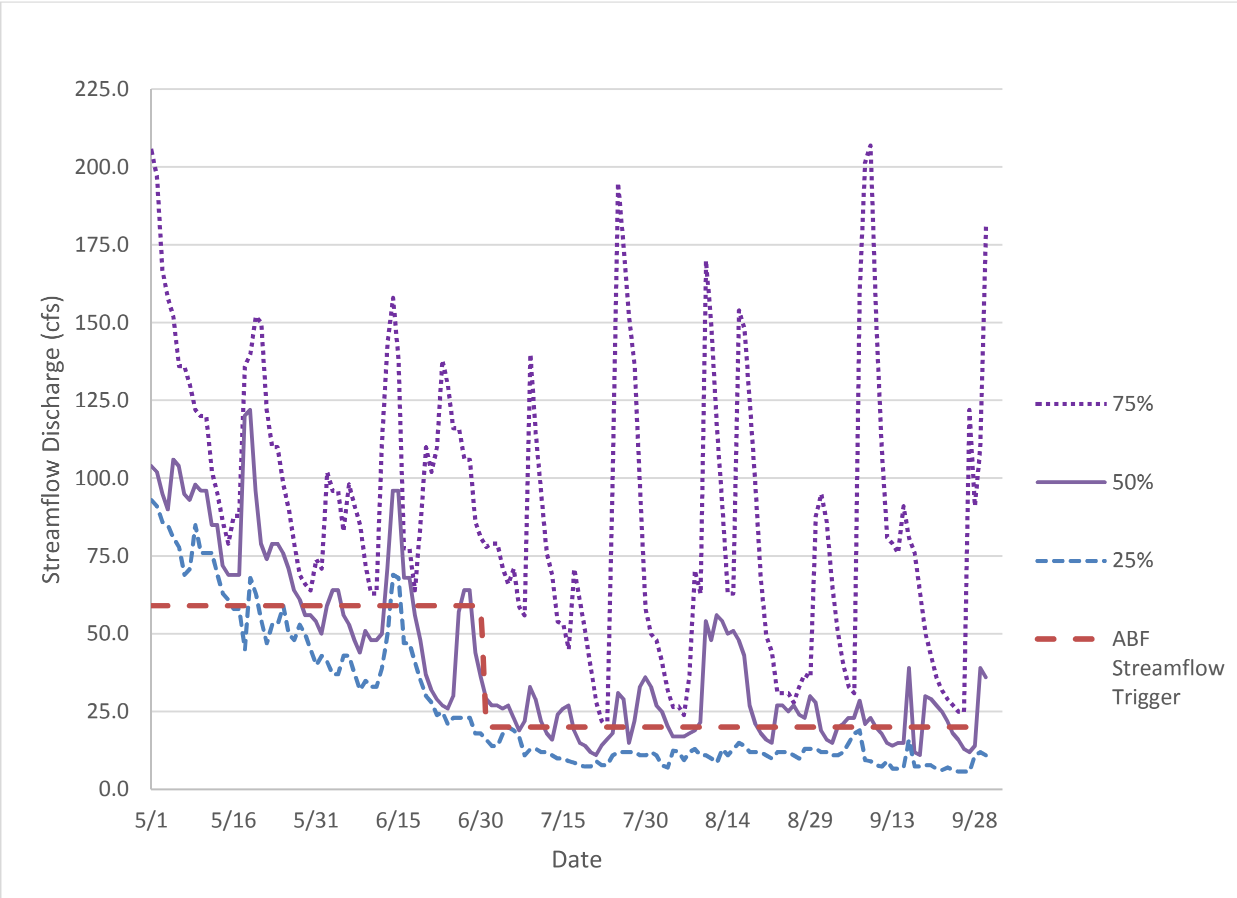


Table 7: Calendar Option Minimization

Percentile	# Unrestricted Days between May 1-Sept 30 using Streamflow Option[1]	# Unrestricted Days between May 1-Sept 30 using Calendar Option[1]
25%	61	44
50%	65	
75%	153	

[1] Should a 7-day low-flow trigger occur during this period, approximately the same number of unrestricted days would decrease under either option.

Based on Table 7, under a streamflow-based water ban option, residents would be allowed to water a total of 21 more days (at the 50th percentile) than if a calendar-based water ban was implemented. Using the calculation for unrestricted weekly water use, as outlined in SWMI Pilot Phase 1 Report, which assumes an average watering flowrate of 5 gpm and an average watering run time of 45 min/day, the approximate water used for outdoor watering at one residence over 21 days is 4,725 gallons. Based on an MAPC estimate from 2014, there are 3,030 households in

Millis. Under the assumption that every household conducted outdoor watering during the additional 21 days, a total of 14.3 MG would be utilized for outdoor watering. Therefore, in Millis' case, based on the evaluation of implementing the Streamflow Option at the 25th, 50th and 75th percentiles, the future Calendar Option would be an effective and feasible low cost minimization measure with a high benefit of reducing withdrawals. The potential minimization of withdrawals by utilizing the Calendar Option is evaluated as Good overall. Accordingly, we consider a calendar-based approach to achieve the greatest reduction in withdrawals of the outdoor water use restrictions.

3.1.3.1 Additional Restrictions to Outdoor Watering

The current seasonal water ban limits outdoor watering to the hours outside of 9am and 5pm; however, under the new WMA permit, regardless of the Minimization Option selected, when a 7-day low-flow is triggered, the Town would be required to enforce a restriction that limits outdoor watering to 1-day per week outside of the 9am-5pm hours. The Board of Selectmen has the authority to further restrict water usage by its customers. For example, during the high demand summer months, the Commissioners can elect to limit outdoor watering to 1-day or 0-days per week. Using the SWMI Pilot Phase 1 Table 4-7, the 1 day/week option represents a water savings of 15,300 gallons/household/year, representing a savings of 0.12 MGD compared to no restriction. A 0-day per week restriction would save an estimated 0.158 MGD compared to no restriction. These options are rated as Poor because although they provide significant savings with little to no monetary cost to the Town, the Town's future outdoor watering restrictions under the new regulations will already be significantly stricter than currently and additional restrictions are likely to be subject to strong public opposition. This option should be considered only if the Town begins to exceed their permitted withdrawal amount during the summer months.

3.1.4 NEWWA BMP Toolbox Options

The New England Water Works Association (NEWWA) Toolbox of Best Management Practices (BMPs) is developed by NEWWA for water suppliers to use as a 'menu' of various BMPs that can be considered for managing a water system. The WMA Permit Guidance document indicates that NEWWA Toolbox Options should be considered for minimization of existing impacts. Evaluation of several minimization Toolbox options is discussed below and summarized on Table 10. In addition, many of the NEWWA Toolbox BMPs are demand management options, which are discussed under Section 3.2, Demand Management.

3.1.4.1 Better Accounting for All Water Use

To reduce the amount of unaccounted water, the NEWWA recommends that Public Water Suppliers identify and quantify each component of real and apparent losses and takes action minimize the impacts when benefits to the water system, society, or environment outweigh the costs. In addition to water audits, the tools discussed in accounting for water losses include: identifying meter inaccuracies and repairing, replacing, or calibrating meters, as necessary; identifying unmetered and unauthorized uses through water audits and leak detection surveys; and considering best practices for data management to mitigate errors associated with data input and billing.

3.1.4.1.1 Meter Inaccuracies

NEWWA recommends that meters should be regularly calibrated to ensure the accuracy of measured quantity of water passing through the system. Accurately calibrated meters improve the ability for a water supplier to account for water losses and identify solutions. The Town of Millis uses a systematic approach to calibrating source water and finished water meters on an annual basis, with master meters calibrated twice per year. As necessary, the Town responds to requests for individual service meter inspection within the billing cycle, and aims to address potential issues expeditiously. As meters age, there is a greater potential for water to be under-registered. Testing meters of a given type (age, model, and size) provides a supplier with a better estimate of quantities of water missed between calibrations due to the tendency for meters to under-register or fail with increasing age. While meter inaccuracies do not directly reduce withdrawals, accounting for the variation in the meter age, model, and size through testing will allow Millis to accurately estimate the quantity of water missed between calibrations and identify meters that require calibration, repair, or replacement. Considering the systematic approach Millis currently uses to ensure accuracy of meters, the limited impact this BMP will have on minimization, and the costs associated with increased testing, this BMP option is evaluated as Poor.

3.1.4.1.2 Unmetered Uses and Unauthorized Uses

To ensure proper accounting for water, all uses should be metered or properly documented, even if a water bill is not issued. Under Town General Bylaws, all connections to the municipal water system require permits and the act of water meter tampering is restricted. The Town annually hires Liston Utility Service to perform a comprehensive survey of all 42 miles of the distribution system. The last survey was conducted in January 2015. In addition, the Town conducts water audits every three years. The Town of Millis is currently following the BMPs to meter all municipal facilities, document water use for activities such as hydrant flushing, and restrict unauthorized use under bylaws, and should continue its current practices. In recent years the Town has identified and remedied several commercial unmetered users. Therefore, the Town could consider increasing the frequency of its water audits in order to identify water losses and adjustments required for metering system. Increasing the frequency of water audits would require additional testing of the water system and additional Town staff time, with likely minimal benefit. Therefore, this option is rated Poor.

3.1.4.1.3 Data Management

Data management errors, either from incorrect data entry when recording meter readings, incorrect software conversion factors, or improper billing, can impact water accounting. As discussed in previous sections, the Town of Millis conducts water audits on a recurring basis. The Town should sustain current practices to ensure billing accuracy. Large meter accounts are reviewed as part of the water audits and through the most recent water audit, five commercial facilities (two car washes and three laundromats) were identified as non-charged accounts. Therefore, the Town could consider reviewing large meter accounts more frequently to ensure that all commercial and business establishments are being billed and accounted for properly. Increasing the frequency of the review of large meter would require a minimal cost associated with additional Town staff time. This option is rated Fair.

3.1.4.2 Reducing Water Withdrawals

Reducing water withdrawals through increased efficiency and reduced demand has the potential to positively impact on streamflow. NEWWA outlines several methods to decrease the amount of water withdrawal including leak detection and repair, water distribution improvement projects, modifications to rates and billing structures, demand management programs for both indoor and outdoor water use, land use, and enforcement of regulations related to water use through plumbing code. These are each discussed below.

3.1.4.2.1 Leak Detection and Repair

The Town of Millis has demonstrated a proactive approach to leak detection and repair. To the best of its ability, the Town repairs any leaks associated with meters and any water main leaks that surface or are discovered in the public right-of-way. Funding is available for the repair of leaks through the Water Department. To detect and locate subsurface or hidden leaks and therefore reduce UAW, the Town annually hires Liston Utility Service to perform a comprehensive survey of all 42 miles of the distribution system. Prior to 2010, Millis' UAW was above 10% but more aggressive efforts have paid off, including the detection and repair of some large leaks. In recent history, surveys identified few leaks (usually no more than 1-3). The most recent survey, in November 2015, detected a service leak of approximately 12 gpm on Himelflarb Street, which was subsequently repaired by the property owner. This resulted in direct and immediate reductions in water loss.

Table 8: 2015 Leak Detection Survey Results

Type	Location	Estimated Leakage (GPM)	Estimated Leakage (GPY)
Service	14 Himelflarb Street	12	6,307,000

The Town intends to continue with current practices and annual surveys, which is more frequent than the 3-year frequency established by the WMA permit, but is consistent with BMPs recommended by NEWWA to minimize impacts of withdrawals. However, alternating survey methods or using system isolation may be a beneficial alternative during annual surveys. Areas of town could be prioritized based on water main age, material, and break history to target smaller but higher risk areas for more comprehensive methods of leak detection. This technique can result in the discovery of a greater number of leaks or larger leaks during each survey. The costs may be dependent on the type of survey method but would likely be a minimal cost differential from the current system-wide surveys. For these reasons, this minimization option is rated as Good.

3.1.4.2.2 Distribution System Improvements

Improvements to the distribution system, including valve replacement and water main replacement of older mains prone to leakage, can minimize water loss. The Town of Millis has a systematic approach to improving the distribution system in implementing the recommendations described in the most recent System Master Plan (Woodard & Curran, 2010). As described in Section 2.2, the Town has taken a proactive approach to implementing the recommended improvements, and in 2015 began or completed projects in each of the three categories described above. As feasible, the Town should prioritize and complete recommended improvements from W&C 2010 Water System Master Plan which minimize impacts to streamflow or decrease withdrawals. Although improvements are dependent on many factors (including funding and public support), prioritizing improvements would yield a moderate environmental benefit with a low administrative cost to determine the improvements which should be prioritized. Prioritization could be refined by using a low cost risk-based approach to minimize probability and consequence of failure. Therefore, this option is rated Fair to Good.

3.1.4.2.3 Rate & Billing Structures

The Town currently bills water accounts on a quarterly basis. Each user is billed a base rate and a value based on usage rates. Base rates vary depending on the size of the metered pipe, with larger pipes, usually located at commercial properties, charged a higher base rate than smaller pipes, usually at residential properties. However, as shown in Table 9, below, usage rates are based on volume of water used, with the first 25,000 gallons of water per billing cycle charged at $2.77 per 1,000 gallons. Quantities of water greater than 25,000 gallons are billed at higher rates. Water bills include a quantitative description of the amount of water used (in gallons) as well as the accounts' past usage, which is consistent with NEWWA recommendations for descriptive billing.

Table 9: Water Usage Rate Structure

Number of Gallons	Tiered Rate ($ per 1,000 gallons)
0-25,000	2.77
25,001-50,000	4.40
>50,000	7.05

NEWWA describes additional options for water rates and billing structures which encourage conservation including: descriptive billing, full cost recovery, increased billing frequency, seasonal surcharges, blocked rate structures for varying types of accounts, and increased rates for irrigation meters. Each of the rate and billing adjustments aim to adjust the consumer valuation of water to account for the real cost of providing water. For example, NEWWA explains that imbedding the costs of infrastructure improvements in a general tax or deferring funding requests until a Town Meeting or until an external funding source is established could lead to lower rates on quarterly bills as opposed to including indirect costs for providing water services in billed rates. The price disparity could account for the need to, at times, postpone essential maintenance and improvements until funding sources are established. In addition, a low water bill may cause consumers to undervalue the cost of water, and potentially use more than is necessary.

Based on NEWWA recommendations, the Town could consider increasing the frequency of billing to monthly and evaluating and potentially adjusting its rate structure on a regular basis to encourage water conservation. The Town indicates that staff manually read meters, which could be a limiting factor to being able to produce bills monthly. The Town indicates that a monthly bill would be cost prohibitive at this time but would consider it in the future if automatic meters are installed. An evaluation of the water savings cannot be determined without further study. Therefore, at this time monthly billing is rated Poor, but could be reconsidered by the Town in the future. However, implementation of water conserving rate structures is moderate to low cost with potentially good benefit and so would be rated Fair.

3.1.4.2.4 Residential Indoor Demand Management

In previous years, the Town of Millis has participated in or coordinated programs to provide households with residential water saving devices. A recent partnership with a local contractor provided low-flow toilets to residents on a first-come-first-served basis. The Town has expressed willingness to continue coordinating or supporting giveaways to reduce residential indoor demand, provided that external funding is available and the community has interest. Millis currently meets WMA Permit standards of 65 RGPD, so a program to reduce residential use is not mandated. However, it may be worthwhile to consider funding opportunities to provide aerators, low flow showerheads, dye tables, and toilet displacement bags to reduce water use. Water savings for these devices are significant, with estimates for low flow showerheads at 2,900 gallons/family/year and aerators at 700 gallons/family/year. The costs associated with such a program would vary depending on the size of the program and without a currently identified source of funding, this option is rated Fair to Poor.

3.1.4.2.5 Outdoor Demand Management

The Town of Millis has a Water Use Restriction Bylaw, which provides the Board of Selectmen with the authority to declare a State of Water Conservation. In addition, the Town has taken measures to reduce outdoor demand. For instance, irrigation controls and rain and moisture sensors are integrated into the sprinkler systems located on Town-operated playing fields. In previous years, the Town of Millis participated in regional initiatives to provide households with rain barrels. The Town has expressed willingness to continue coordinating or supporting outdoor water saving device giveaways to reduce outdoor demand, provided that external funding is available and there is interest within the community. For such giveaways, there may be opportunities to collaborate with local organizations to increase awareness throughout the community and decrease administrative burden on Town staff. Once a specific program is proposed or developed, the water savings and costs, which are anticipated to be low to moderate depending on the type of program and amount of participation, can be determined. Therefore this option is rated Fair.

3.1.4.2.6 Irrigation Alternatives

NEWWA BMPs include implementation of stormwater or greywater capture and reuse, conversion of wet ponds for irrigation, and reclaimed water stored in ponds. No existing bylaw or practices exist to ensure that planned irrigation systems or systems currently in place reflect the best available technology and no programs are in place to provide incentives to improve efficiency of irrigation systems. However, the Town Hall Rain Garden Project, which includes a cistern to collect and store stormwater for irrigation, was completed in 2008 through a state-funded grant. Results from this demonstration project were broadcast on local television throughout November 2008. The Town could implement a similar rain garden project at other municipal buildings, at a relatively low cost by utilizing volunteers or grant funding. Since the water savings offset by the utilization of collected stormwater for irrigation is likely to be low, this option is rated Fair.

3.1.4.2.7 Non-residential Indoor Demand Management

The Town's current WMA permit states all municipally owned public buildings must be retrofitted with water-savings devices by January 1, 2014. The Town has taken steps to retrofit municipal buildings, as funding is available. To date, the Library, Police Station, Town Hall, and DPW have all been retrofitted with some or all of the required water-saving devices. Other municipal buildings, including Millis Public Schools, pose a significant financial obstacle for retrofitting projects due to their size, and therefore improvements are necessary. Once an inventory of required upgrades is developed, the water savings and cost can be determined. The Town Water Department should inform the School Department of the obligation and ask that funding be included in the school budget. Since retrofitting is required as a stipulation of Millis' WMA Permit, this option is rated Good.

3.1.4.2.8 Land Use Pattern Changes

This option looks at modifying development bylaws to promote and/or require conservation development, smart growth, and low impact development strategies. Such requirements can lead over time to increased infiltration of stormwater, promoting aquifer recharge, and reduced demand for outdoor water use. While effective, changes are incremental over time as they apply only to new or redevelopment projects.

The Town already has Planning rules and regulations that require all projects meet the Massachusetts Stormwater Standards. In addition, the current Town bylaws establishes smart growth criteria for mixed-use developments in Village Business District Zoning and list low impact development practices as an option for obtaining a permit to increase residential density within a development. At a low administrative cost, the Town could review the current regulations in place and potentially revise them to include more strict guidelines for low impact development and smart growth. The implementations of revised or new regulations would require a vote of approval by the public, however. As described in the 2009 MS4 General Permit Annual Report, the Town developed and presented at a Town meeting a stormwater bylaw to promote low impact development techniques and received significant opposition to the bylaw. As such, this option is rated Fair.

3.1.4.2.9 Rigorous Enforcement/Additional Plumbing Code Changes

The Town of Millis employs a Plumbing Inspector who is responsible for ensuring properties are in compliance with building codes established at the state level. Savings would be on a property by property basis and are estimated to be low for the administration effort required and this option is rated as Poor.

3.1.4.2.10. Private Well Bylaw

There is no existing private well bylaw, however, the Town has expressed interest in developing partnerships with private well users to optimize the timing of and the quantity of withdrawals. When the Town of Millis issues a water ban notice, the notice stipulates that all residences and businesses must adhere to the ban. However, the Town's bylaws stated that a State of Water Supply Conservation only applies to users of the town's public water system. The Town could consider revising the language of the bylaw to include private well users. This low cost option could produce moderate benefits (the ban would extend to the 222 private well users) due to minimized subbasin impacts and increased water savings. The revised water use ban would need to be approved at Town meeting and could face some public opposition. Therefore this option is rated Fair.

3.1.4.2.11 Mandatory Restrictions

Refer to discussion above in Section 3.1.3.

3.1.5 Summary of Feasibility, Benefit, Cost and Overall Rating: Minimization Options

Table 10 summarizes the minimization options evaluated for Millis in terms of feasibility of implementation, benefit (environmental and/or water savings) of implementation, cost to implement, and overall rating. A planning level cost was conducted for the following three minimization options: Optimization of Existing Resources, Enhanced Non-essential Outdoor Water Restrictions, and Modifying the Survey Method for Leak Detection and Repair, as these were determined to be the top three minimization options for implementation.

Table 10: Summary and Rating of Minimization Options

Item	Current Practice	Minimization Option	Feasibility Good (G) Fair (F) Poor (P)	Benefit High (H) Moderate (M) Low (L)	Cost High (H) Moderate (M) Low (L)	Overall Rating Good (G) Fair (F) Poor (P)
***Optimize Existing Resources**	N/A	Increase withdrawals from subbasin #21123 (Wells #1 and 2) and decrease withdrawals from subbasin #21133 (Wells #3, 5, and 6) during summer season (July - Sept.)	G	H	M	G
Releases from Surface Water Impoundments	N/A	Dam Removal Projects at Bogastow Pond, Richardson Pond, and/or Walkers Pond	P	L	M/H	P
***Enhanced Nonessential Outdoor Water Restrictions**	Calendar-based water ban; 7day no 9am-5pm watering	Implement calendar-based water ban; 2day no 9am-5pm watering instead of streamflow triggered water ban	F	H	L	G
		1 day/week ban; 0 day/ week ban	P	H	L	P
NEWWA BMP Toolbox Options						
Meter Inaccuracies	Source and finished water meters calibrated annually. Master meters calibrated twice per year	Test meters of a given type (age, model, and size)	F	L	L	P

Item	Current Practice	Minimization Option	Feasibility Good (G) Fair (F) Poor (P)	Benefit High (H) Moderate (M) Low (L)	Cost High (H) Moderate (M) Low (L)	Overall Rating Good (G) Fair (F) Poor (P)
Unmetered Users and Unauthorized Uses	Water audits conducted every three years and leak detection surveys conducted annually. Under General Bylaws, all connections to the municipal water system require permits and the act of water meter tampering is restricted.	Continue current practices	G	L	L	F
		Increase water audit frequency	F	L	M	P
Data Management	Water audits conducted every three years	More frequent review of large meter account	F	L	L	F
***Leak Detection and Repair**	Repair leaks on an as-needed basis. Annual leak detection surveys of entire distribution system (42 miles)	Continue current practice	G	M	L	F
		*Modify survey method – prioritize certain areas	G	M/H	L	G
Distribution System Improvements	Implement improvements recommended in the 2010 System Master Plan	Prioritized improvements which minimize impacts to streamflow or decrease withdrawals	F	M	L	F/G
Rate & Billing Structures	Quarterly descriptive billing	Monthly Billing	F	L	L	P
	Billing structure includes two components: base rate (based on metered pipe size) and usage rate (based on volume of water used).	Water Conservation Rate Structure - evaluate and potentially adjust rate structure on a regular basis to encourage water conservation	F	M	M/L	F
Residential Indoor Demand Management	No current programs in place.	Implement a program to reduce residential use	G	M	M/H	F/P
Outdoor Demand Management	Water Use Restriction Bylaw. Irrigation controls on Town-operated playing fields.	Collaborate with local organizations to coordinate or support outdoor water saving device giveaways to reduce outdoor demand	F	L	M/L	F
Irrigation Alternatives	Cistern at Town Hall. No current projects	Implement Rain Garden Project at other municipal buildings	F	L	L	F
Non-residential Indoor Demand Management	The Town has taken steps to retrofit municipal buildings, as funding is available	Inventory required upgrades and retrofit municipal buildings as identified in WMA permit	G	M	M/H	G

Item	Current Practice	Minimization Option	Feasibility Good (G) Fair (F) Poor (P)	Benefit High (H) Moderate (M) Low (L)	Cost High (H) Moderate (M) Low (L)	Overall Rating Good (G) Fair (F) Poor (P)
Land Use Pattern Changes	Town regulations include MA Stormwater Standards, smart growth criteria, and low impact development practices.	Revise regulations to include more strict low impact development and smart growth criteria	F	M	L	F
Rigorous Enforcement/ Additional Plumbing Code Changes	Plumbing Inspector is responsible for ensuring properties comply with building codes. No regulatory changes are currently planned	Rigorous Enforcement or Additional Plumbing Code Regulations	P	L	L	P
Private Well Bylaw	No existing Private Well Bylaw	Extend seasonal limits on nonessential outdoor water use to private well users	G	M	L	F

Notes:
Feasibility and Overall Rating were analyzed as Good, Fair, or Poor (G, F, P)
Benefit and Cost were analyzed as High, Moderate, and Low (H, M, L)
*Top Rated Options

Cost of Optimization of Existing Resources:
As discussed in Section 3.1.1, increasing withdrawals from wells 1 and 2 during the high demand and lower streamflow summer season, while reducing withdrawals from wells 3, 5, and 6 will minimize streamflow impacts to subbasin 21133. There are moderate marginal costs associated with increased pumping rates due to the cost to operate and maintain an air stripping system. Based on a review of available literature, unit costs for air stripping treatment ranges from $0.36 to $0.70 per 1,000 gallons of treated water, depending on pumping rate, technology used, initial concentration of contaminants, and final concentration of contaminants in water (Keller et al., 2006 & Stocking et al., 2006). These estimates accounted for the entire life of the treatment system, including startup costs, rather than marginal increases in flow rate, so the marginal unit cost for additional treatment in the Millis system would likely be below this range or on the lower end of this range. Assuming an additional 0.202 MGD withdrawn from wells 1 & 2 between July 1 and September 30 (92 days) and a marginal cost of $0.36 per 1,000 gallons, there would be an estimated marginal cost of $6,690 per year.

Cost of Enhanced Non-Essential Outdoor Water Restrictions:
As discussed in Section 3.1.3, if the Town were to implement a calendar-based water ban instead of a streamflow-based water ban, the Town would reduce the number of days the Town could water outdoors by 21 days (during an average year). If it is assumed that an average household conducts outdoor watering for 45 min/day at an average flow rate of 5 gpm, then the 3030 households in Millis would save an approximate 14.3 MG during those 21 days. If the Town chose to implement the streamflow-based water ban, the Town would have to monitor the USGS local stream gauge 01103280 daily, to determine when the ban should be implemented and when the

ban could be lifted. The Town would then need to notify residents each time a change to the water ban was enacted. Therefore, the streamflow-based water ban is likely to require additional Town staff time than would a calendar-based water ban. Potential resistance from the public and/or business community should be considered prior to implementation and the Town may want to consider conducting some proactive educational outreach activities to explain the environmental benefit of the additional restrictions. Since the Town is required to notify residents of the water ban under the WMA Permit, no matter which option is chosen, no additional cost is expected if the Town were to implement a calendar-based water ban.

Cost of Modifying the Survey Method for Leak Detection and Repair:
As discussed in Section 3.1.4.2.1, the Town of Millis conducts annual leak detection surveys and repairs identified problem areas as needed. However, the Town of Millis' water distribution system totals 42 miles and in recent history, surveys identified few leaks (usually no more than 1-3). Therefore, alternating survey methods or using system isolation may be a beneficial alternative during annual surveys. This technique could be targeted towards areas where leaks commonly occur or where infrastructure issues are known, which may results in the discovery of a greater number of leaks during each survey. As shown in Table 8, the leak detection survey conducted in 2015 identified a 12 gpm (0.01728 MGD) leak on Himelflarb Street. Based on information provided by the Town, the leak detection survey conducted in 2015 cost $6,090.However, the cost to implement an alternative survey program, which focuses on certain portions of the water system each time, could vary depending of the type of survey conducted and the number of surveys conducted each year. It is assumed that the alternate survey could be conducted under current funding levels but may detect a larger number of leaks by focusing efforts in higher risk areas. The added cost for an evaluation to prioritize the system for targeted leak detection would be on the order of $3,000 to $4,000.

3.2 Mitigation Options

As described in Section 2.3, Millis will be subject to Tier 1 minimization requirements due to the location of wells within GWC 4 and 5 subbasins. In addition, Millis would be subject to Tier 2 requirements if Millis requests withdrawal above its baseline and would be required to implement mitigation measures. As discussed in Section 2.3, potential future development demands within the Town could edge Millis' demand above their baseline of 0.8 MGD. The additional projected demand of 0.184 MGD for proposed developments and water reserves (which includes the proposed Exelon facility) to the current (2015) demand would require a total demand of 0.872 MGD, or 0.072 MGD above the baseline.

Therefore, based on available information, Millis' likely foreseeable 'ask' or volume request above baseline, is not expected to exceed 0.202 MGD, which is the additional capacity of subbasin 21123 without changing the GWC or BC classifications (as discussed in Section 2.4.

Mitigation measures are volumetrically quantified and the total mitigated volume must be equal to the requested increase. Mitigation for withdrawals above baseline can be provided in three categories, in order of decreasing preference as stipulated in the WMA Permit Guidance Document: Additional Demand Management & Wastewater Adjustments, Direct Mitigation, and

Indirect Mitigation. Each of these methods and associated options are discussed in Sections 3.2.1 through 3.2.4.

3.2.1 Additional Demand Management

Under WMA Permit regulations, each permittee is required to meet the following performance standards: a RGPCD of 65 gallons or less and a UAW value of 10% of total water withdrawals or lower. Per the WMA Permit Guidance Document the potential to reduce demand by achieving or exceeding these performance standards over the length of the WMA Permit can be evaluated as a method of offsetting a withdrawal volume over baseline.

3.2.1.1 Residential Use Efficiency

The Town of Millis achieved an average of 55 RGPCD over the past 5 years, with the highest RGPCD in the past five years in 2014 (57 RGPCD), which is summarized in Table 4 above.

The Town has met their WMA permit requirement of 65 RGPCD or lower over the past five years. Millis saved approximately 0.067 MGD by achieving 57 RGPCD in 2014 as compared to the permit limit of 65 RGPCD. However, the Town should strive to maintain a yearly rate of 55 RGPCD or below in the future. Each year the Town would save 0.084 MGD by maintaining a rate of 55 RGPCD when compared to the permit limit of 65 RGPCD. Implementing additional conservation measures can help them meet this goal. Since the Town of Millis' RGPCD was slightly above 55 RGPCD over the last three years and the Town achieved a RGPCD of 55 or below in 2010 and 2011, the option to maintain a RGPCD of 55 is considered Fair.

If the target water efficiency were reduced to 50 RGPCD, the Town would have a total savings of 7 RGPCD (between the target and the 2014 RGPCD). In 2014, according to the Town's Annual Statistical Report there was a residential service population of 8,390. Based on this information, a total volume of 0.059 MGD would be saved beyond the water savings the Town is already achieving by maintaining a RGPCD below 65. This option should be considered only if the Town exceeds their permitted withdrawal amount in the future. In general, the option to increase residential use efficiency below 55 RGPCD is rated as Poor because the residents already implement measures to keep their RGPCD low and additional reductions may not be feasible.

3.2.1.2 Unaccounted for Water

The Town of Millis obtained an average UAW of 8.58% over the past five years, which is summarized in Table 4 above. The Town of Millis currently meets their WMA permit requirement of less than 10% UAW and has for the past four years. Millis saved approximately 0.015 MGD by achieving 7.7% UAW in 2014 as compared to the permit limit of 10% UAW. If the Town were to reduce their UAW by 1% to 6.7%, the additional water savings would be 0.006 MGD, beyond the water savings the Town is already achieving by maintaining a UAW below 10%. Although maintaining a lower UAW could be difficult, modifications as discussed in Section 3.1.4.1 could be considered in ordered to reduce UAW. The cost to implement additional measures to reduce UAW would be moderate; however, reducing Millis' UAW could have a high environmental benefit. Therefore, this option is rated Fair.

3.2.2 Wastewater Returns

Per the WMA Permit Guidance Document if a portion of the water withdrawn is returned to groundwater via septic systems, an 85% credit can be assessed for volume returned to the same major basin. The credit for wastewater returns via septic systems can be subtracted from the total volume that must be mitigated.

Based on available information, some parcels within the Town of Millis are not connected to the municipal sewer system and do have septic systems. However, at the time of this draft, Kleinfelder had not received requested information regarding location or sewer system connections or septic systems. If the Town needed to receive credit for current and future wastewater returns an analysis could be conducted to determine potential credit the Town could receive for wastewater returns.

3.2.3 Estimated Water Savings Through Additional Demand Management & Wastewater Returns

Millis saved approximately 0.067 MGD by achieving 57 RGPCD in 2014 as compared to the permit limit of 65 RGPCD and approximately 0.015 MGD by achieving 7.7% UAW in 2014 as compared to the permit limit of 10% UAW. This is a total estimated water savings of 0.082 MGD in 2014. By maintaining current practices and implementing a minimization plan as described in Section 3.1, it is anticipated that the Town of Millis will maintain the performance standards achieved in 2014 in the future. As summarized in Table 11, if the Town of Millis were to reduce its RGPCD to 55 and its UAW to 6.7%, then the Town would save an estimated 0.105 MGD each year as compared to the permit limits.

Table 11: Estimated Water Savings of Additional Demand Management & Wastewater Returns

Item	Current Practice	Mitigation Option and Potential Adjustment
Residential Use Efficiency	Meet a RGPCD of less than 65, per WMA permit	WMA Guidance Document recognizes water efficiency through reduction in RGPCD as a potential adjustment. The Town should strive to maintain a yearly rate of 55 RGPCD or below in the future. Each year the Town would save 0.084 MGD by maintaining a rate of 55 RGPCD when compared to the permit limit of 65 RGPCD.
Unaccounted for Water	Meet a UAW of less than 10%, per WMA permit	WMA Guidance Document recognizes water efficiency through reduction in UAW as a potential adjustment. If the Town were to reduce UAW by 1% from 2014 UAW value (6.7%), the additional water savings would be 0.021 MGD, as compared to the permit limit of 10%.
Wastewater Returns	N/A	WMA Guidance Document recognizes septic system returns as a wastewater adjustment. Based on available information a determination regarding feasibility of receiving credit for existing or future septic returns could not be determined.

In addition, as discussed in Section 3.2.2, the Town of Millis may be eligible to obtain an adjustment for the volume of water currently returned to groundwater within the Charles River basin through septic systems. However, Kleinfelder was not able to conduct an analysis for current and future wastewater returns to determine if the Town could potentially receive a credit for wastewater returns based on the information available. This could be determined in the future from sewer GIS and a database of the number of septic systems.

Through additional demand management and wastewater adjustments the Town of Millis has the potential to save an estimated volume of water which is greater than the projected future demand above baseline of 0.072 MGD. Kleinfelder also assessed the feasibility of implementing additional mitigation (direct and indirect) measures, should they be needed to meet future additional demand mitigation.

3.2.4 Direct Mitigation

Direct mitigation options are considered volumetric offsets that can be credibly quantified and have direct impact on streamflow by replenishing groundwater recharge, increasing streamflow or releasing surface water. Three primary areas being considered for credit are: surface water releases, stormwater recharge, and infiltration and inflow (I/I) removal. The options are discussed below and summarized on Table 12.

3.2.4.1 Surface Water Releases

Surface water releases were discussed above in Section 3.1.2, and are not considered a viable option for Millis.

3.2.4.2 Stormwater Recharge

There are opportunities to modify existing site specific stormwater management practices by redirecting stormwater from the piped drainage system to localized infiltration to recharge aquifers. The Town of Millis has already implemented a demonstration rain garden project at the Town Hall; however, there are other potential projects available to improve stormwater recharge. On the whole, stormwater recharge mitigation may be achieved by redeveloping or disconnecting impervious surfaces currently draining directly to the Town's stormwater collection system.

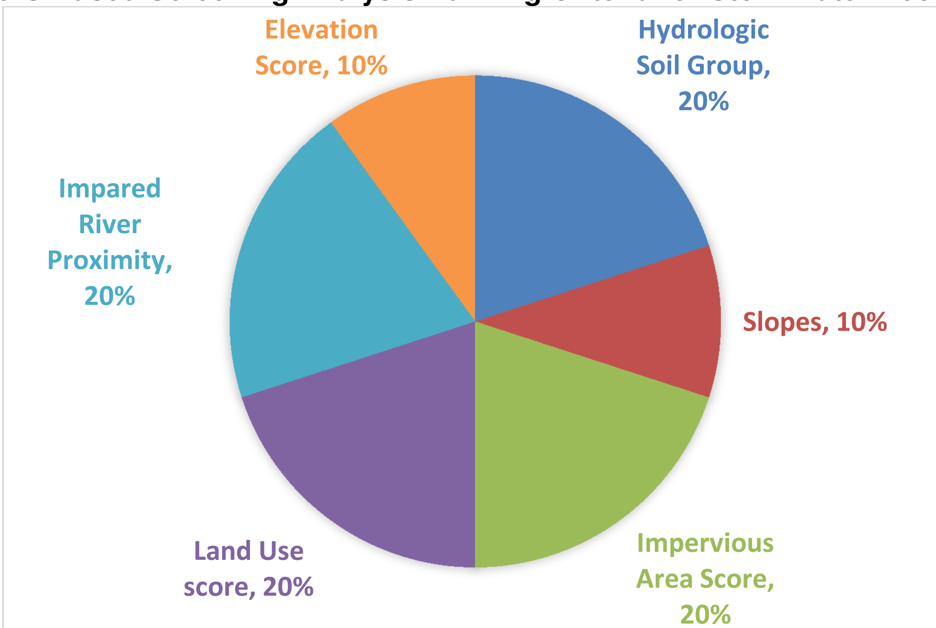
Kleinfelder conducted a GIS-based desktop screening analysis in order to identify potential areas for both enhancing storm water recharge and reducing total phosphorus export, on the parcel level, for the Town of Millis. The analysis utilized a scoring and ranking process that quantitatively evaluated sites where Green Infrastructure (GI) to increase stormwater recharge is most appropriate, based on multiple criteria. For each parcel in the town, the following metrics were evaluated and used to assign ranking criteria:

- Hydrologic soil group
- Slope
- Elevation
- Impervious area
- Land use type
- Impaired river proximity

To increase recharge in subbasins from which the Town pumps public water, only town-owned parcels within the subbasins 21123 and 21133 were evaluated. Additional parcels excluded from the rankings include those classified to include preexisting wetlands, rare wildlife habitats, AUL/Chapter 21e Sites which have documented contamination of soil and / or groundwater.

Both graphical and tabular data identifying potential sites for stormwater recharge and GI is included below. As discussed further in section 3.2.4.3, *a*s projects are evaluated, a site specific investigation to quantify the stormwater recharge capacity for direct mitigation offset and site specific costs should be given further investigation.

Figure 6: GIS Based Screening Analysis Ranking Criteria for Stormwater Recharge Sites



Hydrologic Soil Group (20%): Using soil data retrieved from the USDA web soil survey, a dominant hydrologic soil type was assigned to each land parcel in the study area. Soils with high infiltration rates and low runoff potential are ranked highly (type A, B) and soils with high runoff potential and low infiltration rates are ranked poorly.

Slope / Elevation (10%): Flat slopes and areas of depression were ranked higher than steep areas for their ability to allow stormwater to collect and infiltrate into the underlying soil rather than flowing downhill. Using this metric, the lowest regions in the town are assigned the highest score, and the highest regions the lowest score. Parcels are also ranked by slope category, with the lowest score being assigned to slopes >17% and the highest to areas with slopes between 0-1%

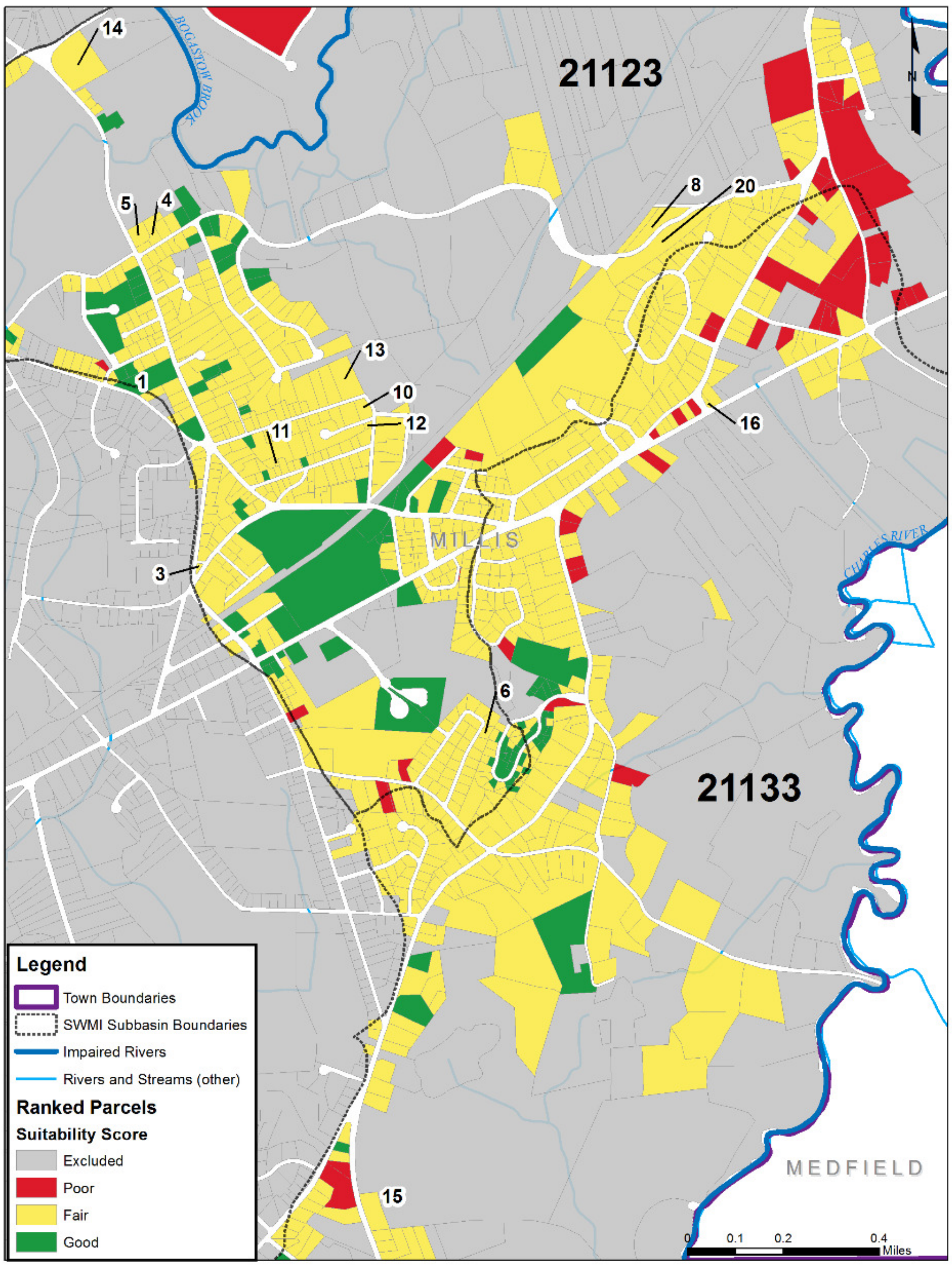
Impervious Area (20%): Parcels with a high percentage of impervious area were targeted using this metric. To calculate the impervious area percentage, the MassGIS Impervious surface raster layer was downloaded and analyzed on a per-parcel level. The impervious area percentage is calculated by dividing the impervious portion of each parcel by the total land area of each parcel.

Land Use Type (20%): Land use data was acquired from MassGIS and reclassified to fall into the 9 land use groups defined by the Massachusetts NPDES MS4 Draft General Permit – Appendix F Attachment 1 guidelines. These land use categories allow the ranking of parcels based on estimated phosphorus load export rates, where water quality is a factor.

Impaired River Proximity (20%): Parcels proximal to the rivers identified by MassDEP as impaired waterbodies with established TMDLs (Bogastow Brook and Charles River) were given preference using this ranking metric. The distance from each parcel to the edge of the closest impaired waterbody was calculated. These distances were scaled to a 0-100 ranking assigned to each parcel, where the closer a parcel is located to an impaired waterbody, the higher it will rank.

Parcel Ranking: Kleinfelder ranked the parcels and then evaluated Town-owned parcels to determine the most feasible and optimal locations for a future stormwater recharge structure. Figure 7 depicts each of the top-rated parcel's quantitative ranking, based on the parameters discussed above, as well as a qualitative suitability score of "excluded," "poor," "fair," or "good."

Figure 7: Stormwater Recharge Parcel Ranking



The highest rated option, the Millis Housing Authority located between Union Street and Exchange Street (labeled as 1, good), has an estimated half-acre of area available for GI improvements due to the large size of the parking lot. The Town has the ability to implement GI improvements on this property since it is Town-owned. However, funding for any project would need to be secured. Additional evaluation would be needed to develop a conceptual design for a proposed green infrastructure BMP.

Appendix A includes a ranking of the top-rated town-owned parcels in the subbasins of interest. as well as the estimated cost for implementing GI based on the size managed area, which is discussed further in Section 3.2.4.3.

As projects are developed, credits may be discussed on a site specific basis with regulatory authorities. Projects aimed towards GI improvements would have a moderate to high environmental benefit, depending on the scale of the project, due to the increase in stormwater recharge and reduction in total phosphorous to nearby surface waters or streams. This option has the benefit of meeting obligations under two regulatory programs, the WMA and the phosphorus TMDL and for these reasons is rated as Good.

3.2.4.3 Infiltration and Inflow Removal

Based on information presented in the Phase III – Sewer System Investigations & Repair Summary Status Report (GCG, 2015), the Town of Millis has performed several infiltration and Inflow (I/I) evaluations and repairs on its overall sewer system between 2008 and 2014 . The Status Report (GCG, 2015) states that through these investigations and repairs, 126,950 gpd of peak I/I have been removed to date and 51,700 gpd of peak I/I are remaining. In addition, the Status Report states that 23,760 gpd of clear flow investigations remain.

Based on WMA Permit Guidance, an assessment could be conducted utilizing the Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation and the Town may be able to seek credit for proposed or completed Infiltration and Inflow removal. However, given the information provided, the level of potential credit could not be established at this time. Nevertheless this option would likely have a significant environmental benefit and is already required by the Town's obligations as a member of the CRPCD to reduce I/I and so the option is rated as Good.

3.2.4.4 Summary of Feasibility, Benefit, Cost, and Overall Rating: Direct Mitigation Options

Table 12 summarizes the direct mitigation options evaluated for Millis in terms of feasibility of implementation, benefit (environmental and/or water savings) of implementation, cost to implement, and overall rating.

Table 12: Summary and Rating of Direct Mitigation Options

Item	Current Practice	Minimization Option	**Feasibility** Good (G) Fair (F) Poor (P)	**Benefit** High (H) Moderate (M) Low (L)	**Cost** High (H) Moderate (M) Low (L)	**Overall Rating** Good (G) Fair (F) Poor (P)
Surface Water Releases	Refer to Table 10					P

Item	Current Practice	Minimization Option	**Feasibility** Good (G) Fair (F) Poor (P)	**Benefit** High (H) Moderate (M) Low (L)	**Cost** High (H) Moderate (M) Low (L)	**Overall Rating** Good (G) Fair (F) Poor (P)
***Stormwater Recharge**	N/A	enhancing storm water recharge at selected parcels	F	M/H	M	G
***Infiltration/ Inflow Removal**	Investigations and repairs conducted between 2008 - 2014. Conduct I/I removal as funding becomes available	Perform remaining I/I work identified. WMA Guidance Document recognizes completed I/I removal as a direct mitigation credit. Kleinfelder was not able to establish potential credit for previous I/I removal with the information in hand at the time of this report	G	M	M/H	G

Notes:
Feasibility and Overall Rating were analyzed as Good, Fair, or Poor (G, F, P)
Benefit and Cost were analyzed as High, Moderate, and Low (H, M, L)
*Top Rated Options

Cost of Stormwater Recharge Option:
As discussed in Section 3.2.4.2, the Millis Housing Authority was identified as the highest rated option for implementation of GI improvements, based on a GIS analysis. The site may be well-suited for bioretention technology, implementation of porous pavement, or other stormwater recharge improvements, with an estimated project cost of on the order of $156,000. The cost was estimated based on the following analysis.

Planning level unit construction costs have become more readily available as more GI programs are implemented in the United States (USEPA, 2013 & USEPA, 2014). The unit construction cost estimates developed here referenced these resources with specific construction, design, contingencies, locational/temporal adjustments that were used to develop the unit construction costs, and unit life-cycle costs for evaluating the implementation scenario costs.

The estimate was prepared in accordance with the guidelines of the Association for the Advancement of Cost Engineering (AACE) International. According to the definitions of AACE International, the Class 5 Estimate is defined as the following:

> *This estimate is prepared based on limited information, where little more than proposed plant type, its location, and the capacity are known. Strategic planning purposes include but are not limited to, market studies, assessment of viability, evaluation of alternate schemes, project screening, location and evaluation of resource needs and budgeting, and long-range capital planning. Examples of estimating methods used would include cost/capacity curves and factors, scale-up factors, and parametric and modeling techniques. Typically, little time is expended in*

the development of this estimate. The expected accuracy ranges for this class estimate are -20 to -50 percent on the low side and +30 to +100 percent on the high side.

The unit construction costs from the ongoing GI programs for other communities (Onondaga County, New York and Lancaster, Pennsylvania and Boston) were used for this analysis (USEPA, 2014). Unit construction costs were not adjusted to account for the inherent locational and temporal differences, rather typical construction costs for GI per unit area were used the estimate project costs for the eleven highest-scoring municipal properties, excluding those without significant impervious area, as summarized in Appendix A. A summary of the costs for the top-rated result is included below, in Table 13.

Table 13: Cost Analysis for Top-Rated Stormwater Recharge Parcel

Site Description	Total Parcel Size (Acres)	Estimated Managed Area Sizes (Acres)	[1]Typical Construction Costs ($/acre area managed by GI)	[2]Construction Cost Year 2015	30% Contingency	Design and System Development Charges Cost	[3]Total Project Cost
Calculations		A	B	C = A x B	D = 30% x C	E = 25% (C + D)	F = C + D + E
Millis Housing Authority Parcel 19_021 UNION & EXCHANGE ST	3.07	0.500	$192,000	$96,000	$28,800	$31,200	$156,000

[1]Area managed by BMP multiplied by the BMP cost per unit area inclusive of the capital cost multipliers

[2]NPV of Construction Costs only

[3]Life-Cycle Costs = Present Value Cost of (Construction Costs + O&M Costs + Replacement Costs)

The cost is intended to be used as high level planning opinions and assumes that although it is possible to receive runoff from outside parcel area, the GI in suitable parcel only manages runoff from itself.

<u>Cost of Infiltration/Inflow Removal Option:</u>

Based on information presented in the Phase III – Sewer System Investigations & Repair Summary Status Report (GCG, 2015), GCG Associates, Inc. prepared a cost estimate ($265,350) for the repair of defects identified during prior investigations. GCG Associates, Inc. stated that the estimate was for the remaining open excavation repair work for removal of I/I, which included sewer main and manhole replacement and repairs. The Phase III – Sewer System Investigations & Repair Summary Status Report (GCG, 2015) also identified 51,700 gpd in remaining peak I/I to date. Therefore, based on the values presented in the 2015 Status Report, the cost per MGD would be $5.1M. Although the cost of I/I removal is high, the Town must implement the program as a condition of its CRPCD wastewater permit.

3.2.5 Indirect Mitigation

Indirect Mitigation options are those that are not easily quantifiable, but that provide a benefit to the environment by improving habitat, flow, water quality, stream continuity, or water supply protection. When a public water supplier's withdrawal request is above baseline and the volume requested cannot be offset via additional demand management, wastewater returns, and direct mitigation, the required number of additional indirect credits must be determined. The number of credits required depends on the remaining volume a public water supplier must offset once savings for additional demand management, wastewater returns, and direct mitigation have been subtracted from the requested volume above baseline. As previously discussed (Section 3.2), the additional projected demand of 0.184 MGD for proposed developments and water reserves to the current (2015) demand would require 0.072 MGD above the baseline. This volume is likely to be mitigated via additional demand management, wastewater returns, and direct mitigation options described in previous sections. Nevertheless, the feasibility of potential indirect mitigation options were evaluated qualitatively in order to provide a complete summary of options Millis might consider. In addition, there are other regulatory obligations that Millis could meet through certain indirect options. As identified in Table 9f-2 of the WMA Permit Guidance Document, strategies for indirect mitigation discussed below have been organized in the following categories and are summarized in Table 14.

Table 14: Indirect Mitigation Options

Indirect Mitigation Options	
Habitat Improvement & Protection	Remove a dam or other flow barrier
	Install and maintain a fish ladder
	Culvert Replacement to meet stream crossing standards
	Streambank restoration
	Stream channel restoration
	Stream buffer restoration
	Establish/contribute to aquatic habitat restoration fund
	Acquire property in Zone I or II
	Acquire property for other natural resource protection
Stormwater	Stormwater bylaw with recharge requirements
	Stormwater utility meeting environmental requirement
	Implement MS4 requirements
Wastewater	Infiltration/Inflow removal program
Optimization	Surcharge Reach
Demand Controls	Private Well Bylaw

3.2.5.1 Habitat Improvement & Protection

3.2.5.1.1 Dam Removal; Fish Ladder Installation

The removal of dam is considered mitigation worthy of significant credits under the WMA Permit Guidance because it would improve aquatic fish habitat by facilitating fish passage. There are three dams within Millis: Bogastow Brook Dam, Richardson Pond Dam, and Walkers Pond Dam. As discussed in Section 3.1.2, the option of dam removal is rated as Poor. Installing and maintaining a fish ladder at Bogastow Brook could also improve fish passage without having to remove the dam. The full extent of the potential benefit would need to be vetted with the Department of Fish and Game. Economically, however, this option would most likely only make sense if major repair or modification to the dam was planned to address structural hazards or flooding / hydraulic issues. For now, this option is rated as Poor but this option could be re-assessed and considered if the Town were to obtain ownership of the dam.

3.2.5.1.2 Culvert Replacement to meet Stream Crossing Standards

Older culverts are often not designed with wildlife passage in mind and may represent barriers to fish or other wildlife passage. The Massachusetts Stream Crossing Standards were developed to provide guidance on design of new or replacement culverts that promote wildlife passage, improve habitat continuity, restore natural hydraulics, and provide suitable streambed for aquatic organisms. Upgrading a culvert to meet Stream Crossing Standards would be eligible for indirect mitigation credit under the WMA Permit Guidance Document. The Town of Millis conducts culvert replacements on an as-needed basis and based on availability of funding. Recently the Town replaced a culvert on Causeway Street in July 2013 and based on the 2015 NPDES PII Small MS4 General Permit Annual Report, the Town is planning for a culvert replacement on Village Street. According to the WMA Permit Guidance Document (November 2014), culvert replacement to meet stream crossing standards is considered indirect mitigation and worth a total of 20 points (Water Quality Improvement = 5 points, Habitat Improvement = 5 points, and Stream Continuity Improvement =105 points) on the Table 9f-2 - Indirect Mitigation Activities and Potential Credits of the guidance document. Should the Town require further mitigation credits, it could seek credit for this practice with regulators. This option is rated as Good.

3.2.5.1.3 Stream Bank, Channel, or Buffer Restoration

This mitigation option would consist of implementing a stream restoration project. Eroded stream banks can choke streams with sediment, resulting in poor water quality and threatening aquatic species. Stream channels that have had natural hydraulics altered by armoring or straightening provide less diverse microhabitat for aquatic species. Stream buffer / riverfront area that has been cleared, paved, or is built upon delivers pollutants in runoff more directly to the stream. The Town is not aware of any areas in Town where stream bank erosion or channel degradation is a particular problem. If undertaken in conjunction with planned projects for roadway improvement or culvert replacement, this option could be worth exploring further. Although channel/bank improvements would require permits from MassDEP and Army Corps, for a large roadway project the added cost may be modest. However, at this time no significant projects are planned in Millis. For these reasons, stream channel or bank project options are rated as Poor.

The restoration of stream buffer / riverfront area could be a relatively lower cost option possibly worth considering. A project involving plantings of native species and invasive species removal would be achievable using Town staff and existing resources, as well as volunteer residents. This would represent an opportunity for public outreach and involvement to get citizens involved in water resources protection. For example, Millis has several locations which are important recreational wildlife viewing locations for the community, including South End Pond and Richardson's Pond. If a portion of a Pond's shoreline was degraded, selected areas could be restored with native plantings. As a lower cost project with an educational component, this option is rated as Fair.

3.2.5.1.4 Aquatic Restoration Fund

The WMA Permit Guidance includes this option as a possible source of indirect mitigation. Some states (for example, New Hampshire) maintain a compensatory mitigation program where monetary contributions can mitigate projects where offsetting of impacts are infeasible by funding projects in other locations. However, Massachusetts does not currently have a state program like New Hampshire's. Even if a fund were to be established, either at the state or local level, with economic pressures high, funds short, and Town infrastructure costs increasing, the business community may not support a monetary contribution that does not have a meaningful direct connection to benefits for the Town. Funds and staff effort is likely better directed towards local, hands-on projects such as clean-up days, stream buffer restoration, or other public involvement activities under the NPDES MS4 stormwater program. For these reasons this option is rated as Poor.

3.2.5.1.5 Acquire Property in Zone I / II

Acquiring and protecting land in the Zone II of a water supply helps protect the quality and capacity of the well by limiting impervious surfaces and thereby promoting filtering and recharge of rainwater into the aquifer. Within Millis, there are currently no parcels within the Zone I or II of the Town's wells identified as high priority and targeted for acquisition. The MassDEP maintains a grant program (Drinking Water Land Protection) that provides 80% funds towards the purchase of land for aquifer protection. However, a grant application would not rank highly and the cost for this action is not likely to be publicly supported if no parcels have been already identified for protection and so this option does not rank high for Millis and was rated as Poor.

3.2.5.1.6 Acquire other habitat for natural resource protection

There are currently no parcels identified as high priority and targeted for acquisition. The cost for this action is not likely to be publicly supported if no parcels have been already identified for protection, so this option was rated as Poor.

3.2.5.2 Stormwater

3.2.5.2.1 Stormwater Bylaw with recharge requirements

The Town's current regulations were reviewed for stormwater control requirements that could be considered as mitigation for groundwater withdrawals, particularly recharge requirements. In accordance with their requirements under the National Pollutant Discharge Elimination System (NPDES) Phase II municipal separate storm sewer system (MS4) general permit, the Town has stormwater regulations in place that precludes illicit discharges or illegal dumping into the Town's drainage system. Millis' regulations include the following:

- The Town of Millis' Stormwater Management Regulations state that all developments of 1 acre or greater shall submit a Stormwater Management Plan which meets Massachusetts Stormwater Management Standards.
- The Zoning Bylaw establishes the Watershed Protection and Special Flood Hazard Zoning Districts in part to protect, preserve and maintain the water table and water recharge areas within present and potential water supplies. These areas include all special flood hazard areas designated as Zone A or AE on the Norfolk County Flood Insurance Rate map (FIRM) issued by the Federal Emergency Management Agency, all land that borders any natural water body that lies within a horizontal distance of 25 feet from the mean high water line, all water bodies encircled by the boundary lines of the District, and all land along designated brooks, tributaries and wetlands described as upland swamps or marshes. No building or structure shall be erected, constructed, or altered in these overlay districts without a Special Permit from the Town.

- The Zoning Bylaw establishes four Groundwater Protection Districts, Zone A, Zone II, Zone C, and Zone I. This bylaw is intended to preserve and protect existing and potential sources of drinking water supplies. Zone A includes all aquifers, Zone II includes Zone II areas delineated by MassDEP, Zone C includes watershed areas, and Zone I includes area within 400 feet of a public water supply. The Zoning Bylaw stipulates Special Use Regulations and Prohibited Activities for each Zone. The Special Use Regulations place limitations on the total impervious surface present and on-site sewer capacity as well as stipulating infiltration of stormwater run-off.
- The Zoning Bylaw stipulates that as part of the approval process for new commercial and industrial developments the Planning Board will review a site plan which must include measures to maximize groundwater recharge and protect groundwater quality.

Currently the Town of Millis applies the recharge standards from the MassDEP Stormwater Management Standards to proposed development. According to the WMA Permit Guidance Document (November 2014), stormwater bylaw with recharge requirements is considered indirect mitigation and worth a total of 10 points (Instream Flow Improvement = 5 points and Water Quality Improvement = 5 points) on the Table 9f-2 - Indirect Mitigation Activities and Potential Credits of the guidance document. Should the Town require further mitigation credits, it could seek credit for this practice with regulators. This option is rated as Good.

Beyond these existing practices, the Town could implement more aggressive recharge standard than that required by the MassDEP Stormwater Management Policy, which would allow more water to infiltrate to the groundwater and therefore replenish base flows while accommodating the potential increased runoff generated by the proposed development. However, as described in the 2009 MS4 General Permit Annual Report, the Town developed and presented at a Town meeting a stormwater bylaw to promote low impact development techniques. The Town received significant opposition to the bylaw and the bylaw was placed on hold.

3.2.5.2.2 Stormwater Utility

A stormwater utility would provide a stable source of revenue for stormwater system operation, maintenance, capital improvements that would include increased recharge, and overall compliance with NPDES Phase II requirements. An added benefit of a stormwater utility is that it typically includes a credit program that encourages reduction in stormwater quantity and/or pollutant loads by ratepayers which would incentivize the use of things like rain gardens, permeable pavement and reduction in impervious surface leading to increased recharge. It can also consolidate and coordinate program responsibilities that are currently dispersed under various departments and not fully recognized as services by the public. When done properly, the system is equitable (i.e. based on system demand).

There are considerable challenges to implementing a Stormwater Utility and a thorough process of public education to achieve stakeholder buy-in - early and often- is critical. Due diligence is critical to establishing a system that is defensible and fair. Due diligence must consider multiple 'tracks' including governance, program elements, legal/financial basis, public involvement and adequacy of data. The process has parallels to business planning. Enabling legislation (MGL Ch 83.S16 and Ch40 S1A) allows the Town to establish a utility. A Town meeting vote would be required to pass an ordinance to put the utility into effect. The potential benefit as a stable revenue source is very high and once implemented, the administrative costs would be fairly low as it could be managed in parallel with the existing water utility. Existing grant programs are available that could fund stormwater utility implementation planning to define revenue potential and build public support. Nevertheless, due to the challenges associated with establishing a stormwater utility, at this time this option is rated Fair.

3.2.5.2.3 Implement MS4 Requirements

Millis is a NPDES Municipal Separate Storm Sewer System (MS4) Phase II regulated community and performs the following actions under its current stormwater management program:

- Public education and outreach which includes publishing news articles, distributing brochures and information at public events, making information available on the Town website, and incorporating water resources topics into the public school's curriculum in an effort to educate residents on the importance of reducing stormwater pollution.

- The Town has continued efforts to remove illicit discharges by testing its sewer system as needed to identify and eliminate improper connections. An outfall location and stormwater drain system map has been completed by the Town. The Town revises the map on an as needed basis as new development is constructed or changes are observed in the field.

- The Town practices pollution prevention and good housekeeping for its municipal operations through various activities. The Department of Public Services (DPS) sweeps 100% of its streets on an annual basis. The Town has a catch basin cleaning program in place and 100% of its catch basins are cleaned on an annual basis. Also, all DPW employees are trained in various topics related to the SPCC plan for the Highway Garage and stormwater.

According to the WMA Permit Guidance Document, work related to implementing the MS4 requirements is considered indirect mitigation and worth 10 points (Water Quality Improvement = 10points) on Table 9f-2 - Indirect Mitigation Activities and Potential Credits of the guidance document. This option is rated as Good for seeking of mitigation credits because it addresses two regulatory programs and the Town's progress is well underway.

3.2.5.2.4 Infiltration/Inflow Removal Program

As discussed in Section 3.2.4.3, The Town of Millis is continuously evaluating its sewer system looking for deficiencies and opportunities to address I/I. According to the WMA Permit Guidance document, implementing an I/I removal program is worth 5 credits for indirect mitigation. This option is rated Good because the Town already must implement the program as a condition of its CRPCD wastewater permit.

3.2.5.3 Summary of Feasibility, Benefit, Cost, and Overall Rating: Indirect Mitigation Options

As previously discussed in Section 3.2.5, if Millis were to request a withdrawal above baseline, this volume is likely to be mitigated via additional demand management, wastewater returns, and direct mitigation options described in previous sections. However, if Millis needed to implement Indirect Mitigation measures to offset a remaining volume of water the town could seek credit through various Indirect Mitigation options as shown in Table 14 and discussed in Sections 3.2.5.1 and 3.2.5.2. As shown in Table 15 below, many of the Stormwater Options are rated as Fair to Good, in part because they would address not only WMA Permit requirements but also NPDES MS4 Permit requirements. Continuing to implement the MS4 requirements and to explore a potential Stormwater Utility to fund future stormwater needs are good actions for the Town to take. Most of the Habitat Protection options are rated Poor.

Table 15: Summary and Rating for Indirect Mitigation Options

Item	Current Practice	Planned or Potential Indirect Mitigation Option	Feasibility Good (G) Fair (F) Poor (P)	Benefit High (H) Moderate (M) Low (L)	Cost High (H) Moderate (M) Low (L)	Overall Rating Good (G) Fair (F) Poor (P)	Possible Credit
Remove a dam or other flow barrier	See Table 10					P	25
Install and maintain a fish ladder	None	Install fish ladder at Bogastow Brook	P	M	H	P	10
***Culvert Replacement to meet stream crossing standards**	Town conducts culvert replacements on an as-needed basis and based on availability of funding	Culvert replacement on Village Street	G	H	M	G	20
Streambank or channel restoration	No significant project are currently planned	Town is not aware of any areas in Town where stream bank erosion or channel degradation is a particular problem	P	M		P	15
Stream buffer restoration	No significant project are currently planned	Restoration of stream buffer/riverfront area - plantings of native species and removal of invasive species	F	M	L	F	15
Establish/ contribute to aquatic habitat restoration fund	None	Establish/contribute to an aquatic restoration fund. Funds would help improve aquatic habitat protection	P	L		P	5
Acquire property in Zone I or II	No current plans to acquire property	Acquire property within a Zone I / II	P	H		P	10
Acquire property for other natural resource protection	No current plans to acquire property	Acquire property for natural resource protection	P	H		P	5
Stormwater bylaw with recharge requirements	The Town's Stormwater Management Regulations requires developments of 1 acre or greater to submit a Stormwater	Adopt a town-wide stormwater bylaw	F	M	L	P	10

Item	Current Practice	Planned or Potential Indirect Mitigation Option	Feasibility Good (G) Fair (F) Poor (P)	Benefit High (H) Moderate (M) Low (L)	Cost High (H) Moderate (M) Low (L)	Overall Rating Good (G) Fair (F) Poor (P)	Possible Credit
	Management Plan which meets MA Stormwater Management Standards.						
Stormwater utility meeting environmental requirement	None	Implement a Stormwater Utility	F	H	M	F	10
Implement MS4 requirements	Town is currently in the NPDES Phase II Stormwater Program	Continue to implement MS4 requirements	G	H	M	G	10
Infiltration / Inflow removal program	See Table 12						5
Surcharge Reach	See Table 10						10
Private Well Bylaw	See Table 10						10

Notes:
Feasibility and Overall Rating were analyzed as Good, Fair, or Poor (G, F, P)
Benefit and Cost were analyzed as High, Moderate, and Low (H, M, L)
*Top Rated Options

Kleinfelder identified the top Indirect Mitigation option as the replacement of the Village Street culvert. The Town could seek credit once this activity is completed (potential 20 credits). Based on the 2015 NPDES PII Small MS4 General Permit Annual Report, the culvert replacement is still in the design phase; therefore, the cost will be dependent on the final design. However, based on information from the Town, there are structural issues with the culvert and the Town will also consider stormwater improvement opportunities during the design/replacement. Therefore, there is a high benefit to replacing the Village Street culvert.

4. Summary of Analysis

The Town of Millis has taken many steps to better manage its water and to reduce demand, including leak detection and repair, water auditing, meter calibration, outdoor watering restrictions, and promoting conservation. These efforts are helping to minimize and mitigate impacts on flow-altered subbasins in the Charles River Basin. As described in Section 1.1.2, Millis will be subject to Tier 1 minimization requirements due to the location of wells within a subbasin with an August net groundwater depletion of 25% or more. Upon renewal of the Town's WMA permit, the Town will be required to develop and implement a plan to minimize impacts as part of the requirements under the WMA permit regulations. **The top three minimization options were identified as Optimization of Existing Resources, Enhanced Non-essential Outdoor Water Restrictions, and Modifying the Survey Method for Leak Detection and Repair.**

In addition, Millis could be subject to Tier 2 requirements if Millis requests a withdrawal above its baseline (currently 0.80 MGD) to meet projected demands. If the Town of Millis requests a withdrawal above baseline, mitigation measures would need to be implemented in order to offset the requested volume above baseline. The Town of Millis could request an adjustment for water efficiency through achieving a higher RGPCD and UAW than stipulated by the WMA Performance Standards. In addition, the Town of Millis could request a potential adjustment for current and future wastewater returns through septic systems. Through these adjustments the Town of Millis has the potential to save an estimated volume of water which is greater than the projected future demand above baseline. However, if the Town is not able to offset the requested volume above baseline via adjustments the Town would need to implement mitigation measures. For that reason, Kleinfelder assessed the feasibility of various mitigation options, as discussed in Section 3.2. **The top three mitigation options were identified as: Stormwater Recharge Projects, Infiltration/Inflow Removal and the replacement of the Village Street Culvert.**

5. List of References

Kleinfelder's scope of review was limited to documents provided by the Town of Millis and its representatives, as summarized below.

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26. Town of Millis, 2010, *General Bylaws*, November

27. Town of Millis, 2009, *NPDES PII Small MS4 General Permit Annual Report*, May.
28. Town of Millis, 2007, *Stormwater Management Regulations, Article I,* Amended February 12.
29. Town of Millis, 2004, *Stormwater Management Regulations, Article II*, Adopted June 28.
30. Town of Millis, 2012, Zoning By-Law, Amended May 14.
31. Town of Millis Department of Treasurer/Collector, 2015, *FY2015 Water/Sewer Rates.*
32. USEPA, 2014, *The Economic Benefits of Green Infrastructure: A Case Study of Lancaster, PA,* February
33. Schumacher, L., 2008, City and Town, Chapter 188 of the Acts of 2008 — Understanding and Applying the New Intermunicipal Agreements Law, December.
34. Stocking, A. et al., 2006, *Removal of MTBE from Drinking Water Using Air Stripping: Case Studies*, October.
35. Woodard & Curran (W&C), 2010, *Water System Master Plan*, June

APPENDIX A
GIS Analysis Top-Rated Stormwater Recharge Parcels

Figure A-1: Stormwater Recharge Locus Map

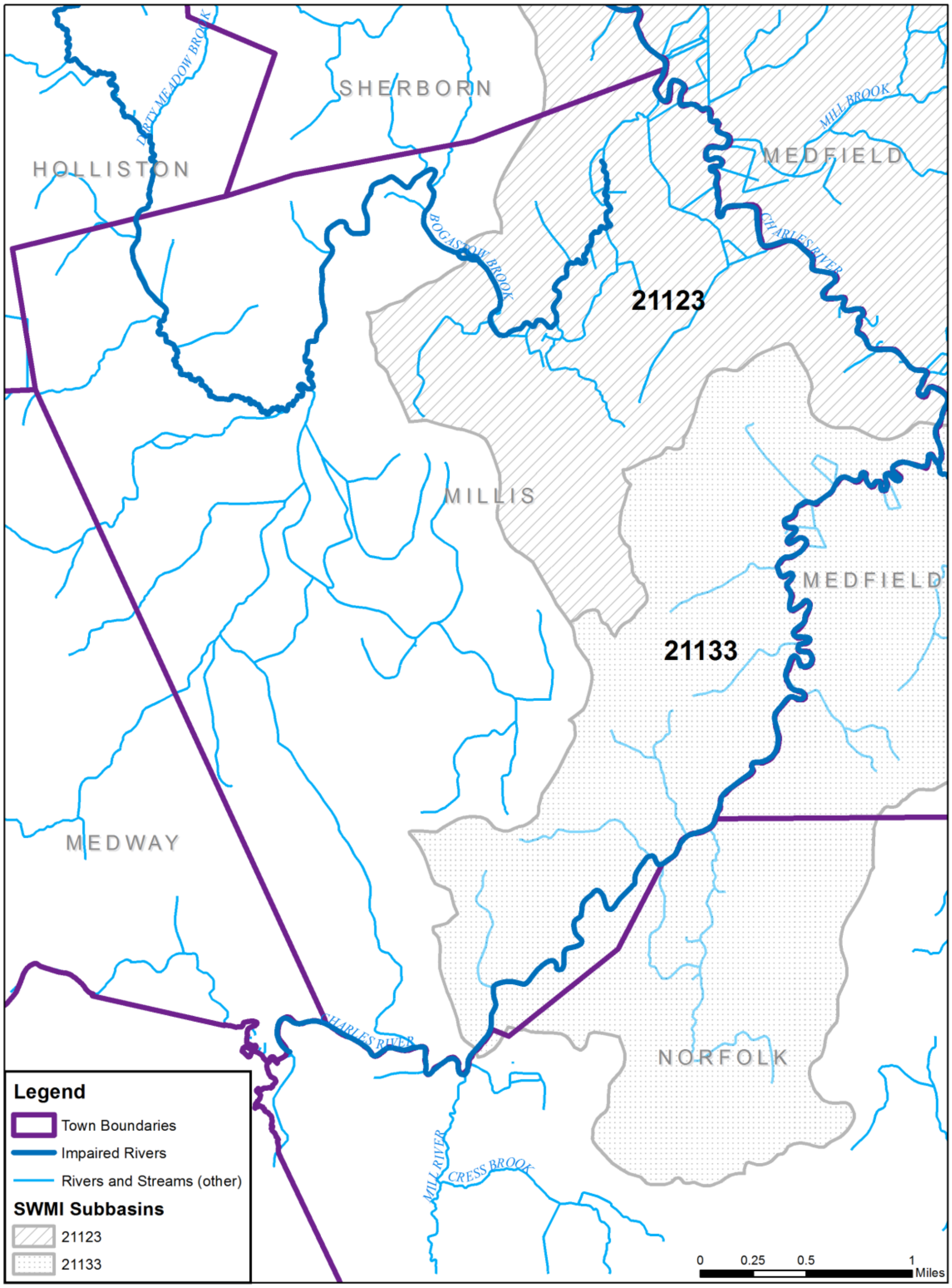


Figure A-2: Stormwater Recharge Centered

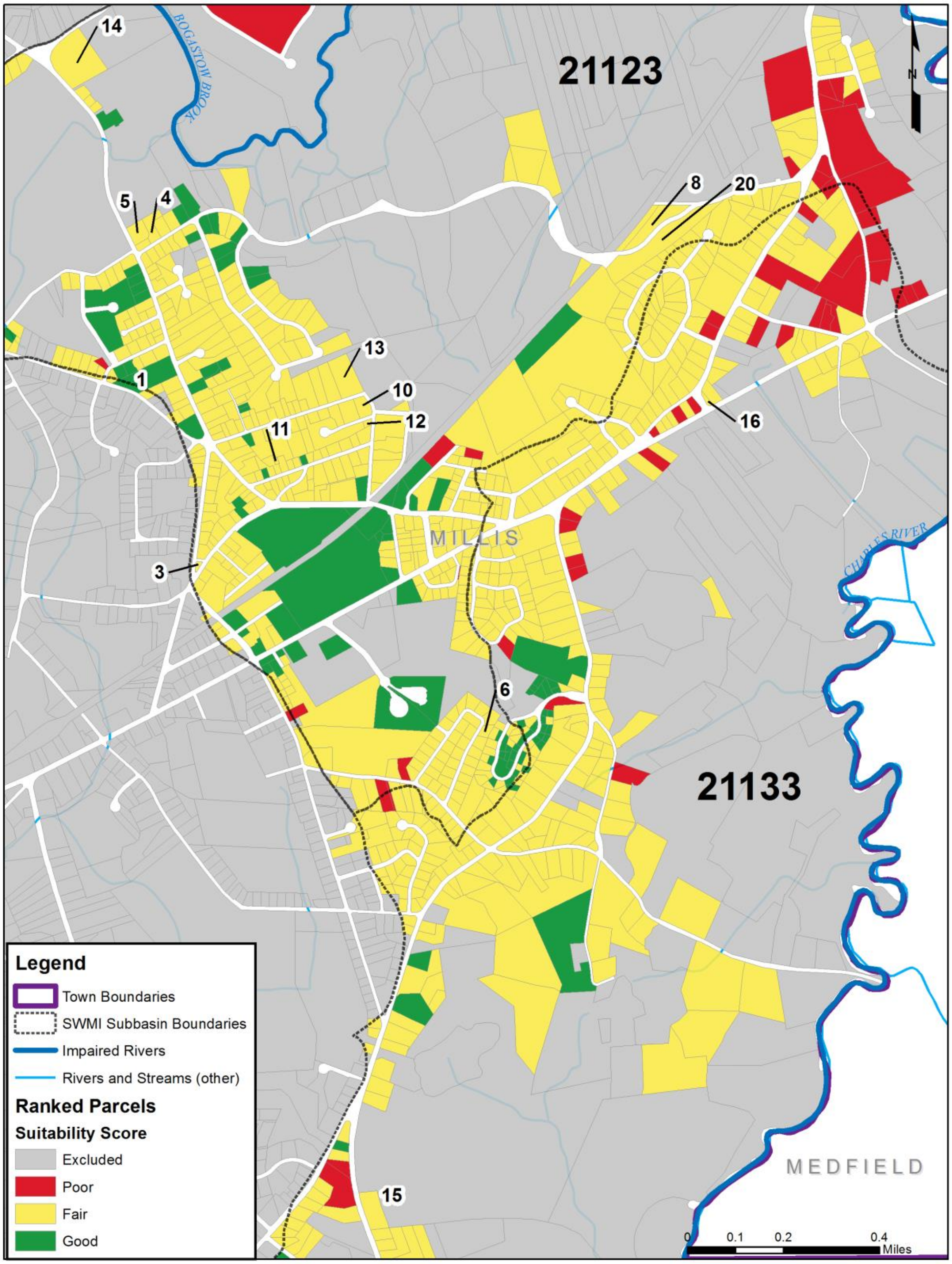


Figure A-3: Stormwater Recharge North

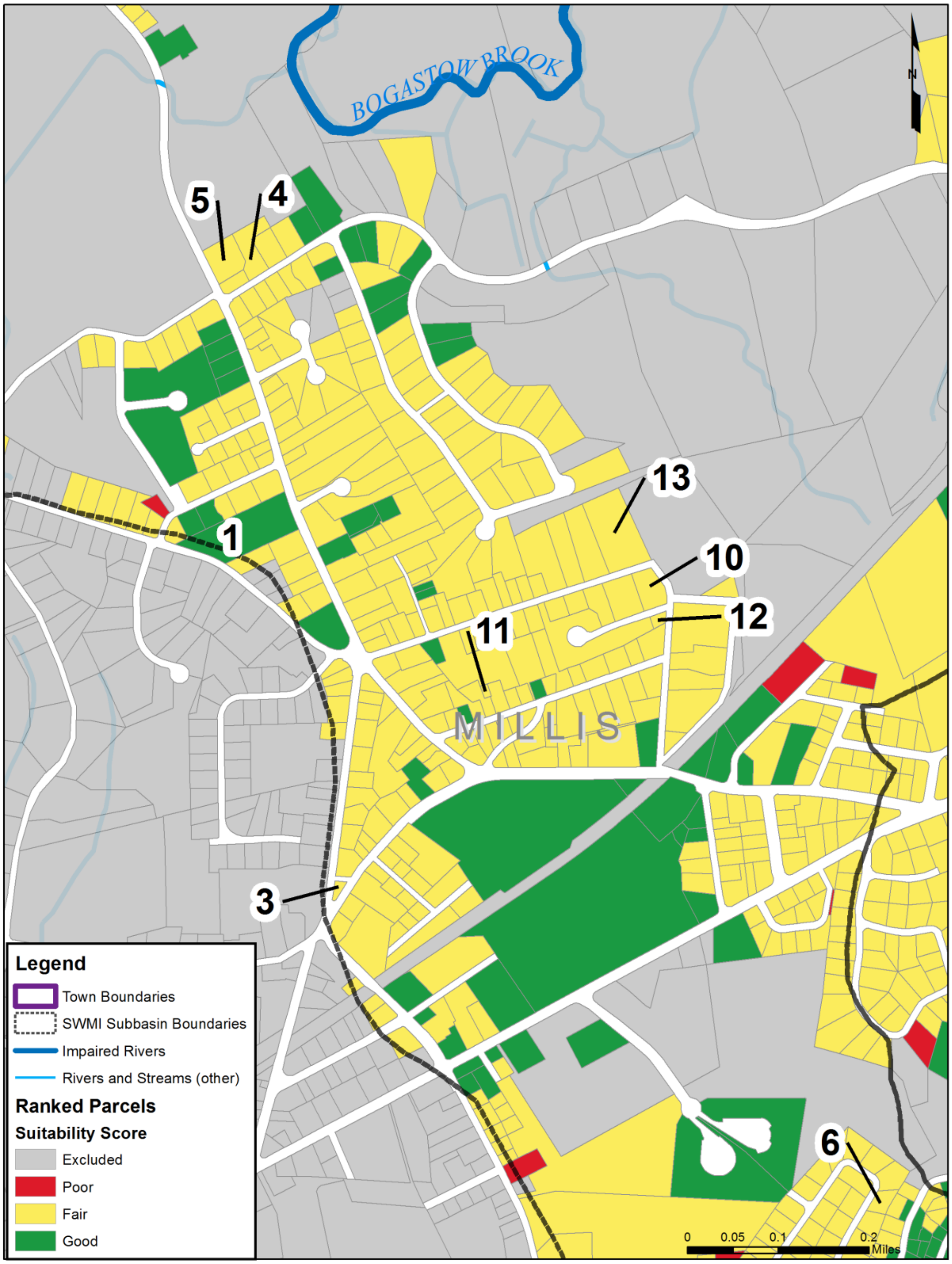


Figure A-4: Stormwater Recharge South

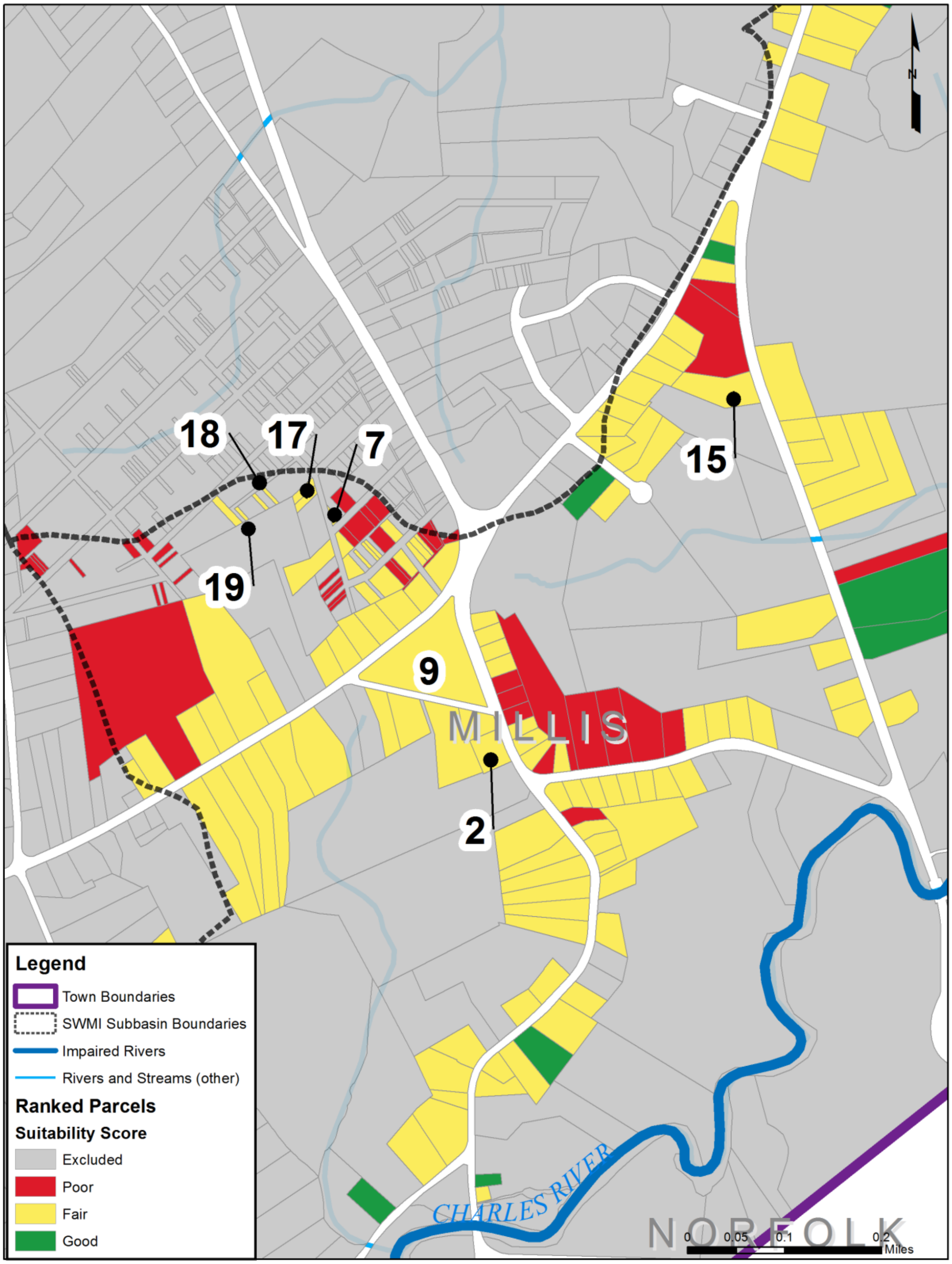


Table A-1: Millis Municipal Parcels GI Suitability Ranking

Rank #	Parcel ID	Site Address	Parcel Area (Acres)	Soil Type	Impervious Area (Acres)	Final Rank (%)
1	**19_021**	**UNION & EXCHANGE ST**	**3.07**	**A**	**1.34**	**72.1**
2	**43_013**	**185 PLEASANT ST**	**0.74**	**A**	**0.04**	**56.9**
3	**24_004**	**MEMORIAL PARK**	**0.12**	**A**	**0.04**	**56.5**
4	16_116	48 ISLAND RD	0.90	B	0.00	56.2
5	16_117	EXCHANGE ST	0.97	B	0.00	55.4
6	29_101	BOW ST	0.35	A	0.00	52.7
7	**40_103**	**MILLIS HGHTS**	**0.06**	**B**	**0.05**	**51.6**
8	**53_042**	**ISLAND RD**	**2.18**	**A**	**0.09**	**51.6**
9	**40_019**	**PLEASANT ST PARK**	**4.46**	**A**	**0.12**	**48.8**
10	19_116	VAN KLEECK RD	0.77	A	0.00	48.8
11	19_137	IRVING ST	0.07	A	0.00	48.1
12	19_155	DANIELS ST	0.14	A	0.00	48.1
13	**19_068**	**VAN KLEECK RD**	**2.51**	**A**	**0.03**	**46.2**
14	**11_042**	**ORCHARD ST**	**5.53**	**B/D**	**0.01**	**44.7**
15	**39_043**	**121 NORFOLK RD**	**1.99**	**A**	**0.13**	**43.7**
16	**26_014**	**DOVER RD**	**0.16**	**B/D**	**0.04**	**42.9**
17	40_096	BROAD ST	0.15	B	0.00	42.8
18	40_089	COURT PL	0.06	B	0.00	42.4
19	40_091	COURT PL	0.05	B	0.00	42.2
20	**53_043**	**ISLAND RD**	**5.61**	**A**	**0.02**	**42.2**
21	40_125	CONGRESS ST	0.12	A	0.00	41.4
22	52_014	WATER ST	0.34	A	0.00	40.8
23	40_090	COURT PL	0.05	B	0.00	40.3
24	40_128	MILLIS HGHTS	0.09	A	0.00	39.9
25	40_118	BROAD ST	0.07	B	0.00	39.8
26	40_120	MILLIS HGHTS	0.05	B	0.00	38.1
27	40_124	CONGRESS ST	0.07	A	0.00	37.8
28	40_127	CONGRESS ST	0.20	A	0.00	37.8
29	40_102	GEORGE AVE	0.23	C	0.00	33.1
30	44_009	PLEASANT ST	2.71	D, C/D	0.00	30.0
31	40_037	MILLIS HGHTS	0.05	D, C/D	0.00	27.8
32	40_036	MILLIS HGHTS	0.05	D, C/D	0.00	25.8
33	40_092	FEDERAL ST	0.06	D, C/D	0.00	25.6
34	40_068	MILLIS HGHTS	0.05	D, C/D	0.00	25.3
35	40_067	FEDERAL ST	0.11	D, C/D	0.00	25.2
36	40_039	COMMONWEALTH BLVD	0.06	D, C/D	0.00	24.4
37	40_093	HENRY ST	0.06	D, C/D	0.00	23.7
38	40_094	HENRY ST	0.06	D, C/D	0.00	21.6
39	40_066	1 MARGO PL	0.11	D, C/D	0.00	19.8

Bold values represent municipally owned parcels with estimated impervious area greater than 0.001 acres

Table A-2: Millis Municipal Parcels GI Cost Estimate

GI Suitability Rank	Parcel ID	Street Name	Total Parcel Size (Acres)	Estimated Managed Area Sizes (Acres)	[1]Typical Construction Costs ($/acre area managed by GI)	[2]Construction Cost	30% Contingency	Design and System Development Charges Costs	[3]Total Project Cost
				A	B	C = A x B	D = 30% x C	E = 25% (C + D)	F = C + D + E
1	19_021	UNION & EXCHANGE ST	3.07	1.34	$192,000	$256,779	$77,034	$83,453	$417,265
2	43_013	185 PLEASANT ST	0.74	0.04		$8,587	$2,576	$2,791	$13,955
3	24_004	MEMORIAL PARK	0.12	0.04		$6,805	$2,042	$2,212	$11,059
4	16_116	48 ISLAND RD	0.90	0.00		Excluded due to Managed Area Size			
5	16_117	EXCHANGE ST	0.97	0.00					
6	29_101	BOW ST	0.35	0.00					
7	40_103	MILLIS HGHTS	0.06	0.05		$8,935	$2,681	$2,904	$14,520
8	53_042	ISLAND RD	2.18	0.09		$16,357	$4,907	$5,316	$26,579
9	40_019	PLEASANT ST PARK	4.46	0.12		$23,094	$6,928	$7,505	$37,527
10	19_116	VAN KLEECK RD	0.77	0.00		Excluded due to Managed Area Size			
11	19_137	IRVING ST	0.07	0.00					
12	19_155	DANIELS ST	0.14	0.00					
13	19_068	VAN KLEECK RD	2.51	0.03		$6,140	$1,842	$1,995	$9,977
14	11_042	ORCHARD ST	5.53	0.01		$2,603	$781	$846	$4,229
15	39_043	121 NORFOLK RD	1.99	0.13		$25,079	$7,524	$8,151	$40,753
16	26_014	DOVER RD	0.16	0.04		$7,655	$2,297	$2,488	$12,439
17	40_096	BROAD ST	0.15	0.00		Excluded due to Managed Area Size			
18	40_089	COURT PL	0.06	0.00					
19	40_091	COURT PL	0.05	0.00					
20	53_043	ISLAND RD	5.61	0.02		$2,916	$875	$948	$4,739
Total				**1.90**		**$364,949**	**$109,485**	**$118,608**	**$593,042**

Technical Appendix F

Town of Medway Leak Correlation Survey Report

Final Report

Town of Medway, Massachusetts

2014

Leak Correlation Survey

Liston Utility Services
19 Mauriello Drive
Stoneham, MA 02180-2775
Phone: 781 635 7711
Fax: 781 435 1480
WWW.LISTONUTILITYSERVICES.COM

January 1, 2012

Final Report
Correlation Water Leak Detection Survey
Town of Medway, MA
Department of Public Works
155 Village Street
Medway, MA 02053

The Town of Medway, Massachusetts contracted the services of Liston Utility Services to perform a correlation leak detection survey on their water distribution system.

Beginning November 13, 2014 and continuing through December 10, 2014 Liston Utility Services conducted the comprehensive correlation leak detection survey on the water distribution system of the Town of Medway MA as outlined in the Scope of work dated October 14, 2014 This survey was performed on 74 miles of distribution system to reduce unaccounted for water by identifying hidden and surfaced leaks.

The leak correlation survey consists of magnetically connecting leak correlating dataloggers to every intersection of the water distribution system to be surveyed. This is accomplished by attaching SoundSens Loggers to hydrants, hydrant valves, mainline valves and or service connections. The loggers are programmed to turn on at pre-determined intervals and collect leak noise data. Once the data has been stored in the loggers they are then retrieved and placed into a docking station for downloading into the leak correlation software for analyzing. Once the data from the loggers collected are downloaded into the software a diagram is completed that connects adjacent loggers. The data is then analyzed for potential leakage. When a leak had been identified additional correlations may be performed to pinpoint the exact location of the leak. Once completely satisfied with the location, the water department is notified and the leak is turned into the water department for repair.

The survey was performed entirely by James D. Liston and Richard Welch utilizing Radcom Technologies correlating system SoundSens.

During the survey a total of 6 leaks were located, they consisted of 2 main breaks, 1 service leak, and 3 hydrant leaks. A leak report sheet as well as the correlation data is included in this report.

Leaks Located:

Type	Location	Estimated Leakage (GPD)
Hydrant	Samoset Circle at Dead End	2 GPM
Hydrant	Village Street @ Franklin Street	2 GPM
Main	@ 3 Ellis Street	50 GPM
Hydrant	@ 12 School Street	4 GPM
Main	Village Street near Walker Street	300 GPM
Service	6 Fales Street	2 GPM

Total Estimated Leakage 360 GPM

189,216,000 Gallons per Year (189.216 million gallons of water)

Conclusion:

Unaccounted for water is a very complex issue with many variables involved, with undetected leaks being one of those variables. A water department requires timely and accurate data from their master meters feeding the distribution system to help determine if and when a leak survey needs to be performed. The survey should not be performed solely on the absence of time since the last survey. It should be based upon accurate flow data into the distribution system. The data that should be look at is total consumption, minimum night rates. If the consumption starts to rise, then at a certain threshold a new leak survey should be performed.

If a SCADA system is unavailable to monitor master meters then a battery powered telemetry datalogging system should be utilized at all the master metered sites as well as storage tank to monitor levels. I recommend RADCOM Technologies Multilog Data logger for the solution. This logger is a standard 4-channel unit and can be equipped with a telephone line modem or a cellular interface. The unit is completely battery powered water proof with a guarantee battery life of 5 years. The logger downloads into a very powerful multi licensed software package as well as alarms out for high, low and minimum nightline data points. The logger can read a 4-20 mA input as well as power its own internal or external pressure and flow sensors.

Recommendations:

- Continue leak detection survey to maintain system.
- That all compound and turbine water meter accounts be investigated for potential unaccounted for water. That these accounts be data logged and then sized properly based upon the data results. You may also want to look at all 2 inch displacement meters as well..

I would like to thank the Town of Medway for the opportunity to serve you and look forward to doing your leak detection surveys in the future. If you have any questions on the report and or would like to speak further on my recommendations please call me at 781 635 7711. I can also reach by emailing me at jim@listonutilityservcies.com.

Our goal is to serve clients to the best of our ability. Thank you for choosing to do business with us.

Sincerely,

James D. Liston
Liston Utility Service
www.listonutilityservices.com
jim@listonutilityservices com

Liston Utility Services
19 Mauriello Drive Stoneham, MA 02180-2775
781-635-7711
781-435-1480 Fax
www.listonutilityservices.com

Summary of

WATER CORRELATION SURVEY

MWRA – Town of Medway, Massachusetts

Survey Conducted By: James D. Liston

Date Survey Started: November 13, 2014 Date Survey Completed: December 10, 2014

Classification	Number of Leaks	Estimated Leakage GPM	Estimated Leakage GPD	Estimated Leakage GPY
1	2	350	504,000	183,960,000
2	0	0	0	0
3	4	10	14,400	5,256,000
Totals	6	360	518,400	189,216,000

GPM= Gallons per Minute GPD= Gallons per Day GPY = Gallons per Year

Source of Leakage	Number of Leaks	Estimated Leakage GPM	% of Total Number	% of Total Estimated GPM
Mains	2	350	33	97
Services	1	2	17	6
Hydrants	3	8	50	2.4
Totals	6	360	100	100

Type of Survey :	Correlation	Grade 1 (C)	15 to + GPM
Miles of Main Inspected:	74	Grade 2 (B)	5 to 14 GPM
Number of Leaks Located:	6	Grade 3 (A)	1 to 4 GPM

Leak Indication Classification

Leak indication classification is not an exact science despite the use of modern Instruments as well as training and experience by the consultant It is impossible to Determine the exact condition of the underground piping without exposing it In View of this limitation, our classification (including estimated volume loss) is intended as an aid in scheduling repairs based upon information available, the consultant's judgment, and sight conditions at the time the report is repaired Once the leak is exposed for repair the utility may wish to revise the volume loss in order to establish a more accurate estimate of actual water loss

Our goal is to serve clients to the best of our ability. Thank you for choosing to do business with us. If you have any questions on this matter please call or email me.

Liston Utility Services
19 Mauriello Drive Stoneham, MA 02180-2775
781-635-7711
781-435-1480 Fax
www.listonutilityservices.com

Town of Medway Leak Correlation Survey Tests

Survey Test 1: November 13, 2014
Center Street, Village Street, Legion Avenue, Prospect, Lovers Lane, Riverview Street,

Survey Test 2: November 13, 2014
Lovering Street, Memory Lane, Redgate Drive, Howe Street, Bria Lane, Pern Path,

Survey Test 3: November 18, 2014
Summer Street, Milford Street, Highland Street, Fales Street, Kingson Lane, Independence Lane, Knowllwood Road

Survey Test 4: November 18, 2014
Milford Street, Fisher Street, Grey Squirrel, West Street

Survey Test 5: November 19, 2014
Holliston Street, Malloy Street, Orchard Street, Kelley Street, Dean Street, Crestview Avenue, Gable Way, Kings Lane, Villa Drive, Queens Way

Survey Test 6: November 19, 2014
Main Street, Holliston Street, Coffee Street, Lee Lane, Carol Lane, Beatrice Lane, Karen Avenue, Richard Road, Gorwin Drive, Meryl Street

Survey Test 7: November 20, 2014
Juniper Road, Holliston Street, LVY Lane, Hunter Lane, Causeway Street, Puddingstone Lane, Birch Bark Road, Hickory Drive, Broken Tree Lane

Survey Test 8: November 20, 2014 PVC Test
Pheasant Run Road, Azalea Drive, Dogwood Lane, Quail Drive, Hookset Circle, Bayberry Lane

Survey Test 9: November 25, 2014
Cottage Street, Evergreen Street, Elm Street, Wellington Street, Cutler Street, Philips Street, Williams Street, Forest Road, Richardson Street, Karen Lane

Survey Test 10; December 1, 2014
Village Street, Lewis Drive, Lakeshore Drive, Candlewood Drive, Pine Ridge Drive, Cynthia Circle, Island Road, Pumping Station

Survey Test 11: December 1, 2014
Water Street, Populatic Street, Walker Street Canal Street, Village Street

Town Of Medway Leak Correlation Survey Tests Continued

Survey Test 12; December 1, 2014
Village Street, Oakland Street, New City Road, North Street, Crook Street, Broad Street, Barber Street, School Street, Pine Street, Church Street

Survey Test 13: December 2, 2014
Holliston Street, Skyline Drive, Fairway Lane, Algonquin Avenue, Homestead Drive, Cider Mill Road, Winthrop Street

Survey Test 14: December 2, 2014
Main Street, Village Street, Sherwood Drive, Waterview Drive, Country Lane, Old Summer Street

Survey Test 15: December 3, 2014
West Street, Millbrook Road, Holbrook Street, Castle Road, Granite Street, Daffodil Lane, Tulip Way,

Survey Test 16 December 3, 2014
Alder Street, Trotters Drive, Lost Hill Drive, Clark Street

Survey Test 17: December 3, 2014
Sun Valley Drive, Ellis Street, Saddle Hill Road, Hickory Drive, Broken Tree Road, Green Valley Road, Pine Needle Drive, Maple Leaf Lane, Indian Creek Road, Spruce Road, Hillview Terrace, Bridle Path Lane

Survey Test 18: December 4, 2014
Industrial Park Road, Mark Road, Main Street, Oakland Street, Oakview Circle, Vernon Road, Park

Survey Test 19: December 4, 2014
Oak Street, Brandywine Road, Daniels Road, Mechanic Street, Maim Street, Slocumb Place, Mann Street, High Street, Lincoln Street, Adams Street

Survey Test 20: December 4, 2014
Pond Street, Sunset Drive, Maple Lane, Meadow Road, Sunset Drive, Grace Terrace, Florence Circle, Flintlock Lane, Maple Street

Survey Test 21: December 8, 2014
Main Street, Winthrop Street, Maple Street, temple Street, Grove Street, Priscilla Road, Delmar Road, Lovering Street, Ash Lane, Buttercup Lane, Hemlock Drive, Clover Lane

Survey Test 22: December 8, 2014
Lovering Street, Winthrop Street, Ohlson Circle

Survey Test 23: December 8, 2014 PVC Test
Milford Street, Jasmine Road, West Street, Laurelwood Lane, Short Street, Liberty Road, Fox Run Road Area

Town of Medway Leak Correlation Survey Tests Continued

Survey Test 24: December 10, 2014
Coffee Street, Applegate Road, Ellis Street, Golden Road Drive, Virginia Road, Holliston Street, Higgins Road, Morningside Drive, Shamrock Lane, Ellis Street

Survey Test 25: December 10, 2014
Holliston Street, Village Street, Kennedy Drive, Kenart Road, Fuller Brook Road, Sanderson Street, Sanford Street, John Street, River Street

Survey Test 26: December 10, 2014 PVC Test
Little Tree Road, Rustic Road, Elm Street

Our goal is to serve clients to the best of our ability. Thank you for choosing to do business with us. If you have any questions on this matter please call or email me.

Best Regards,

James D. Liston
jim@listonutilityservices.com

Liston Utility Services
19 Mauriello Drive, Stoneham, MA 02801-2775
Phone 781 635 7711 Fax 781 435 1480

Page No. 1

Date December 4, 2017

Ownership Public Private Easement

Leak Indication classification

I C II B III A

Leakage Control Report

Contract

Company **Town Of Medway** Address **155 Village Street**

City **Medway** State **Massachusetts** **02053**

Address Samoset Circle at End

N

Indication of Leak

Sonic		X
Surfaced Water		
Correlation		

Leak Detected at:

Main Valve	
Curb Valve	
Meter Box	
Selected Test	
Hydrant	✓

Leak appears to be on

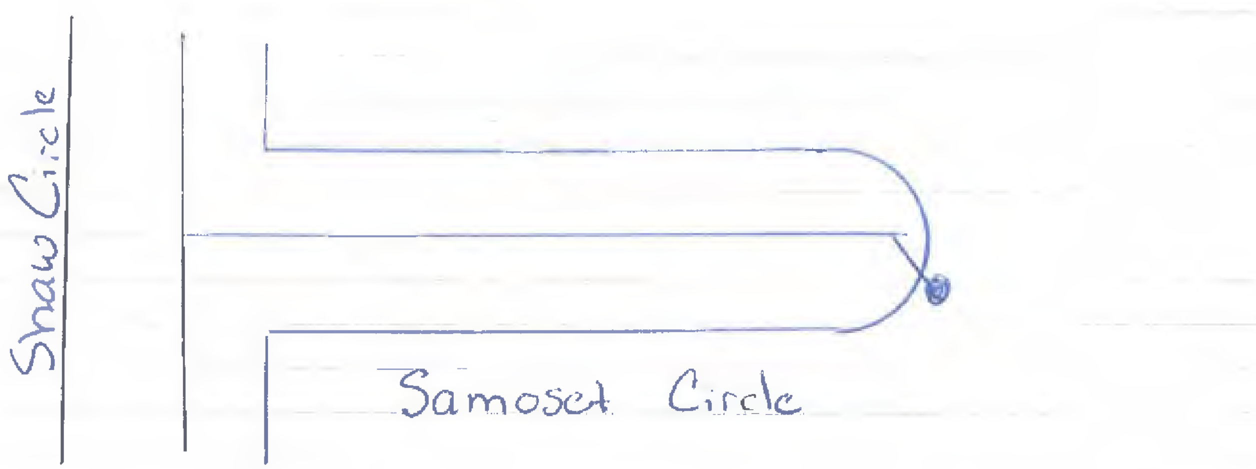
Main	
Service	
Joint Connection	
Hydrant	✓
Valve	
Misc	

Cover

Concrete	
Asphalt	✓
Brick	
Gravel	
Soil	✓
Other	

Estimated Leakage

2 GPM



Remarks

Leak was found sonically to be on the fire hydrant at the dead end of Samoset Circle

Liston Utility Services
19 Mauriello Drive, Stoneham, MA 02801-2775
Phone 781 635 7711 Fax 781 435 1480

Page No. 2
Date December 2, 2012
Ownership Public Private Easement
Leak Indication classification
I C II B III A

Leakage Control Report

Contract

Company **Town Of Medway** Address **155 Village Street**
City **Medway** State **Massachusetts** **02053**

Address Village Street at Franklin Street

N

Indication of Leak

Sonic		X
Surfaced Water		
Correlation		

Leak Detected at:

Main Valve	
Curb Valve	
Meter Box	
Selected Test	
Hydrant	X

Leak appears to be on

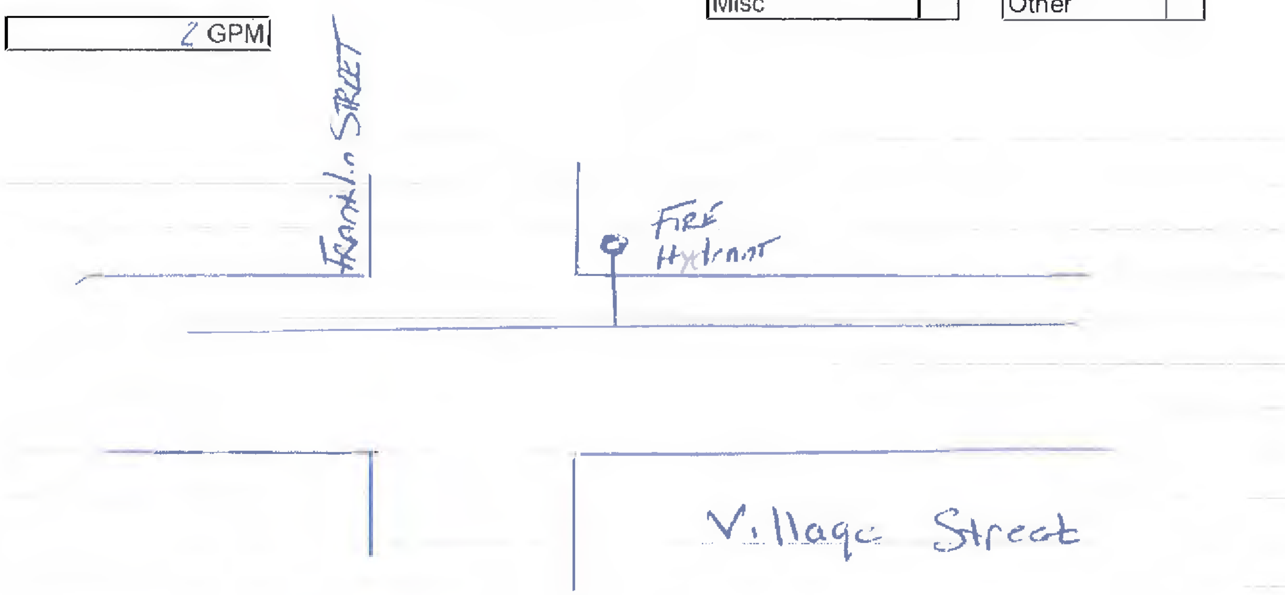
Main	
Service	
Joint Connection	
Hydrant	X
Valve	
Misc	

Cover

Concrete	
Asphalt	X
Brick	
Gravel	
Soil	
Other	

Estimated Leakage

2 GPM



Remarks
Leak was sonically found to be on the fire hydrant on Village Street at Franklin Street

Liston Utility Services

19 Mauriello Drive, Stoneham, MA 02801-2775

Phone 781 635 7711 Fax 781 435 1480

Page No. 3

Date December 2, 2014

Ownership Public Private Easement

Leak Indication classification

I C II B III A

Leakage Control Report

Contract

Company **Town Of Medway** Address **155 Village Street**

City **Medway** State **Massachusetts** **02053**

N

Address At 3 Ellis Street

Indication of Leak

Sonic	
Surfaced Water	
Correlation	X

Estimated Leakage

30+ GPM

Leak Detected at:

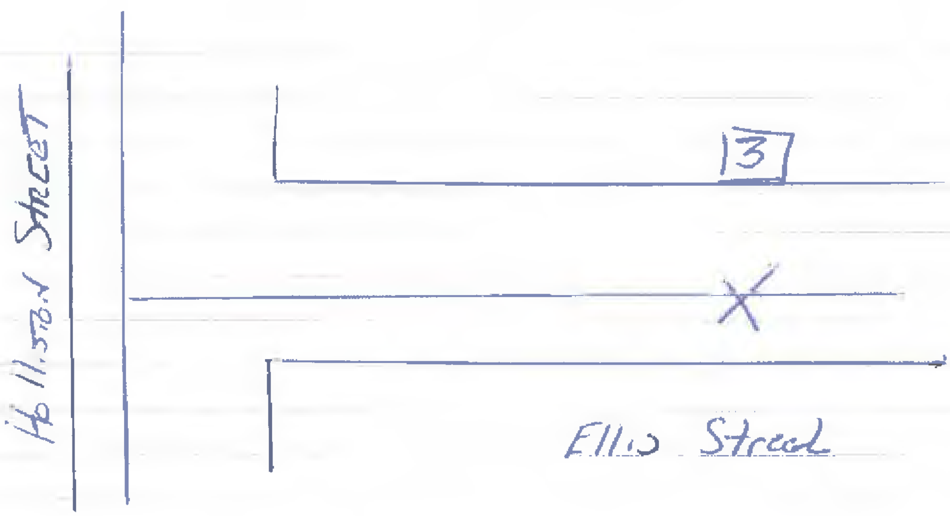
Main Valve	X
Curb Valve	
Meter Box	
Selected Test	
Hydrant	

Leak appears to be on

Main	X
Service	
Joint Connection	
Hydrant	
Valve	
Misc	

Cover

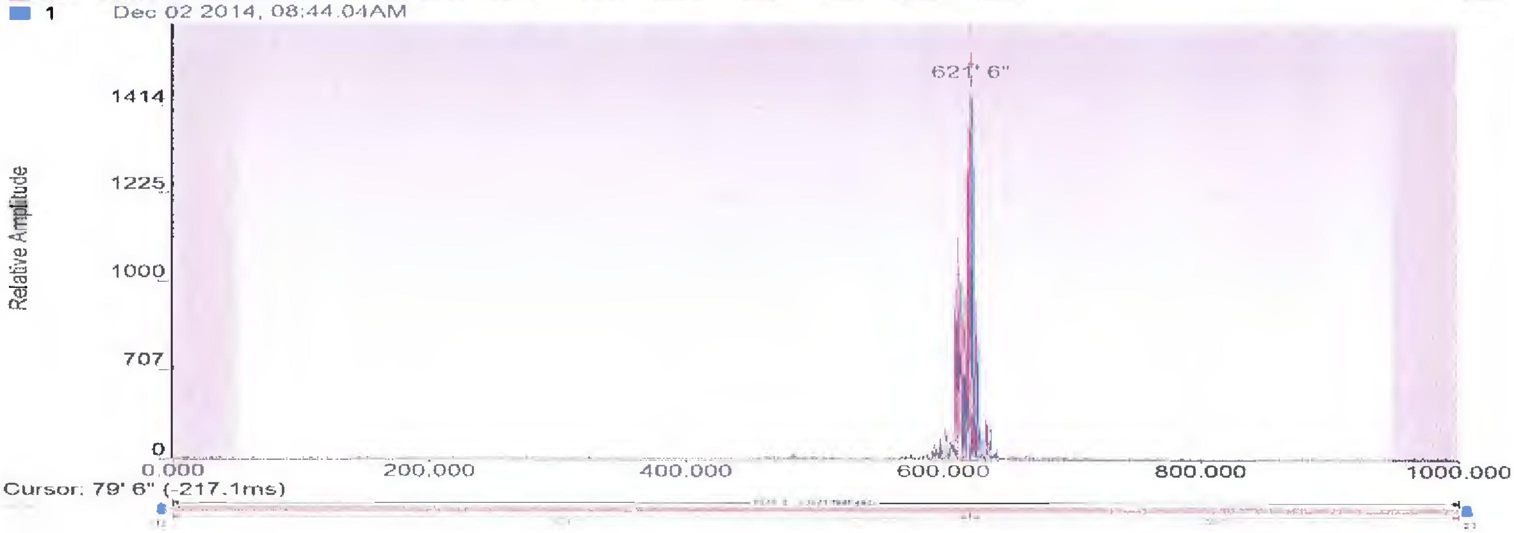
Concrete	
Asphalt	X
Brick	
Gravel	
Soil	
Other	



Remarks

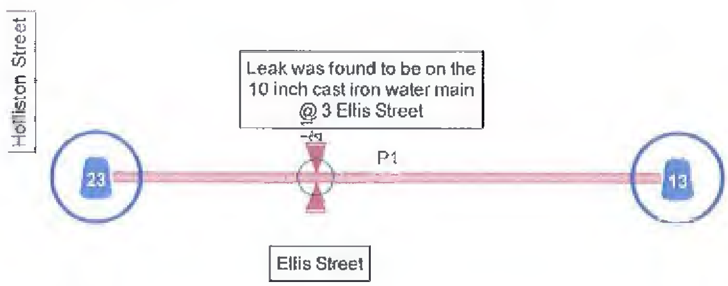
Leak was Correlated and found to be on the water main at 3 Ellis Street

[redacted]



Pipe ID	Length	Diameter	Material	Sound Velocity
P1	1000' 0"	10"	Cast Iron	3871 feet/sec

Leak ID	Leak Position	Correlation Between	Confidence	Recording Time
L1	623' 6" from 13	13 -> 23	91.9%	Dec 02 2014, 08:44:04AM
L2	621' 6" from 13	13 -> 23	91.3%	Dec 02 2014, 08:49:04AM
L3	621' 6" from 13	13 -> 23	91.3%	Dec 02 2014, 08:49:04AM



Printed Dec 16 2014, 07:40:45PM, Recorded Dec 02 2014, 08:49:04AM
C:\Users\Jim\Documents\SoundSens\Medway 2014\leak Ellis Street.ssd

RADCOM TECHNOLOGIES LTD SoundSens Leak Localisation & Correlation

Liston Utility Services

19 Mauriello Drive, Stoneham, MA 02801-2775

Phone 781 635 7711 **Fax 781 435 1480**

Page No. 4

Date December 2, 2014

Ownership Public Private Easement

Leak Indication classification

I C II B III A

Leakage Control Report

Contract

Company **Town Of Medway** Address **155 Village Street**

City **Medway** State **Massachusetts** **02053**

Address At 12 School Street

N

Indication of Leak

Sonic		✓
Surfaced Water		
Correlation		✓

Estimated Leakage

4 GPM

Leak Detected at:

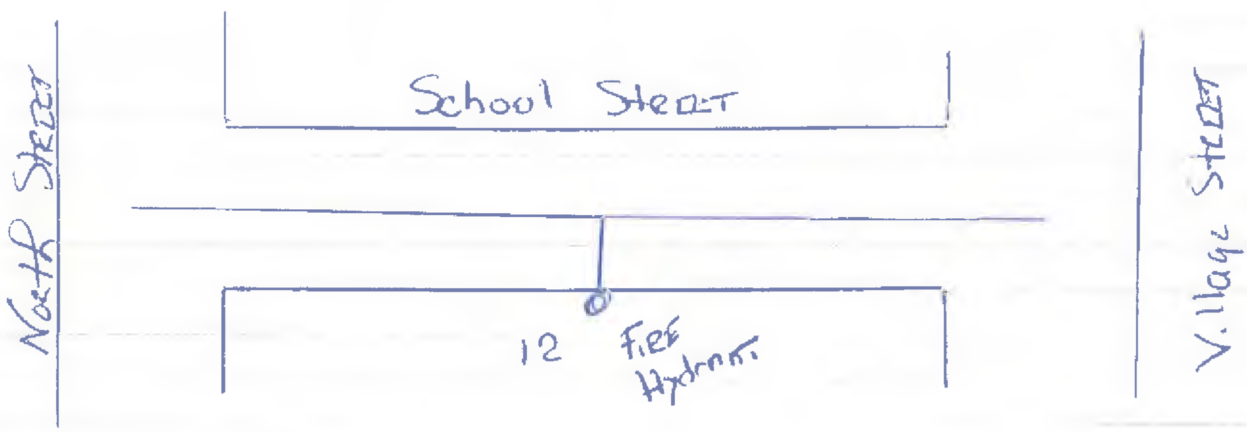
Main Valve	✓
Curb Valve	
Meter Box	
Selected Test	
Hydrant	✓

Leak appears to be on

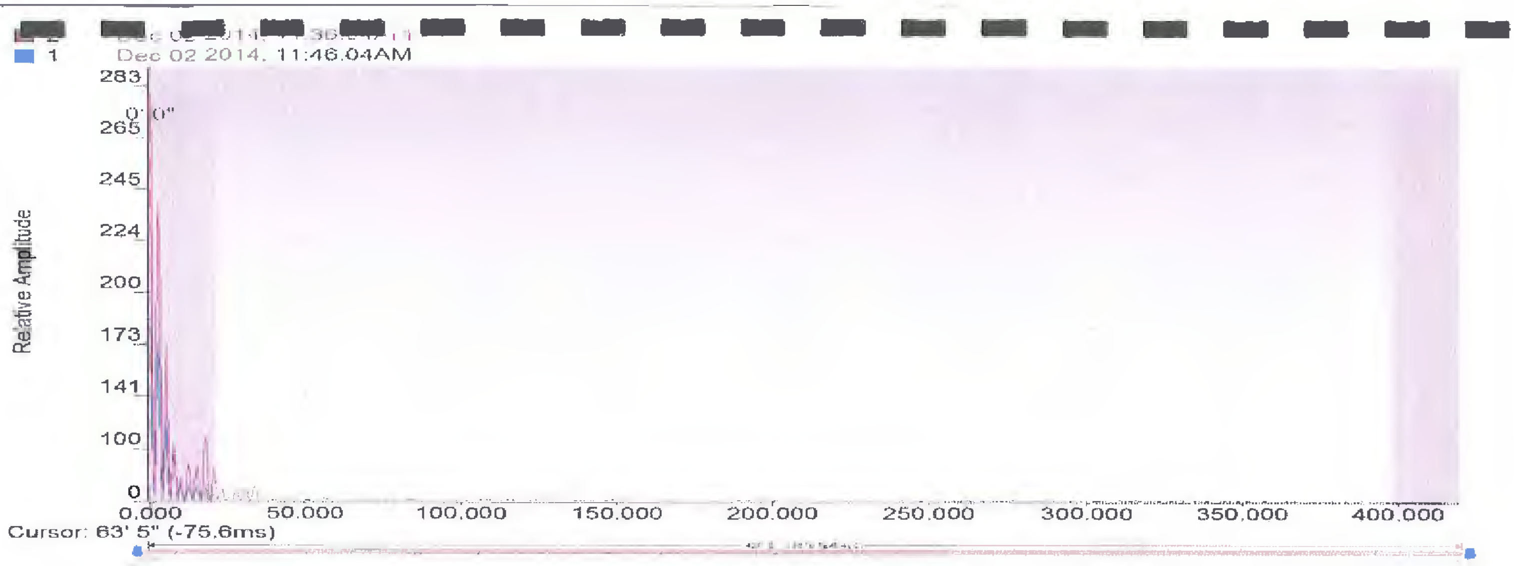
Main	
Service	
Joint Connection	
Hydrant	X
Valve	
Misc	

Cover

Concrete	
Asphalt	X
Brick	
Gravel	
Soil	X
Other	

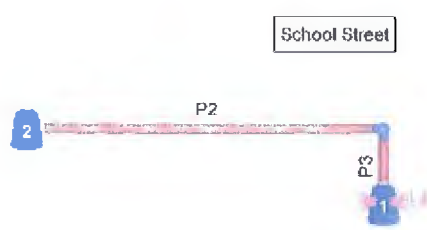


Remarks Leak was correlated and found to be on the hydrant on School Street



Pipe ID	Length	Diameter	Material	Sound Velocity
P2	410' 0"	10"	Cast Iron	3871 feet/sec
P3	10' 0"	6"	Cast Iron	4072 feet/sec

Leak ID	Leak Position	Correlation Between	Confidence	Recording Time
L1	419' 7" from 2	2 -> 1	88.7%	Dec 02 2014, 11:46:04AM
L2	419' 7" from 2	2 -> 1	87.9%	Dec 02 2014, 11:36:04AM
L3	0' 0" from 1	1 -> 2	88.7%	Dec 02 2014, 11:46:04AM
L4	0' 0" from 1	1 -> 2	87.9%	Dec 02 2014, 11:36:04AM



Liston Utility Services
19 Mauriello Drive, Stoneham, MA 02801-2775
Phone 781 635 7711 Fax 781 435 1480

Page No. 5
Date December 3, 2014
Ownership Public Private Easement
Leak Indication classification
I C II B III A

Leakage Control Report

Contract

Company **Town Of Medway** Address **155 Village Street**
City **Medway** State **Massachusetts** **02053**

Address Village Street at Walker Street

N

Indication of Leak

Sonic		X
Surfaced Water		
Correlation		X

Estimated Leakage: 300+ GPM

Leak Detected at:

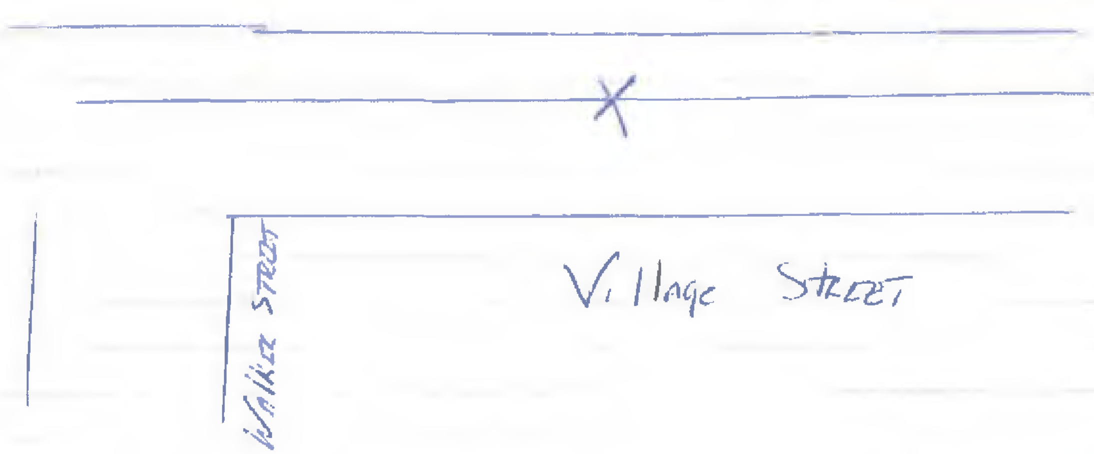
Main Valve	✓
Curb Valve	
Meter Box	
Selected Test	
Hydrant	✓

Leak appears to be on

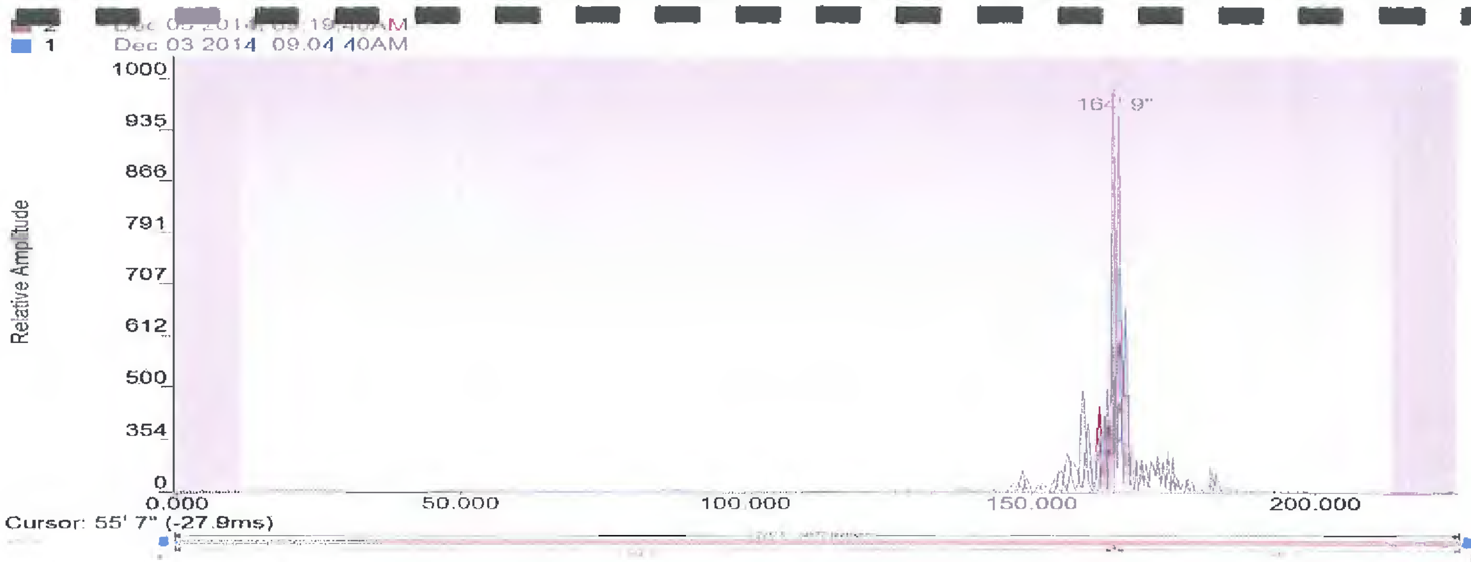
Main	✓
Service	
Joint Connection	
Hydrant	
Valve	
Misc	

Cover

Concrete	
Asphalt	X
Brick	
Gravel	
Soil	
Other	



Remarks leak was multi-correlated and found to be on the main on Village Street near Walker Street.



Pipe ID	Length	Diameter	Material	Sound Velocity
P1	225' 0"	6"	Cast Iron	4072 feet/sec

Leak ID	Leak Position	Correlation Between	Confidence	Recording Time
L1	165' 7" from 4	4 -> 2	83.4%	Dec 03 2014, 09:04:40AM
L2	164' 9" from 4	4 -> 2	83.2%	Dec 03 2014, 09:19:40AM

Liston Utility Services
19 Mauriello Drive, Stoneham, MA 02801-2775
Phone 781 635 7711 Fax 781 435 1480

Page No. 6
Date December 10, 2014
Ownership Public Private Easement
Leak Indication classification
I C II B III A

Leakage Control Report

Contract

Company **Town Of Medway** Address **155 Village Street**
City **Medway** State **Massachusetts** **02053**

Address 6 Fales Street

N

Indication of Leak

Sonic	✓
Surfaced Water	
Correlation	

Leak Detected at:

Main Valve	
Curb Valve	✓
Meter Box	
Selected Test	
Hydrant	

Leak appears to be on

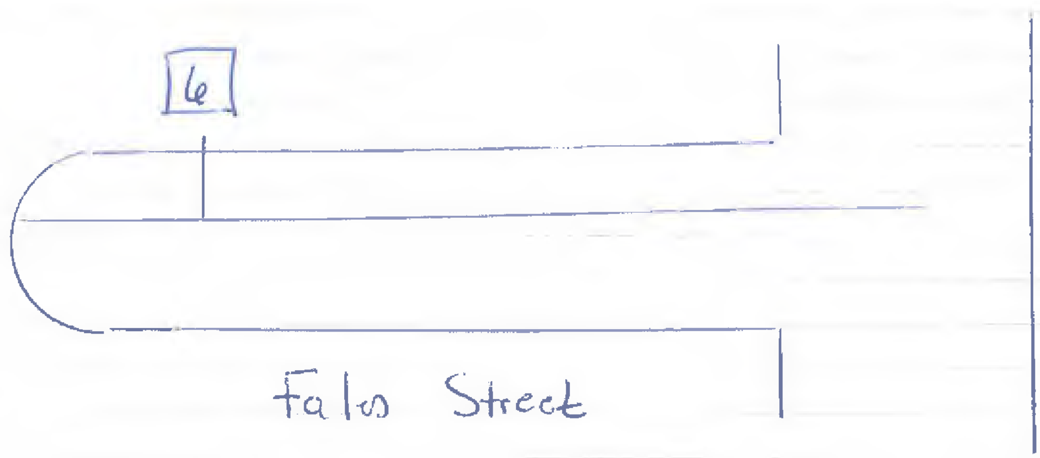
Main	
Service	✓
Joint Connection	
Hydrant	
Valve	
Misc	

Cover

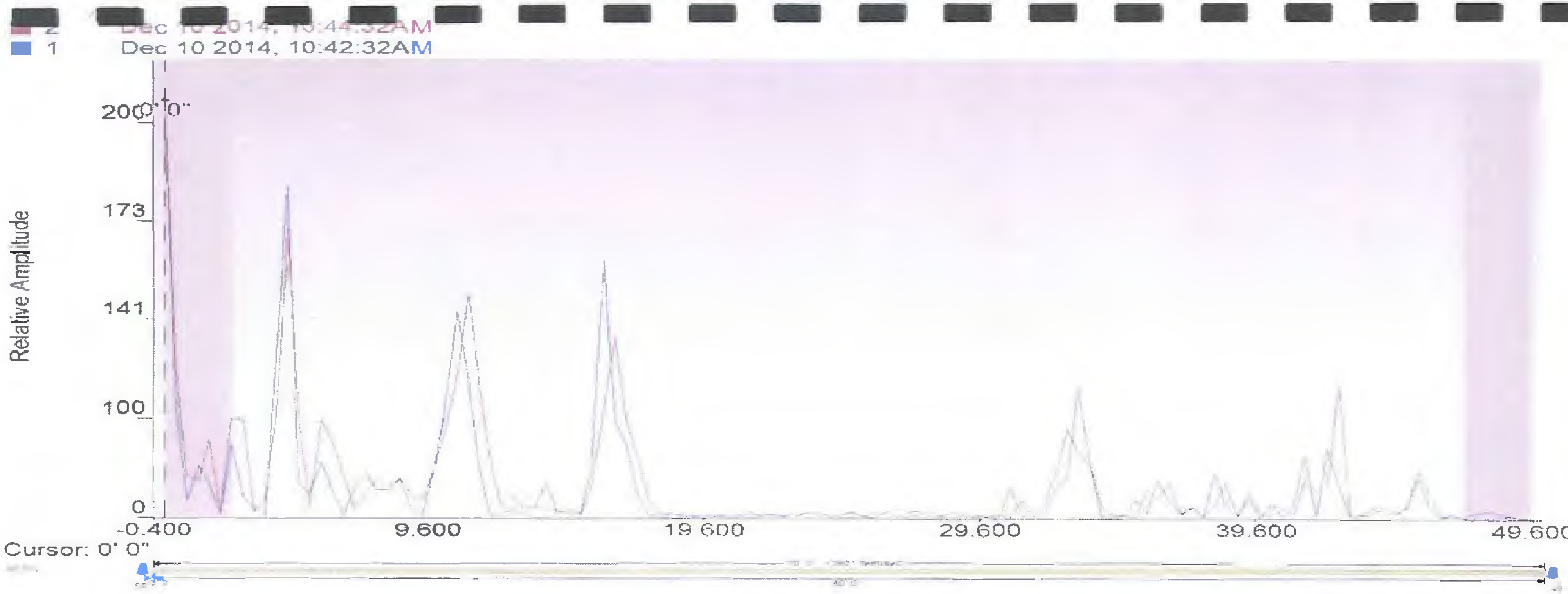
Concrete	
Asphalt	
Brick	
Gravel	
Soil	X
Other	

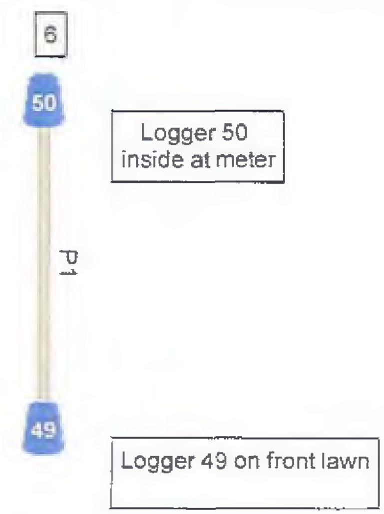
Estimated Leakage

2 GPM



Remarks Leak was correlated and appears to be at or near the foundation of 6 Fales Street





Pipe ID	Length	Diameter	Material	Sound Velocity
P1	50' 0"	1"	Copper	3901 feet/sec

Leak ID	Leak Position	Correlation Between	Confidence	Recording Time

Technical Appendix G

(1) Town of Medway 2014 Annual Statistical Report

(2) Town of Millis 2014 Annual Statistical Report

2014 Public Water Supply Verification

Please verify the information below and then click the Continue button.

PWS ID:	**2177000**
PWS Name:	**MEDWAY WATER/SEWER DEPARTMENT**
PWS Street Address Line 1:	**155 VILLAGE ST**
PWS Street Address Line 2:	
City/Town:	**MEDWAY**
State:	**MA**
Zip Code:	**02053-0000**
Class:	**COM**

Legally Responsible Party Contact Information

The Legally Responsible Party is that individual who has the ultimate authority to ensure that your system is in compliance with the federal and state drinking water regulations. This may be the owner of a private facility, a town or school official or other similarly authorized person.

Book/Page:	
First Name	WILLIAM
Middle Initial	
Last Name	DONAHUE
Company Name	MEDWAY WATER/SEWER DEPARTMENT
Phone Number	5085333208
Street Address 1	155 VILLAGE STREET
Street Address 2	
City/Town	MEDWAY
State	MA
Zip Code	02053

System Information (COM/NTNC)

1. PWS Street Address

MEDWAY WATER/SEWER DEPARTMENT		
PWS Name		
155 VILLAGE ST		
PWS Street Address Line 1	PWS Street Address Line 2	
MEDWAY	Massachusetts	02053
City/Town	State	Zip Code
508-533-3208	508-533-3201	
Phone Number	Fax Number (if available)	
Web Site Address of PWS (if available)		

2. PWS Mailing Address ☑ Same as street address.

MEDWAY WATER/SEWER DEPARTMENT		
Mailing Name		
155 VILLAGE ST		
Mailing address Line 1	Mailing address Line 2	
MEDWAY	Massachusetts	02053
City/Town	State	Zip Code

3. Is this a Seasonal System? (This question is not applicable to your PWS)

4. Owner/Responsible Person:

WILLIAM	A	DONAHUE	508-801-4586	☐ This is a new owner.
Owners Name- First, Middle Int, Last - one name only(if not municipal):			Phone Number	

5. Primary Contact:

BARRY		
SMITH	774-285-0482	☑ This is a new contact.
Name (First, Middle Int, Last) ▪ one name only▪	Phone Number	
bsmith@townofmedway.org		
Email Address (For Emergency Purposes)	Re-enter Email Address	

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

6. Certified Drinking Water Operators employed by the PWS:

Name	Grade	License Number	Function	Begin-Date	End-Date
WILLIAM , DONAHUE	1T/2D	22163/22379	PRIMARY TREATMENT OPERATOR	2/21/2012	
JEFFREY P, ROACH	1D/1T/2T/2D	23756/20206/24328/24512	SECONDARY TREATMENT OPERATOR	5/19/2006	
MARK A, LEONARDO	1T/1D	23431/24483	PRIMARY DISTRIBUTION OPERATOR	2/12/2013	3/14/2014
RYAN C, DUNN	1D OIT/1T OIT	24189/24515	GENERAL OPERATOR	2/12/2013	
GERALD J, OUILLETTE	4T/3D/3T/4D	8870/4942/8240/5775	GENERAL OPERATOR	2/12/2013	10/15/2013
PAUL E, MORRIS	1T OIT/1D OIT	23971/23144	SECONDARY DISTRIBUTION OPERATO	2/3/2014	
BARRY , SMITH	1D/1T/2D	22701/22346/24914	GENERAL OPERATOR	3/11/2014	
WILLIAM , DONAHUE	1T/2D	22163/22379	PRIMARY DISTRIBUTION OPERATOR	3/19/2014	
MARK A, LEONARDO	1T/1D	23431/24483	SECONDARY DISTRIBUTION OPERATO	3/19/2014	
JEFFREY P, ROACH	1D/1T/2T/2D	23756/20206/24328/24512	SECONDARY DISTRIBUTION OPERATO	3/19/2014	
MARK A, LEONARDO	1T/1D	23431/24483	SECONDARY TREATMENT OPERATOR	3/19/2014	

To add an operator, begin typing a license # in the field below. Pick the license number from the list and then click the "Add Operator" button.
License Number:

7. Primary Certified Operator Contact Information:

Primary Distribution Certified Operator Contact Information

WILLIAM DONAHUE 508-533-3208
Name Phone Number Fax Number

Mailing address information is provided to MassDEP by the Division of Professional Licensure

61 CONANT ROAD
Mailing Address 1 Mailing Address 2

WESTWOOD Massachusetts 02090
Town/City State Zip Code E-Mail Address Re-Enter E-Mail Address

Primary Treatment Certified Operator Contact Information

WILLIAM DONAHUE 508-533-3208
Name Phone Number Fax Number

Mailing address information is provided to MassDEP by the Division of Professional Licensure

61 CONANT ROAD
Mailing Address 1 Mailing Address 2

WESTWOOD Massachusetts 02090
Town/City State Zip Code E-Mail Address Re-Enter E-Mail Address

If you use a contract certified operator, does your system have a signed Public Water System Certified Operator Compliance Notice approved by the DEP

(•) N/A ( ) Yes ( ) No

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

8. Names of Water Commissioners/Selectmen/Trustees/Association Board Members (if applicable). Please attach an organizational chart, if available. ☐ Check here to upload

Name	Phone	Title

9. Owner Type:
MUNICIPAL

Federal Employment Identification Number (FEIN):
046001217
(FEIN) - Do NOT provide SSN

10. Is this system a not-for-profit organization

○ Yes ◉ No

If yes, indicate Tax Exempt code (e.g., 501C):		
11. Population Served(DailyAverage):		
Winter Population (October March):	11397	
Summer Population (April September):	11397	
By what method was the population figured	Census Type:	City/Town
	Other Description:	

12. Testing requirements for lead and copper and bacteria in your system is based on the population .

	Number of Samples	Frequency of Samples
Lead and copper samples required:	30	3YEARS
Winter Bacteria samples required:	23	MONTH
Summer Bacteria samples required:	23	MONTH

13. **Distribution Meter information:**	
a. Number of Service Connections:	3508
b. Percentage of service connections that are metered:	99 %
c. Are all publicly owned buildings metered?	◉ Yes ○ No ○ N/A
d. If No, what percent are	%

14. System Information	
a. Number of Distribution Systems:	1
b. Finished Water Storage Capacity in Million Gallons (MG): [Conversion factor is (# of gallons)/(1,000,000)= MG]	2.24
c. Pumping Capacity (GPM):	1350

15. Percentage of Source Types (must add up to 100%)

Ground Water	Surface Water	Purchased Ground	Purchased Surface
100 %	0 %	0 %	0 %

16. Emergency Response Actions:

a. Has your system completed an Emergency Response Plan (ERP).(DO NOT submit your ERP to MassDEP. MassDEP will review the ERP during your next sanitary survey.)

(•) Yes ( ) No

( ) I have made changes to the ERP (attach copies of all changes.)

(•) I have made no changes to the ERP.

b. Does your system have an Emergency Response (ER) annual training plan

( ) Yes (•) No

If Yes, please attach a copy of the plan. Describe the training performed during the reporting period, including the types of training, the date(s) of training, and number of staff and local officials trained on each date and their job titles.

c. Is your system registered for the Health and Homeland Alert Network (HHAN)

( ) Yes (•) No

d. Has your system signed the agreement and joined the Massachusetts Water and Wastewater Agency Response Network

( ) Yes ( ) No

e. How often does your system test the following

Alarms:	Annual	Other Frequency:	
Interlocks:	Annual	Other Frequency:	
Back-up power sources:	Other	Other Frequency:	WEEKLY

f. List and describe all Level 3 or higher ER incidents during the reporting period.

Date of ER incident	Level	Description

17. Do you have an antenna or other appurtenance (not needed for drinking water purposes) attached to any of your storage tank (s)

(•) Yes ( ) No ( ) No storage tanks

If Yes, list the antennae or other appurtenances, owner(s) names, and the date installed:

Storage Tank Name	Antennae or Appurtenance	Owner Name	Date (mm/dd/yyyy) Installed
HIGLAND STREET STORAGE TANK	ANTENNA FOR AMR	MEDWAY WATER	8/1/2012
LOVERING STREET STORAGE TANK	ANTENNA FOR AMR	MEDWAY WATER	8/1/2012
LOVERING STREET STORAGE TANK	2-WAY RADIO ANTENN	MEDWAY DPS	6/1/2013

18. Comments or additional information regarding this section:

Cross Connection Control Program (CCCP)

1. Cross Connection Program Coordinator

WILLIAM	DONAHUE	
Coordinator First Name	Coordinator Last Name	
155 VILLAGE ST		
Coordinator Street Address Line 1	Coordinator Street Address Line 2	
MEDWAY	Massachusetts	02053
City/Town	State	Zip Code
508-533-3208	508-533-3201	
Phone Number	Fax Number (if available)	
WDONAHUE@TOWNOFMEDWAY.ORG		
Coordinator email		

Surveyor Personnel Information :

To add a surveyor, begin typing the certification ID # in the field below. Pick the license # off the list and then click the "Add Surveyor" button.

MassDEP Certification ID Number

Tester Personnel Information :

To add a tester, begin typing the certification ID # in the field below. Pick the license # off the list and then click the "Add Tester" button..

MassDEP Certification ID Number

2. Did your system use the services of a third party/consultant for the implementation of your Cross-connection Control Program or a portion of it?

(●) Yes ( ) No

ROBERT	HEITZ	WATER SAFETY SERVIC
Contact First Name	Contact Last Name	Doing Business As (Company/Individual Name)
6 WALNUT HILL PARK		
Consultant Street Address Line 1	Consultant Street Address Line 2	
WOBURN	Massachusetts	01801
City/Town	State	Zip Code
781-932-8787	781-932-0957	
Phone Number	Fax Number (if available)	
WSS-INC@COMCAST.NET		
Consultant email		

Third Party Consultant Surveyor Personnel Information:

To add a surveyor, begin typing the certification ID # in the field below. Pick the license # off the list and then click the "Add Surveyor" button.

MassDEP Certification ID Number

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Surveyor's FirstName	Surveyor's LastName	MassDEP Certification ID Number	Expiration Date	Phone Number	Third Party Reviewer Surveyor
ROBERT G	HEITZ JR	31278		781-932-8787	☑
JOSEPH R	HEITZ	31866		781-932-8787	☑
MATTHEW J	QUILITZSCH	32360	12/1/2017	781-932-8787	☐

Third Party Consultant Tester Personnel Information:
To add a tester, begin typing the certification ID # in the field below. Pick the license # off the list and then click the "Add Tester" button.
MassDEP Certification ID Number

Tester's FirstName	Tester's LastName	MassDEP Certification ID Number	Expiration Date	Phone Number
MATTHEW J	QUILITZSCH	32360	12/1/2017	781-932-8787
JOSEPH R	HEITZ	31866	2/1/2017	781-932-8787

What services does the consultant perform for the town	
☑ Facilities Survey	☑ Testing of Devices
☑ Device Installation Plan Approval	☐ Program Management
☑ Other(explain)	CONSULTING

3. Complete the following table summarizing types and numbers of facilities surveyed during this reporting period.

Type of Facility	Total # of Facilities Served by PWS	# of Facilities Surveyed Prior to this reporting period	# of Facilities with first time surveys during this reporting period	# of Facilities Remaining to be Surveyed	# of Facilities Re-surveyed in this reporting period
	A	B	C	= A - (B+C)	
Commercial	181	181	0	0	55
Industrial	4	4	0	0	4
Institutional	1	1	0	0	1
Municipal	17	16	1	0	17
Residential (Optional)	0	0	0	0	0
Total	203	202	1	0	77

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

*Use Comment field at the end of this question set (question #16) to provide, clarifications, descriptions or explanations regarding the above data. Please reference the question number and table field in your description.

4. Are there any cross-connection(s) within your systems service area protected by:

Reduced Pressure Backflow Preventer (RPBP):	(●) Yes ( ) No
Double Check Valve Assembly (DCVA):	(●) Yes ( ) No

If the answer is No to both questions go to question 8. If the answer is yes please complete the appropriate section(s) of the following table.

Type of Facility	Total # of devices at the beginning of this reporting period	# of devices installed in this reporting period	# of devices removed & not replaced in this reporting period	Total # of devices	# of seasonal devices in Total
	A	B	C	= A +B-C	
RPBP					
Commercial	64	3	3	64	5
Industrial	12	0	1	11	0
Institutional	1	0	0	1	0
Municipal	30	1	0	31	1
Residential (Optional)	0	0	0	0	0
Total	107	4	4	107	6
DCVA					
Commercial	31	0	0	31	0
Industrial	4	0	0	4	0
Institutional	0	0	0	0	0
Municipal	5	1	0	6	0
Residential (Optional)	0	0	0	0	0
Total	40	1	0	41	0

*Use Comment field at the end of this question set (question #16) to provide, clarifications, descriptions or explanations regarding the above data.
Please reference the question number and table field in your description.
*PWSs must maintain a list of ALL registered cross connections that are being protected by a RPBP or DCVA. The list must contain at a minimum the following information: owner/business name, Cross Connection ID#, types of protection (RPBP or DCVA), brand, model, serial # and exact location within the facility.

5. Provide information on the testing performed in this reporting period by the type of device/assembly.

Type of Protection	# of Initial tests	# of Routine tests	# of Failures	# of Repairs &Re-tests	# Not Tested
RPBP	4	208	3	3	0
DCVA	1	41	1	1	0

Describe any discrepancies between the expected number of tests, based on the total number of devices reported in question #5, and the actual number of tests reported in question #6. If you reported a value greater than 0 for "# Not Tested" in question #6 provide an explanation for why the devices were not tested.

6. Can your PWS provide MassDEP with a copy of the list of RPBP and DCVA within 2 hours?

(●) Yes ( ) No

7. Does your PWS approve, permit and/or test PVB and/or SPPVB* devices?

PVB DEVICES: (●) Yes ( ) No — SPPVB DEVICES: ( ) Yes (●) No

if Yes to either please provide the following details:

Type of Protection	# of Initial tests	# of Routine tests	# of Failures	# of Repairs &Re-tests
PVB		15	0	0
SPPVB				

*Use Comment field at the end of this question set (question #16) to provide, clarifications, descriptions or explanations regarding the above data. Please reference the question number and table field in your description.

8. What is the maximum time allowed to protect a cross connection after the discovery of a violation?

Check one: ( ) 14 days (●) 30 days ( ) 90 days ( ) Greater than 90 days

9. Do you have a fully implemented active cross-connection educational program directed toward residential customers?

(●) Yes ( ) No

If No, is there a date when you plan to have an educational program implemented?
NTNCs may skip this question.

Date(mm/dd/yyyy)

10. Do you have a fully implemented educational program for specific users (ex. Industrial, Commercial, Institutional, Municipal and Residential)?

(●) Yes ( ) No ( ) N/A

"N/A" should be selected only if your system does not have any Industrial, Commercial, Institutional, Municipal or Residential users. If Yes, please list the types of users targeted through your education program. (Check all that apply):

[x] Industrial [x] Commercial [x] Institutional [x] Municipal [x] Residential

If No, when do you plan to have the educational program implemented?

Date(mm/dd/yyyy)

11. Does your system have an atmospheric vacuum breaker (hose bib) program for your customers?

( ) Yes (●) No

If no do you plan to institute one in furure?
If yes go to question13

( ) Yes (●) No

If yes When?
If no go to question 13.

Date(mm/dd/yyyy)

12. Does your system have a local ordinance, by-law or policy statement on cross-connection control?

(•) Yes ( ) No

If YES,and you already provided copy to MassDEP in 2008 (2007 ASR) no further action is required.

If YES,and you did not provide a copy to MassDEP please forward a copy to:

MassDEP Boston office, 1 Winter Street, 5th floor, Boston, MA 02108

Attn : Otavio DePaula-Santos

13. Does your water system have a total containment policy?

( ) Yes (•) No

Containment policy means ALL services connections have a device installed at the meter. Containment protects the water main by isolating each facility independently of its activity (residential, commertial, industrial, or municipal).

14. Has there been a cross-connection incident in your water system during the reporting period?

( ) Yes (•) No

If Yes, please provide infomation below:

Date of Incident	Location of the Incident	DESCRIPTION

Comments or additional information regarding this section

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Water Production & Consumption Information

How to report in Gallons vs. Million Gallons
When Converting gallons to Million gallons, decimal point moves 6 places to the left.

	If Reporting in Gallons (Gal)	If Reporting in Million Gallons (MG)
Example 1	45,562,100	45.5621
Example 2	340,212	0.340212
Example 3	631,020,000	631.02
Example 4	96,543	0.096543

Volume Units ○ Gallons (GAL) ◉ Million Gallons (MG) ○ No Meter

FINISHED Water Production and Consumption Summary for Reporting Year :

Finished Water means water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as treatment necessary to maintain water quality in the distribution system (e.g. booster disinfection, addition of corrosion control chemicals).

Month	(1) Amount of **finished** water from own sources (MG)	(2) Amount of **finished** water purchased from other systems (MG)	(3) Amount of **finished** water sold to other systems (MG)	(4) Net **finished** Water that entered your distribution system (1) + (2) - (3)= (4) (MG)
January	37.160	0.000	0.000	37.160
February	31.229	0.000	0.000	31.229
March	32.623	0.000	0.000	32.623
April	30.521	0.000	0.000	30.521
May	34.558	0.000	0.000	34.558
June	36.250	0.000	0.000	36.250
July	34.693	0.000	0.000	34.693
August	36.177	0.000	0.000	36.177
September	40.325	0.000	0.000	40.325
October	36.532	0.000	0.000	36.532
November	34.907	0.000	0.000	34.907
December	23.976	0.000	0.000	23.976
TOTAL	408.951	0.000	0.000	408.951

Maximum Daily Finished Water Consumption:	Volume (MG): 1.602	Date: 1/12/2014

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

RAW Water Production and Consumption Summary for Reporting Year :

Raw Water means water in its natural state, prior to treatment and is usually the water entering the first treatment process of a water treatment plant.

☑ Same as finished water (it is not necessary to complete Table if same volume as above)

Month	(1) Amount of **raw** water pumped from own sources (MG)	(2) Amount of **raw** water purchased from other systems (MG)	(3) Amount of **raw** water sold to other systems (MG)	(4) Net **raw** Water Consumption (1) + (2) - (3) = (4) (MG)
January	0.000	0.000	0.000	0.000
February	0.000	0.000	0.000	0.000
March	0.000	0.000	0.000	0.000
April	0.000	0.000	0.000	0.000
May	0.000	0.000	0.000	0.000
June	0.000	0.000	0.000	0.000
July	0.000	0.000	0.000	0.000
August	0.000	0.000	0.000	0.000
September	0.000	0.000	0.000	0.000
October	0.000	0.000	0.000	0.000
November	0.000	0.000	0.000	0.000
December	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000
Maximum Daily Raw Water Pumping:	Volume (MG):		Date:	

Summary of Water Sold
Sold Water

System Name	PWS ID#	Total Volume Sold	Water type

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Metered Finished Water Consumption by Service Type

U.S. EPA requires every PWS to report what their water is used for in order to characterize each system. In this table, report the percentages of metered water for each category below, ONLY for those categories over 10%. For municipal water suppliers, most of the water will be reported as Residential Area. If any other categories are more than 10% of your metered use, report it in the appropriate category. If any category is less than 10%, do NOT report it. The precentage do NOT have to add to 100%, since water use in some categories will be less than 10% and therefore is not reported.

ONLY report uses for categories over 10% of total metered use. Report ALL metered water use in the Water Management Distribution System Form (if appropriate)

%	Primary Service Area	Type	%	Primary Service Area	Type
	○ Yes	Day Care Center		○ Yes	Other Residential
	○ Yes	Dispenser		○ Yes	Other Transient
	○ Yes	Homeowners Association		○ Yes	Recreation Area
	○ Yes	Hotel/Motel	81	◉ Yes	Residential Area
	○ Yes	Highway Rest Area		○ Yes	Restaurant
	○ Yes	Industrial/Agricultural		○ Yes	Retail Employees
	○ Yes	Interstate Carrier		○ Yes	School
	○ Yes	Institution		○ Yes	Sanitary Improvement District
	○ Yes	Medical Facility		○ Yes	Summer Camp
	○ Yes	Mobile Home Park		○ Yes	Secondary Residences
	○ Yes	Mobile Home Park, Principal Residence		○ Yes	Service Station
	○ Yes	Municipality		○ Yes	Subdivision
	○ Yes	Other Area		○ Yes	Water Bottler
	○ Yes	Other Non-Transient Area		○ Yes	Wholesaler
19	○ Yes	Commercial			

Summary of Treatment Plant Losses (complete only if finished water volume is less than raw water)

☐ No treatment plant losses (not applicable)

Treatment Plant ID:	Total Raw Water into treatment plant last year (raw pumped + raw purchased - raw sold):	-	Total Finished Water from treatment plant last year:	=	Total Water Lost to Treatment Process last year:

Briefly describe the fate of the waste product (slurry or sludge) produced by your treatment process (discharge to sewer, groundwater discharge, settling lagoons, re-circulate back into treatment plant, etc.):

X. Comments or additional information regarding this section

Source Protection - Zone II

Zone

1. Mass DEP assigned Zone II ID # :	**410**

2. DEP Source IDs and Names of the withdrawal points in Zone II.

SourceID	Source Name	Zone I Radius(ft)	Zone I Control	Pollution Sources
2177000-02G	OAKLAND STREET GP WELL	400	Y	STREAM, FUEL STORAGE (PROPANE, ABOVE GROUND)

3. MassDEP SWAP Program Identified Potential Sources of Contamination (PSC), please update with current water supply protection area inventory information.

PSC Description	Quantity	Ground Threat	Comments
AQUATIC WILDLIFE	3	L	
STORMWATER DRAINS / RETENTION BASINS	10	L	
VERY SMALL QUANTITY HAZARDOUS WASTE GENERATORS	4	M	
21E OIL OR HAZARDOUS MATERIALS RELEASE	1	-	
NPDES LOCATIONS	1	L	
LIVESTOCK OPERATIONS	1	M	
AUTO REPAIR SHOP	1	H	
CEMETARY	2	M	
FUNERAL HOME	1	L	
GAS / SERVICE STATION	1	H	
MEDICAL FACILITY	1	M	
PAINT SHOP	1	H	
FUEL OIL DISTRIBUTOR	1	H	
RESIDENTIAL FUEL OIL STORAGE	10	M	
RESIDENTIAL LAWN CARE/GARDENING	10	M	
RESIDENTIAL SEPTIC/CESSPOOL	10	M	
ROAD/MAINTENANCE FACILITY	1	M	
TRANSMISSION LINE	1	L	
TRANSPORTATION CORRIDOR	1	M	
WASTE WATER TREATMENT PLANT	1	M	
MANURE SPREADING OR STORAGE	1	H	

4. Did your inspections of the Zone II identify any new land uses or activities that pose a threat to drinking water quality?

○ Yes ◉ No

If YES, please describe:

5. Did your inspection identify any violations of state or local land use controls?

○ Yes ◉ No

If YES, please describe the violation(s), reporting and resolutions:

6. If YES, did you report those violations to the municipality (i.e. building inspector, board of health, planning board)?

○ Yes ○ No

Zone

1. Mass DEP assigned Zone II ID # :	**501**

2. DEP Source IDs and Names of the withdrawal points in Zone II.

SourceID	Source Name	Zone I Radius(ft)	Zone I Control	Pollution Sources
2177000-01G	POPULATIC/WATER STREET GP WELL	400	N	ROAD, STREAM, STORAGE AREA (PIPES), PARKING AREA, FUEL STORE
2177000-03G	VILLAGE STREET GP WELL	400	N	STREAM, FUEL STORAGE (PROPANE, ABOVE GROUND)
2177000-05G	VILLAGE ST. 12X18" REPLACEMENT WELL	400	N	CHARLES RIVER, STREAM/WETLAND, UTILITY EASEMENTS

3. MassDEP SWAP Program Identified Potential Sources of Contamination (PSC), please update with current water supply protection area inventory information.

PSC Description	Quantity	Ground Threat	Comments
AQUATIC WILDLIFE	3	L	
STORMWATER DRAINS / RETENTION BASINS	10	L	
VERY SMALL QUANTITY HAZARDOUS WASTE GENERATORS	4	M	
21E OIL OR HAZARDOUS MATERIALS RELEASE	1	-	
NPDES LOCATIONS	1	L	
LIVESTOCK OPERATIONS	1	M	
AUTO REPAIR SHOP	1	H	
CEMETARY	2	M	
FUNERAL HOME	1	L	
GAS / SERVICE STATION	1	H	

MEDICAL FACILITY	1	M	
PAINT SHOP	1	H	
FUEL OIL DISTRIBUTOR	1	H	
RESIDENTIAL FUEL OIL STORAGE	10	M	
RESIDENTIAL LAWN CARE/GARDENING	10	M	
RESIDENTIAL SEPTIC/CESSPOOL	10	M	
ROAD/MAINTENANCE FACILITY	1	M	
TRANSMISSION LINE	1	L	
TRANSPORTATION CORRIDOR	1	M	
WASTE WATER TREATMENT PLANT	1	M	
MANURE SPREADING OR STORAGE	1	H	

4. Did your inspections of the Zone II identify any new land uses or activities that pose a threat to drinking water quality?

○ Yes ◉ No

If YES, please describe:

5. Did your inspection identify any violations of state or local land use controls?

○ Yes ◉ No

If YES, please describe the violation(s), reporting and resolutions:

6. If YES, did you report those violations to the municipality (i.e. building inspector, board of health, planning board)?

○ Yes ○ No

Zone

1. Mass DEP assigned Zone II ID # :	**646**

2. DEP Source IDs and Names of the withdrawal points in Zone II.

SourceID	Source Name	Zone I Radius(ft)	Zone I Control	Pollution Sources
2177000-04G	INDUSTRIAL PARK RD. WELL	400	Y	NONE

3. MassDEP SWAP Program Identified Potential Sources of Contamination (PSC), please update with current water supply protection area inventory information.

4. Did your inspections of the Zone II identify any new land uses or activities that pose a threat to drinking water quality?

○ Yes ◉ No

If YES, please describe:

5. Did your inspection identify any violations of state or local land use controls?

○ Yes ◉ No

If YES, please describe the violation(s), reporting and resolutions:

6. If YES, did you report those violations to the municipality (i.e. building inspector, board of health, planning board)?

○ Yes ○ No

Comments or Additional Information regarding this section:

Water Management Act Annual Report - Distribution

All public water suppliers distributing 100,000 gallons per day or more must complete Tables DS-1 through DS-5 and Tables DS-7 and DS-8. Tables DS-6 and DS-9 are optional. Instructions for completing Tables DS-1 through DS-8 are included in the ASR Instructions available at MassDEP's website. If you have any questions concerning completion of the Distribution System Report, please contact Richard Friend with the WMA Program at (617) 654-6522 or email him at richard.friend@state.ma.us

Table DS-1 Summary of Leak Detection Activities During the Reporting Year	
1. Total miles of water mains	75
2. Miles of mains surveyed this year	75
3. Number of leaks found	7
4. Number of leaks repaired	7
5. Estimated volume lost (mg) if a reliable estimate can be made	158.99
6. Date of last leak detection survey of entire system:	11/1/2014 (mm/dd/yyyy)

Table DS-2 Water Conservation - Limits on Withdrawals

1. **Did your PWS implement mandatory nonessential outdoor water use restrictions in the reporting year?**

   (●) Yes ( ) No

2. **If yes,why did you institute mandatory restrictions (check all that apply)?**

a. [x] Required by WMA permit

   [x] Calendar trigger in permit

   [ ] Streamflow trigger in permit

   [ ] Other trigger in permit — If "Other Trigger" then describe:

b. [ ] Reason other than permit requirement

   Describe:

3. **Please characterize the type of mandatory restrictions that were in place (Check all that apply)**

   [x] Total outdoor ban

   [x] Hand-held only

   [ ] Hourly Describe:

   Daily: ( ) Odd/Even ( ) Twice/Week ( ) Once/Week ( ) Other Daily — If "Other Daily" then describe:

4. **If you instituted mandatory restrictions, on what dates were restrictions in place? (you may have had only one period of restriction)**

	Start Date	End Date
Period 1	5/1/2014	10/1/2014
	(mm/dd/yyyy)	(mm/dd/yyyy)
Period 2		
	(mm/dd/yyyy)	(mm/dd/yyyy)
Period 3		
	(mm/dd/yyyy)	(mm/dd/yyyy)

5. **Indicate if you plan or expect to institute nonessential outdoor water use restrictions in the upcoming summer. If you hold a WMA permit with Seasonal Limits on Nonessential Outdoor Water Use conditions, indicate whether you plan on instituting calendar-based or streamflow trigger-based outdoor water use restrictions. Remember that if you plan on instituting calendar restrictions, they must be in place by May 1. Streamflow-based restrictions must be in place once the trigger specified in your WMA permit has been reached for three consecutive days. Refer to your permit for specific nonessential outdoor water use requirements. Indicate if you plan on instituting restrictions even though you do not hold a WMA permit with outdoor water use restriction or do not hold a permit at all.**

- [x] Planning to institute calendar-based nonessential outdoor water use restrictions per WMA permit.
- [ ] Planning to institute streamflow-based nonessential outdoor water use restrictions per WMA permit.
- [ ] Planning to institute nonessential outdoor water use restrictions for reasons other than WMA permit requirements.
- [ ] Do not intend on instituting nonessential outdoor water use restrictions.

Please Note: Enter volumes in Tables DS-3, DS-4, DS-5 and DS-6 in million gallons per year (mgy).
Example 1: if a volume is 654,120,152 gallons, enter 645.120152 mgy.
Example 2: if a volume is 580,123 gallons, enter 0.580123 mgy.
Example 3: if a volume is 86,000 gallons, enter 0.086 mgy.

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Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Table DS-3 Metered Finished Water Use Complete Table DS-3 to account for all of your metered water volumes (e.g. permanent and temporary; private and municipal/government; billed and non-billed). Do not include water sold to other PWSs, which is reported on the Water Production & Consumption Information form

Use Category	No. of Service Connections	Total Volume (mgy)	Category Description
Residential	3333	251.53583	Water provided to residences in your distribution system, including for-profit apartments, condos, and seasonal homes. All water used for lawn watering at residential buildings belongs in this category.
Residential Institutions	17	1.593455	Water provided to institutions with residential population such as colleges. It is optional to account institutions volumes separately (may be included in Residential above - see instructions).
Commercial/Business	153	2.226257	Water served to businesses and other commercial entities.
Agricultural	5	0.026499	Water used mainly to grow food, raise animals, or run a garden center.
Industrial	30	1.407786	Water used mainly for industrial purposes.
Municipal/Institutional/Non-profits	42	0.614320	Water used for municipal purposes, including schools, playing fields, municipal buildings, treatment plant; non-profits such as churches; non-residential institutions such as private schools.
Other*			Water used for purposes not included in above categories.
TOTALS	3580	257.404147	Total number of service connections and metered volume.

* If you include a volume under "Other", list the use(s):

UNACCOUNTED FOR WATER (UAW)

Table DS-4 Confidently Estimated Municipal Use volume To qualify as confidently estimated municipal use calculations/documentation for each estimated use must be attached to this ASR or mailed to MassDEP. If no documentation is provided, DEP will count the volumes as unaccounted for water. See ASR Instructions for more detail. Leak detection volumes are not counted as a confidently estimated municipal use. Optional Excel spreadsheets for calculating confidently estimated use can be found at the MADEP website at http://www.mass.gov/eea/agencies/massdep/water/approvals/drinking-water-forms.html#16

Confidently Estimated Municipal Use (CEMU)	Estimated million gallons per year
Fire protection & training	1.17
Hydrant/water main flushing/main construction	+ 8.82
Flow testing	+ 0.07
Bleeders/ Blow offs	+ 0.0
Tank overflow & drainage	+ 0.0
Sewer & stormwater system flushing	+ 0.02
Street cleaning	+ 0.01
Source meter calibration adjustments	+ 0.01
Major water main breaks (not leak detection)	+ 158.99
Total Confidently Estimated Municipal Use	= 169.09

YOU MUST PROVIDE DOCUMENTATION FOR ALL OF YOUR CEMU VOLUMES.

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PWS Class: COM

Are you attaching electronic files to the eASR that document your CEMU volumes?

(•) Yes ( ) No

Paper copies of CEMU volumes may be mailed to:
Mass DEP
1 Winter St.
Boston MA 02108
Attn: Water Management Act Program

Table DS-5 Unaccounted for Water To calculate UAW, subtract total metered use and confidently estimated municipal use volumes from the total volume of finished water entering your distribution system.

	Million Gallons/Year (MGY)	% of Total Water Available for Distribution
Total Finished Water Available for Distribution **(Total Net Finished Water from Production Form)**	408.951	100%
Total Metered Use **(System Total Metered Use from Table DS-3)**	- 257.404147	- 62.9 %
Total Confidently Estimated Municipal Use **(Total from Table DS-4)**	- 169.09	- 41.3 %
Unaccounted for Water (UAW)	= -17.5	= -4.3 %

Table DS-6 Sources of Unaccounted for Water (Optional) Use this table to provide estimated volumes of your unaccounted for water.

Known or Suspected Source of Unaccounted for Water	Estimated Volume (MGY)
Leak Detection	158.992
Water Theft	
Meter Malfunction/mis-registration	
Other (specify):	
Other (specify):	
Total:	158.992

RESIDENTIAL GALLONS PER CAPITA DAY (RGPCD)

RGPCD is a performance standard for public water suppliers serving municipalities and is a measure of the average amount of water a resident uses each day during the reporting period. High RGPCD values are associated with unrestricted outdoor water use, especially lawn watering. See ASR Instructions for further explanation and examples. There are two steps to determine your RGPCD number: Step 1: Determine the residential population served by your system (2 options to choose from). Step 2: Calculate RGPCD from population served and residential metered water volume.

RGPCD Step 1 - Choose one of two options to determine Population Served

Population Option 1: Accurate Count (census data): If your PWS serves an entire municipality, then use the most recent local or Federal census number for the total residential population. Click Here for 2010 U.S. census populations for MA cities and towns. Partially served communities can use the most recent local or Federal census if private well users and/or those served by other PWS systems are subtracted out (attach documentation to this ASR). Communities with high seasonal fluctuations can pro-rate the population for the duration of the influx. See ASR Instructions for further detail and examples.

Population Option 2: Estimate from Households Served If your PWS serves a portion of one or more communities and you cannot obtain a reliable census, click on the following link to open an excel spreadsheet for estimating your population. Click Here. This estimate is calculated from the number of households connected to your distribution system and the average household size. Save the spreadsheet onto your computer for use in subsequent years' reporting. If you are using a spreadsheet from your assessor's office or planning board to estimate number of households served, attach the spreadsheet or mail it to DEP and report the population served on Table DS-7 below.

If mailing Population Calculations or documentation send to:
Mass DEP
1 Winter St.
Boston MA 02108
Attn: Water Management Act Program

Table DS-7 Residential Population Served	
Community(ies) served by PWS is (are) :	Partially Served
Method of Determining Population Served:	Option 1(Census)
Census Type (Federal or Local):	Federal
Census year:	2013
Population Served:	8910

RGPCD Step 2 – Calculate RGPCD

Table DS-8 Residential Gallons per Capita Day To determine RGPCD, your metered residential volume (million gallons/year) is divided by 365 days. The result in then divided by the population served and multiplied by 1,000,000 to obtain gallons per person per day. If you include Residential Institutions volume in your RGPCD volume, also include the Residential Institutions population. See ASR instructions

Residential Water Use (million gallons)	**/ 365**	**/ Population Served**	**X 1,000,000**	**=**	**Residential Gallons per Capita Day (gallons/person/day)**
251.53583	/ 365	/ 8910	X1,000,000	=	77

Table DS-9: Use this table to provide comments or additional information regarding this section of the ASR. You may explain discrepancies, provide supplemental information, or provide any other information to assist MassDEP in processing the data in your ASR.

Water Management Act Annual Report - Basin Withdrawal

Instructions for completing Tables BW-1 through BW-4 are included in the ASR Instructions available at MassDEP's website. If you have any questions concerning completion of the Water Management Act Annual Report, please contact Richard Friend with the WMA Program at (617) 654-6522 or email him at richard.friend@state.ma.us

Table BW-1 Permit & Registration Information

River Basin (Watershed)	Registration Number	Permit Number
20-CHARLES	22017701	9P422017701

Water Withdrawal by Watershed

Calculation of Daily Average Withdrawal: Use Table BW-2 to document the reporting year withdrawal volume(s) by watershed. Table BW-3 compare's the reporting year actual withdrawal volume(s) to the volume(s) authorized under your WMA registration (s) and/or permit(s). The total volumes for each source and their respective watershed are reported in the Ground Water Sources and for Surface Water Sources report forms. Enter the total of all sources for each watershed in Table BW-2.

Enter volumes in million gallons per year(MGY). Example: If you pumped 400,512,000 gallons in the year, enter 400.512.

Table BW-2 Average Daily Withdrawal by Watershed

River Basin	Total Raw Water Pumped in the reporting year (mgy)	/ 365 =	Watershed Average Daily Withdrawal (mgd)
20-CHARLES	400.01	/ 365 =	1.10

Table BW-3 WMA Authorized Volume vs. Actual Withdrawal Volume

River Basin	Registered Volume (mgd)	+	Permitted Volume (mgd)	=	WMA Authorized Withdrawal Volume (mgd)	-	Daily Avg. Water Use (mgd) (from Table BW-2 above)	=	Difference*
20-CHARLES	0.72	+	0.20	=	0.92	-	1.10	=	-0.18

*** A positive difference indicates that the volume withdrawn is less than the authorized volume. A negative value indicates that more water was pumped than is authorized and that your PWS may be out of compliance.**

Table BW-4 Permit Special Conditions

Review your WMA permit and list any Special Conditions of your WMA permit that require submission of an annual report to MassDEP. If the required report is being submitted with this ASR, please note in Table BW-4. If a required report was submitted earlier in the year, please provide the date submitted.

WMA Permit Special Condition Requiring Annual Report to MassDEP	Report Attached to ASR	If not attached, date submitted to MassDEP
	○ Yes ○ No	(mm\dd\yyyy)

If mailing annual report, send to:
MADEP
1 Winter St.
Boston MA 02108
Attn: Water Management Act Program

Table BW-5 Use this table to provide comments or additional information regarding this section of the ASR. You may explain discrepancies, provide supplemental information, or provide any other information to assist MassDEP in processing the data in your ASR.

Treatment Plants

Treatment Plant

1. Plant Information

Plant ID# : 2177000-05T		Plant Name: VILLAGE ST. GP WELL #5 TREATMENT PLANT	
Street Address Line 1: VILLAGE ST.		Street Address Line 2:	
City/Town: MEDWAY		State(2 letter abbreviation): MA	Zip: 02053
Status: A	Availability: ACTIVE	Class: I - T	Capacity (MGD):
Contact:		Phone:	Fax:

2. Related Sources Table

2177000-05G	VILLAGE ST. 12X18" REPLACEMENT WELL

3. Treatment Table(s)

Treatment Objective: CORROSION CONTROL		Treatment Process: SEQUESTRATION
Innovative: N	Start Date: 05/07/2008	End Date:

Chemical Name
SODIUM CALCIUM MAGNESIUM POLYPHOSPHATE, GLASSY

Comment:

Treatment Objective: OTHER		Treatment Process: FLUORIDATION
Innovative: N	Start Date: 05/07/2008	End Date:

Chemical Name
SODIUM FLUORIDE

Comment:

Treatment Objective: CORROSION CONTROL		Treatment Process: PH ADJUSTMENT
Innovative: N	Start Date: 05/07/2008	End Date:

Chemical Name
CALCIUM HYDROXIDE

Comment:

Treatment Plant

1. Plant Information

Plant ID# : 2177000-04T		Plant Name: INDUSTRIAL RD. WELL WTF	
Street Address Line 1: INDUSTRIAL ROAD		Street Address Line 2:	
City/Town: MEDWAY		State(2 letter abbreviation): MA	Zip: 02053
Status: A	Availability: ACTIVE	Class: I - T	Capacity (MGD): .5
Contact:		Phone:	Fax:

2. Related Sources Table

2177000-04G	INDUSTRIAL PARK RD. WELL

3. Treatment Table(s)

Treatment Objective: CORROSION CONTROL	Treatment Process: PH ADJUSTMENT	
Innovative: N	Start Date: 05/13/2009	End Date:

Chemical Name
CALCIUM CARBONATE

Comment:
LIME FOR PH ADJUSTMENT

Treatment Objective: CORROSION CONTROL	Treatment Process: INHIBITOR, ORTHOPHOSPHATE	
Innovative: N	Start Date: 05/13/2009	End Date:

Chemical Name
BLENDED PHOSPHATE

Comment:

Treatment Objective:	Treatment Process:
OTHER	FLUORIDATION

Innovative:	Start Date:	End Date:
N	05/13/2009	

Chemical Name
SODIUM FLUORIDE

Comment:

Treatment Objective:	Treatment Process:
DISINFECTION	HYPOCHLORINATION, POST

Innovative:	Start Date:	End Date:
N	05/13/2009	

Chemical Name
SODIUM HYPOCHLORITE

Comment:

Treatment Plant

1. Plant Information

Plant ID# :	Plant Name:
2177000-02T	VILLAGE ST. GP WELL 3 TREATMENT PLANT

Street Address Line 1:	Street Address Line 2:
VILLAGE ST	

City/Town:	State(2 letter abbreviation)	Zip:
MEDWAY	MA	02053

Status:	Availability:	Class:	Capacity (MGD):
I	INACTIVE	I - T	

Contact:			Phone:	Fax:
WILLIAM		DONAHUE	5085333208	

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Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

2. Related Sources Table

2177000-03G	VILLAGE STREET GP WELL

3. Treatment Table(s)

No Data Found

Treatment Plant

1. Plant Information

2177000-03T		POPULATIC ST. GP WELL 1 TREATMENT PLANT	
Plant ID# :		Plant Name:	
POPULATIC ST			
Street Address Line 1:		Street Address Line 2:	
MEDWAY		MA	02053
City/Town:		State(2 letter abbreviation)	Zip:
A	ACTIVE	I - T	
Status:	Availability:	Class:	Capacity (MGD):
WILLIAM	DONAHUE	5085333208	
Contact:		Phone:	Fax:

2. Related Sources Table

2177000-01G	POPULATIC/WATER STREET GP WELL

3. Treatment Table(s)

Treatment Objective: CORROSION CONTROL	Treatment Process: PH ADJUSTMENT	
Innovative: N	Start Date: 01/07/2000	End Date:

Chemical Name
CALCIUM HYDROXIDE

Comment:

Treatment Objective: CORROSION CONTROL	Treatment Process: SEQUESTRATION	
Innovative: N	Start Date: 01/07/2000	End Date:

Chemical Name
SODIUM CALCIUM MAGNESIUM POLYPHOSPHATE, GLASSY

Comment:

Treatment Objective: OTHER	Treatment Process: FLUORIDATION	
Innovative: N	Start Date: 01/08/1993	End Date:

Chemical Name
SODIUM FLUORIDE

Comment:

Treatment Objective: CORROSION CONTROL	Treatment Process: INHIBITOR, BIMETALLIC PHOSPHATE	
Innovative: N	Start Date: 7/21/2007	End Date:

No Data Found

Comment:

Treatment Plant

1. Plant Information

Plant ID# : 2177000-01T		Plant Name: OAKLAND ST. GP WELL 2 TREATMENT PLANT	
Street Address Line 1: OAKLAND ST		Street Address Line 2:	
City/Town: MEDWAY		State(2 letter abbreviation): MA	Zip: 02053
Status: A	Availability: ACTIVE	Class: I - T	Capacity (MGD):
Contact: WILLIAM DONAHUE		Phone: 5085333208	Fax:

2. Related Sources Table

2177000-02G	OAKLAND STREET GP WELL

3. Treatment Table(s)

Treatment Objective:	Treatment Process:
CORROSION CONTROL	PH ADJUSTMENT

Innovative:	Start Date:	End Date:
N	01/07/2000	

Chemical Name
CALCIUM HYDROXIDE

Comment:

Treatment Objective:	Treatment Process:
CORROSION CONTROL	SEQUESTRATION

Innovative:	Start Date:	End Date:
N	01/07/2000	

Chemical Name
SODIUM CALCIUM MAGNESIUM POLYPHOSPHATE, GLASSY

Comment:

Treatment Objective:	Treatment Process:
OTHER	FLUORIDATION

Innovative:	Start Date:	End Date:
N	01/08/1993	

Chemical Name
SODIUM FLUORIDE

Comment:

Treatment Objective:	Treatment Process:
DISINFECTION	CHLORAMINES

Innovative:	Start Date:	End Date:
N	8/21/2007	

No Data Found

Comment:

Comments or additional information regarding this section

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Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Pump Stations

Pump

1. Pump Information

POPULATIC/WATER STREET GP WELL PUMP 01G	WATER STREET
Pump Station Name	Location

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	0
Raw or Finished Water:	Raw	Maximum Aggregate Capacity (Gallons per Minutes):	740
Standby/Emergency Power:	Y		

Primary Pump Details

Suction Type:		Suction Head (ft.):	0
Suction Size (inches):	6	Motor Horse Power:	60
Motor Type:	ELECTRIC	Motor Control:	
Discharge Type:		Discharge Size (inches):	8
Installation Date		Model #:	
Pump Manufacturer:	GOULDS		

2. Related Sources Table (if applicable)

2177000-01G	POPULATIC/WATER STREET GP WELL

Pump

1. Pump Information

INDUSTRIAL PARK RD. WELL PUMP 04G	INDUSTRIAL PARK ROAD
Pump Station Name	Location

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	0
Raw or Finished Water:	Finished	Maximum Aggregate Capacity (Gallons per Minutes):	350
Standby/Emergency Power:	Y		

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PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Primary Pump Details

Suction Type:		Suction Head (ft.):	0
Suction Size (inches):	6	Motor Horse Power:	60
Motor Type:	ELECTRIC	Motor Control:	A
Discharge Type:		Discharge Size (inches):	6
Installation Date	05/13/2009	Model #:	
Pump Manufacturer:	GOULD		

2. Related Sources Table (if applicable)

2177000-04G	INDUSTRIAL PARK RD. WELL

Pump

1. Pump Information

VILLAGE STREET REPLACEMENT WELL PUMP05G	VILLAGE STREET
Pump Station Name	Location

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	0
Raw or Finished Water:	Finished	Maximum Aggregate Capacity (Gallons per Minutes):	550
Standby/Emergency Power:	Y		

Primary Pump Details

Suction Type:		Suction Head (ft.):	0
Suction Size (inches):	6	Motor Horse Power:	60
Motor Type:	ELECTRIC	Motor Control:	A
Discharge Type:		Discharge Size (inches):	6
Installation Date		Model #:	
Pump Manufacturer:	GOULDS		

2. Related Sources Table (if applicable)

2177000-05G	VILLAGE ST. 12X18" REPLACEMENT WELL

Pump

1. Pump Information

OAKLAND STREET GP WELL PUMP 02G	OAKLAND STREET
Pump Station Name	Location

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	0
Raw or Finished Water:	Raw	Maximum Aggregate Capacity (Gallons per Minutes):	350
Standby/Emergency Power:	Y		

Primary Pump Details			
Suction Type:		Suction Head (ft.):	0
Suction Size (inches):	6	Motor Horse Power:	60
Motor Type:	ELECTRIC	Motor Control:	
Discharge Type:		Discharge Size (inches):	6
Installation Date		Model #:	
Pump Manufacturer:	GOULDS		

2. Related Sources Table (if applicable)

2177000-02G	OAKLAND STREET GP WELL

Comments or additional information regarding this section

Storage Facilities

Show all storage facilities

Storage Facility

Edit Delete

LOVERING STREET STORAGE TANK	LOVERING ST (PAX MIXER, 2014)
Storage Facility Name	**Location**

Status:	A	Availability:	ACTIVE
Storage Type:	GROUND LEVEL STORAGE TANK	Capacity (MG):	1.8
Material:	STEEL	Installation Date	01/01/1964

Storage Facility

Edit Delete

HIGLAND STREET STORAGE TANK	HIGHLAND STREET
Storage Facility Name	**Location**

Status:	A	Availability:	ACTIVE
Storage Type:	GROUND LEVEL STORAGE TANK	Capacity (MG):	.8
Material:	GLASS/STEEL	Installation Date	08/15/2011

Comments or additional information

Ground Water Sources

Individual Ground Water Source Statistics

Source ID:	2177000-01G
Source Name:	POPULATIC/WATER STREET GP WELL
Location:	WATER ST
	MEDWAY
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	MG
Latitude:	42.138268	January:	17.476000
Longitude: -	71.386939	February:	15.012000
Source Watershed:	CHARLES	March:	17.726000
Well Type:	GRAVEL-PACKED	April:	17.207000
Well Depth (ft.):	61	May:	17.773000
Well Casing Height (ft.):	0	June:	17.214000
Well Casing Depth (ft.):	45	July:	17.654000
Screen Length (ft.):	20	August:	15.616000
		September:	15.931000
Pump Setting (ft):	0	October:	16.505000
		November:	15.629000
Approved Daily Pumping Volume (MGD):	.87	December:	14.198000
Source Metered:	Yes	Total Amount Pumped:	197.941000
Date of Meter Installation:	8/20/2014	Total # of Days Pumped:	365
Type of water metered for source:	FINISHED	Maximum Single Day Pumped Volume:	0.651000
Last Meter Calibration:	11/18/2014	Date of Maximum Amount Pumped:	6/28/2014

Massachusetts Department of Environmental Protection
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Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Individual Ground Water Source Statistics

Source ID:	2177000-02G
Source Name:	OAKLAND STREET GP WELL
Location:	OFF OAKLAND ST
	MEDWAY
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	MG
Latitude:	42.148101	January:	4.560000
Longitude: -	71.38916	February:	6.192000
Source Watershed:	CHARLES	March:	2.339000
Well Type:	GRAVEL-PACKED	April:	1.606000
Well Depth (ft.):	69	May:	3.331000
Well Casing Height (ft.):	0	June:	4.310000
Well Casing Depth (ft.):	59	July:	4.213000
Screen Length (ft.):	10	August:	5.456000
		September:	7.631000
Pump Setting (ft):	0	October:	5.362000
		November:	4.997000
Approved Daily Pumping Volume (MGD):	.59	December:	0.617000
Source Metered:	Yes	Total Amount Pumped:	50.614000
Date of Meter Installation:		Total # of Days Pumped:	339
Type of water metered for source:	FINISHED	Maximum Single Day Pumped Volume:	0.329000
Last Meter Calibration:	11/18/2014	Date of Maximum Amount Pumped:	8/21/2014

Massachusetts Department of Environmental Protection
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PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Individual Ground Water Source Statistics

Source ID:	2177000-03G
Source Name:	VILLAGE STREET GP WELL
Location:	OFF VILLAGE ST
	MEDWAY
Status:	I
Source Availability:	

		Withdrawal Units:	GAL
Latitude:	42.136122	January:	
Longitude: -	71.383743	February:	
Source Watershed:	CHARLES	March:	
Well Type:	GRAVEL-PACKED	April:	
Well Depth (ft.):	58	May:	
Well Casing Height (ft.):	0	June:	
Well Casing Depth (ft.):	46	July:	
Screen Length (ft.):	12	August:	
		September:	
Pump Setting (ft):	0	October:	
		November:	
Approved Daily Pumping Volume (MGD):	.66	December:	
Source Metered:	No	Total Amount Pumped:	106.185
Date of Meter Installation:		Total # of Days Pumped:	
Type of water metered for source:		Maximum Single Day Pumped Volume:	
Last Meter Calibration:		Date of Maximum Amount Pumped:	

Massachusetts Department of Environmental Protection
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Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Individual Ground Water Source Statistics

Source ID:	2177000-05G
Source Name:	VILLAGE ST. 12X18" REPLACEMENT WELL
Location:	OFF VILLAGE STREET
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	MG
Latitude:	42.136355	January:	10.376000
Longitude: -	71.383735	February:	3.787000
Source Watershed:	CHARLES	March:	10.089000
Well Type:	GRAVEL-PACKED	April:	9.869000
Well Depth (ft.):	86	May:	10.059000
Well Casing Height (ft.):	0	June:	10.326000
Well Casing Depth (ft.):	70	July:	8.632000
Screen Length (ft.):	15	August:	9.186000
		September:	9.218000
Pump Setting (ft):	65	October:	9.105000
		November:	8.327000
Approved Daily Pumping Volume (MGD):	.66	December:	7.211000
Source Metered:	Yes	Total Amount Pumped:	106.185000
Date of Meter Installation:		Total # of Days Pumped:	365
Type of water metered for source:	FINISHED	Maximum Single Day Pumped Volume:	0.452000
Last Meter Calibration:	11/18/2014	Date of Maximum Amount Pumped:	1/10/2014

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
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PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Individual Ground Water Source Statistics

Source ID:	2177000-04G
Source Name:	INDUSTRIAL PARK RD. WELL
Location:	OFF INDUSTRIAL PARK RD.
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	MG
Latitude:	42.161411	January:	4.752000
Longitude: -	71.39334	February:	6.238000
Source Watershed:	CHARLES	March:	2.469000
Well Type:	GRAVEL-PACKED	April:	1.839000
Well Depth (ft.):	86	May:	3.395000
Well Casing Height (ft.):	0	June:	4.400000
Well Casing Depth (ft.):	68.3	July:	4.194000
Screen Length (ft.):	12	August:	5.919000
		September:	7.545000
Pump Setting (ft):	67.8	October:	5.560000
		November:	5.954000
Approved Daily Pumping Volume (MGD):	.475	December:	1.950000
Source Metered:	Yes	Total Amount Pumped:	54.215000
Date of Meter Installation:		Total # of Days Pumped:	345
Type of water metered for source:	FINISHED	Maximum Single Day Pumped Volume:	0.343000
Last Meter Calibration:	11/18/2014	Date of Maximum Amount Pumped:	1/6/2014

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2177000
Name: MEDWAY WATER/SEWER DEPARTMENT
City: MEDWAY
PWS Class: COM

Comments or additional information regarding this section
ENTERED PUMPING INTO SOURCE ID: 2177000-03G ON ACCIDENT, NOT IN USE.

Surface Water Sources

No Data Found

Comments or additional information regarding this section:

Purchased Water Sources

No Data Found

Comments or additional information regarding this section

Massachusetts Department of Environmental Protection

eDEP Transaction Copy

Here is the file you requested for your records.

To retain a copy of this file you must save and/or print.

Username: **JAMESMCKAY**

Transaction ID: **716417**

Document: **Public Water System Annual Statistical Report**

Size of File: **1591.17K**

Status of Transaction: **In Process**

Date and Time Created: **2/17/2015:8:40:25 PM**

Note: This file only includes forms that were part of your transaction as of the date and time indicated above. If you need a more current copy of your transaction, return to eDEP and select to “Download a Copy” from the Current Submittals page.

2014 Public Water Supply Verification

Please verify the information below and then click the Continue button.

PWS ID:	**2187000**
PWS Name:	**MILLIS WATER DEPT**
PWS Street Address Line 1:	**900 MAIN STREET, ROOM 201**
PWS Street Address Line 2:	
City/Town:	**MILLIS**
State:	**MA**
Zip Code:	**02054-0000**
Class:	**COM**

Legally Responsible Party Contact Information

The Legally Responsible Party is that individual who has the ultimate authority to ensure that your system is in compliance with the federal and state drinking water regulations. This may be the owner of a private facility, a town or school official or other similarly authorized person.

Book/Page:	
First Name	JAMES
Middle Initial	
Last Name	MCKAY
Company Name	TOWN OF MILLIS
Phone Number	5083765424
Street Address 1	900 MAIN ST.
Street Address 2	ROOM 201
City/Town	MILLIS
State	MA
Zip Code	02054

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2187000
Name: MILLIS WATER DEPT
City: MILLIS
PWS Class: COM

System Information (COM/NTNC)

1. PWS Street Address

MILLIS WATER DEPT		
PWS Name		
900 MAIN STREET, ROOM 201		
PWS Street Address Line 1	PWS Street Address Line 2	
MILLIS	Massachusetts	02054
City/Town	State	Zip Code
508-376-5424	508-376-2442	
Phone Number	Fax Number (if available)	
Web Site Address of PWS (if available)		

2. PWS Mailing Address ☐ Same as street address.

MILLIS WATER DEPARTMENT		
Mailing Name		
900 MAIN STREET, ROOM 201		
Mailing address Line 1	Mailing address Line 2	
MILLIS	Massachusetts	02054
City/Town	State	Zip Code

3. Is this a Seasonal System? (This question is not applicable to your PWS)

4. Owner/Responsible Person:

	☐ This is a new owner.
Owners Name- First, Middle Int, Last - one name only(if not municipal):	Phone Number

5. Primary Contact:

JAMES MCKAY	508-376-5424 ☐ This is a new contact.
Name (First, Middle Int, Last) ▪ one name only▪	Phone Number
jmckay@millis.net	
Email Address (For Emergency Purposes)	Re-enter Email Address

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2187000
Name: MILLIS WATER DEPT
City: MILLIS
PWS Class: COM

6. Certified Drinking Water Operators employed by the PWS:

Name	Grade	License Number	Function	Begin-Date	End-Date
RONALD F, MCKENNEY	2D/1T/2T	12191/22221/24788	PRIMARY TREATMENT OPERATOR	5/25/2010	
MICHAEL H, PERCIACCANTE	1T/1D	5047/4946	SECONDARY TREATMENT OPERATOR	9/22/2008	
KEVIN S, KANDOLA	1T OIT/1D OIT	20114/20006	GENERAL OPERATOR	9/22/2008	
KENNETH A, MCCOLL	1T/1D	4238/3044	GENERAL OPERATOR	1/1/2012	1/20/2014
RONALD F, MCKENNEY	2D/1T/2T	12191/22221/24788	PRIMARY DISTRIBUTION OPERATOR	3/20/2014	
MICHAEL H, PERCIACCANTE	1T/1D	5047/4946	SECONDARY DISTRIBUTION OPERATO	3/20/2014	

To add an operator, begin typing a license # in the field below. Pick the license number from the list and then click the "Add Operator" button.
License Number:

7. Primary Certified Operator Contact Information:

Primary Distribution Certified Operator Contact Information

RONALD | F | MCKENNEY | 508-376-5424 | 508-376-2442

Name | Phone Number | Fax Number

Mailing address information is provided to MassDEP by the Division of Professional Licensure

15 MONSE AVE

Mailing Address 1 | Mailing Address 2

MILLIS | Massachusetts | 02054

Town/City | State | Zip Code | E-Mail Address | Re-Enter E-Mail Address

Primary Treatment Certified Operator Contact Information

RONALD | F | MCKENNEY | 508-376-5424 | 508-376-2442

Name | Phone Number | Fax Number

Mailing address information is provided to MassDEP by the Division of Professional Licensure

15 MONSE AVE

Mailing Address 1 | Mailing Address 2

MILLIS | Massachusetts | 02054

Town/City | State | Zip Code | E-Mail Address | Re-Enter E-Mail Address

If you use a contract certified operator, does your system have a signed Public Water System Certified Operator Compliance Notice approved by the DEP

(•) N/A ( ) Yes ( ) No

8. Names of Water Commissioners/Selectmen/Trustees/Association Board Members (if applicable). Please attach an organizational chart, if available. [ ] Check here to upload

Name	Phone	Title

9. Owner Type:
MUNICIPAL

Federal Employment Identification Number (FEIN):
046001226
(FEIN) - Do NOT provide SSN

10. Is this system a not-for-profit organization

(•) Yes ( ) No

If yes, indicate Tax Exempt code (e.g., 501C):	046001226

11. Population Served(DailyAverage):

Winter Population (October March):	8390	
Summer Population (April September):	8390	
By what method was the population figured	Census Type:	City/Town
	Other Description:	

12. Testing requirements for lead and copper and bacteria in your system is based on the population .

	Number of Samples	Frequency of Samples
Lead and copper samples required:	20	3YEARS
Winter Bacteria samples required:	19	MONTH
Summer Bacteria samples required:	19	MONTH

13. **Distribution Meter information:**

a. Number of Service Connections:	2471
b. Percentage of service connections that are metered:	100 %
c. Are all publicly owned buildings metered?	(•) Yes ( ) No ( ) N/A
d. If No, what percent are	%

14. System Information

a. Number of Distribution Systems:	1
b. Finished Water Storage Capacity in Million Gallons (MG): [Conversion factor is (# of gallons)/(1,000,000)= MG]	1.5
c. Pumping Capacity (GPM):	1750

15. Percentage of Source Types (must add up to 100%)

Ground Water	**Surface Water**	**Purchased Ground**	**Purchased Surface**
100 %	0 %	0 %	0 %

16. Emergency Response Actions:

a. Has your system completed an Emergency Response Plan (ERP).(DO NOT submit your ERP to MassDEP. MassDEP will review the ERP during your next sanitary survey.)

(●) Yes ( ) No

( ) I have made changes to the ERP (attach copies of all changes.)

(●) I have made no changes to the ERP.

b. Does your system have an Emergency Response (ER) annual training plan

( ) Yes (●) No

If Yes, please attach a copy of the plan. Describe the training performed during the reporting period, including the types of training, the date(s) of training, and number of staff and local officials trained on each date and their job titles.

c. Is your system registered for the Health and Homeland Alert Network (HHAN)

(●) Yes ( ) No

d. Has your system signed the agreement and joined the Massachusetts Water and Wastewater Agency Response Network

( ) Yes (●) No

e. How often does your system test the following

Alarms:	Monthly	Other Frequency:	
Interlocks:	Monthly	Other Frequency:	
Back-up power sources:	Monthly	Other Frequency:	

f. List and describe all Level 3 or higher ER incidents during the reporting period.

Date of ER incident	Level	Description

17. Do you have an antenna or other appurtenance (not needed for drinking water purposes) attached to any of your storage tank (s)

(●) Yes ( ) No ( ) No storage tanks

If Yes, list the antennae or other appurtenances, owner(s) names, and the date installed:

Storage Tank Name	Antennae or Appurtenance	Owner Name	Date (mm/dd/yyyy) Installed
FARM ST TANK 2	ANTENNAE	MIKKIS	6/25/2001
WALNUT ST TANK	ANTENNAE	MILLIS	6/25/2001

18. Comments or additional information regarding this section:

NOTE: DAVID RACHMACIEJ IS THE SECONDARY OPERATOR FOR BOTH TREATMENT AND DISTRIBUTION. LICENSE # 24119 T1 & 23456 D1. UNABLE TO ADD IN SECTION 6. MICHAEL PERCIACCANTE IS NOW GENERLA FOREMAN PER THE MOST RECENT STAFFING PLAN SUBMITTED 2/9/2015.

Treatment Plants

Treatment Plant

1. Plant Information

Plant ID# : 2187000-01T		Plant Name: GEORGE D'ANGELIS WATER TREATMENT PLANT	
Street Address Line 1: WATER ST		Street Address Line 2:	
City/Town: MILLIS		State(2 letter abbreviation): MA	Zip: 02054
Status: A	Availability: ACTIVE	Class: I - T	Capacity (MGD):
Contact: RONALD F MCKENNEY		Phone: 5083765424	Fax: 5083762442

2. Related Sources Table

2187000-01G	WELL 1
2187000-02G	WELL 2

3. Treatment Table(s)

Treatment Objective: CORROSION CONTROL
Treatment Process: PH ADJUSTMENT, POST
Innovative: N | Start Date: 07/03/1998 | End Date:

Chemical Name
SODIUM HYDROXIDE

Comment:

Treatment Objective: DISINFECTION
Treatment Process: HYPOCHLORINATION, POST
Innovative: N | Start Date: 07/03/1998 | End Date:

Chemical Name
SODIUM HYPOCHLORITE

Comment:

Treatment Objective: ORGANICS REMOVAL
Treatment Process: AERATION, PACKED TOWER
Innovative: N | Start Date: 07/03/1998 | End Date:

No Data Found

Comment:

Treatment Objective:	Treatment Process:
OTHER	FLUORIDATION

Innovative: N | Start Date: 07/03/1998 | End Date:

Chemical Name
SODIUM FLUORIDE

Comment:

Treatment Objective:	Treatment Process:
DISINFECTION	4-LOG TREATMENT OF VIRUSES

Innovative: N | Start Date: 11/07/2014 | End Date:

No Data Found

Comment:

Treatment Plant

1. Plant Information

Plant ID# :	2187000-02T	Plant Name:	WELL 3 VILLAGE ST
Street Address Line 1:	BIRCH ST	Street Address Line 2:	
City/Town:	MILLIS	State(2 letter abbreviation)	MA
Zip:	02054		
Status:	A	Availability:	ACTIVE
Class:	I - T	Capacity (MGD):	
Contact:	RONALD F MCKENNEY	Phone:	5083765424
Fax:	5083762442		

2. Related Sources Table

2187000-03G	WELL 3

3. Treatment Table(s)

Treatment Objective:	Treatment Process:
CORROSION CONTROL	PH ADJUSTMENT, POST

Innovative:	Start Date:	End Date:
N	01/01/2001	

Chemical Name
SODIUM HYDROXIDE

Comment:

Treatment Objective:	Treatment Process:
OTHER	FLUORIDATION

Innovative:	Start Date:	End Date:
N	01/01/1992	

Chemical Name
SODIUM FLUORIDE

Comment:

Treatment Objective:	Treatment Process:
DISINFECTION	HYPOCHLORINATION, POST

Innovative:	Start Date:	End Date:
N	03/04/2013	

No Data Found

Comment:

Treatment Plant

1. Plant Information

Plant ID# :	Plant Name:		
2187000-03T	WELL 4 SOUTH END POND		

Street Address Line 1:	Street Address Line 2:
ORCHARD ST	

City/Town:	State(2 letter abbreviation)	Zip:
MILLIS	MA	02054

Status:	Availability:	Class:	Capacity (MGD):
A	ACTIVE	I - T	

Contact:			Phone:	Fax:
RONALD	F	MCKENNEY	5083765424	5083762442

2. Related Sources Table

2187000-04G	WELL 4

3. Treatment Table(s)

Treatment Objective:	Treatment Process:	
CORROSION CONTROL	PH ADJUSTMENT, POST	
Innovative: N	Start Date: 01/01/2001	End Date:

Chemical Name
SODIUM HYDROXIDE

Comment:

Treatment Objective:	Treatment Process:	
OTHER	FLUORIDATION	
Innovative: N	Start Date: 01/01/1992	End Date:

Chemical Name
SODIUM FLUORIDE

Comment:

Treatment Plant

1. Plant Information

Plant ID# :	Plant Name:	
2187000-04T	PAINE WATER TREATMENT FACILITY	
Street Address Line 1:	**Street Address Line 2:**	
NORFOLK RD		
City/Town:	**State(2 letter abbreviation)**	**Zip:**
MILLIS	MA	02054
Status: / Availability:	**Class:**	**Capacity (MGD):**
A / ACTIVE	I - T	1.5
Contact:	**Phone:**	**Fax:**
RONALD F MCKENNEY	5083765424	5083762442

2. Related Sources Table

2187000-05G	WELL 5
2187000-06G	WELL 6

3. Treatment Table(s)

Treatment Objective:	Treatment Process:
OTHER	FLUORIDATION

Innovative:	Start Date:	End Date:
N	07/14/2003	

Chemical Name
SODIUM FLUORIDE

Comment:

Treatment Objective:	Treatment Process:
DISINFECTION	HYPOCHLORINATION, POST

Innovative:	Start Date:	End Date:
N	07/14/2003	

Chemical Name
SODIUM HYPOCHLORITE

Comment:

Treatment Objective:	Treatment Process:
CORROSION CONTROL	PH ADJUSTMENT, POST

Innovative:	Start Date:	End Date:
N	07/14/2003	

Chemical Name
SODIUM HYDROXIDE

Comment:

Comments or additional information regarding this section

Pump Stations

Pump

1. Pump Information

Pump Station Name	Location
WALNUT STREET BOOSTER STATION	WALNUT STREET

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	
Raw or Finished Water:	Finished	Maximum Aggregate Capacity (Gallons per Minutes):	
Standby/Emergency Power:	N		

Primary Pump Details			
Suction Type:		Suction Head (ft.):	
Suction Size (inches):		Motor Horse Power:	3
Motor Type:	CENT	Motor Control:	
Discharge Type:		Discharge Size (inches):	
Installation Date	06/01/1993	Model #:	
Pump Manufacturer:			

2. Related Sources Table (if applicable)

No Data Found

Pump

1. Pump Information

Pump Station Name	Location
WELL 3 PUMP	BIRCH ST

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	
Raw or Finished Water:	Raw	Maximum Aggregate Capacity (Gallons per Minutes):	450
Standby/Emergency Power:	Y		

Primary Pump Details			
Suction Type:		Suction Head (ft.):	
Suction Size (inches):		Motor Horse Power:	40
Motor Type:	CENT	Motor Control:	
Discharge Type:		Discharge Size (inches):	
Installation Date		Model #:	
Pump Manufacturer:	JOHNSON VERTICL		

2. Related Sources Table (if applicable)

2187000-03G	WELL 3

Pump

1. Pump Information

WELL 4 PUMP	ORCHARD ST
Pump Station Name	Location

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	
Raw or Finished Water:	Raw	Maximum Aggregate Capacity (Gallons per Minutes):	650
Standby/Emergency Power:	Y		

Primary Pump Details			
Suction Type:		Suction Head (ft.):	
Suction Size (inches):		Motor Horse Power:	50
Motor Type:	CENT	Motor Control:	
Discharge Type:		Discharge Size (inches):	
Installation Date		Model #:	
Pump Manufacturer:	GOULDS		

2. Related Sources Table (if applicable)

2187000-04G	WELL 4

Pump

1. Pump Information

WELL 5 PAINE PUMP	NORFOLK ROAD
Pump Station Name	Location

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	
Raw or Finished Water:	Raw	Maximum Aggregate Capacity (Gallons per Minutes):	600
Standby/Emergency Power:	Y		

Primary Pump Details			
Suction Type:		Suction Head (ft.):	
Suction Size (inches):		Motor Horse Power:	
Motor Type:	VERT TURB	Motor Control:	
Discharge Type:		Discharge Size (inches):	
Installation Date		Model #:	
Pump Manufacturer:			

2. Related Sources Table (if applicable)

2187000-05G	WELL 5

Pump

1. Pump Information

WELL 6 PAINE PUMP	NORFOLK ROAD
Pump Station Name	Location

Status:	A	Availability:	ACTIVE
Number of Pumps:	1	Number of Emergency Pumps:	
Raw or Finished Water:	Raw	Maximum Aggregate Capacity (Gallons per Minutes):	875
Standby/Emergency Power:	Y		

Primary Pump Details			
Suction Type:		Suction Head (ft.):	
Suction Size (inches):		Motor Horse Power:	
Motor Type:	VERT TURB	Motor Control:	
Discharge Type:		Discharge Size (inches):	
Installation Date		Model #:	
Pump Manufacturer:			

2. Related Sources Table (if applicable)

2187000-06G	WELL 6

Comments or additional information regarding this section

Storage Facilities

Show all storage facilities

Storage Facility

Edit Delete

WALNUT ST TANK	DISTRIBUTION SYSTEM WALNUT STREET
Storage Facility Name	**Location**

Status:	A	Availability:	ACTIVE
Storage Type:	GROUND LEVEL STORAGE TANK	Capacity (MG):	.6
Material:	STEEL	Installation Date	

Storage Facility

Edit Delete

FARM ST TANK 2	DISTRIBUTION SYSTEM FARM STREET
Storage Facility Name	**Location**

Status:	A	Availability:	ACTIVE
Storage Type:	GROUND LEVEL STORAGE TANK	Capacity (MG):	1
Material:	STEEL	Installation Date	

Comments or additional information

Cross Connection Control Program (CCCP)

1. Cross Connection Program Coordinator

CHARLES	TOOMEY	
Coordinator First Name	Coordinator Last Name	
15 RUFUS PUTNAM RD		
Coordinator Street Address Line 1	Coordinator Street Address Line 2	
NORTH BROOKFIELD	Massachusetts	01535
City/Town	State	Zip Code
508-867-5016	508-867-4380	
Phone Number	Fax Number (if available)	
TOOMEYWATER@AOL.COM		
Coordinator email		

Surveyor Personnel Information :

To add a surveyor, begin typing the certification ID # in the field below. Pick the license # off the list and then click the "Add Surveyor" button.

MassDEP Certification ID Number

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
Reporting Year 2014

PWSID#: 2187000
Name: MILLIS WATER DEPT
City: MILLIS
PWS Class: COM

Tester Personnel Information :
To add a tester, begin typing the certification ID # in the field below. Pick the license # off the list and then click the "Add Tester" button..

MassDEP Certification ID Number [ ]

2. Did your system use the services of a third party/consultant for the implementation of your Cross-connection Control Program or a portion of it?

(•) Yes ( ) No

CHARLES	TOOMEY	TOOMEY WATER SERVIC
Contact First Name	Contact Last Name	Doing Business As (Company/Individual Name)
15 RUFUS PUTNAM RD		
Consultant Street Address Line 1	Consultant Street Address Line 2	
NORTH BROOKFIELD	Massachusetts	01535
City/Town	State	Zip Code
508-867-5016	508-867-4380	
Phone Number	Fax Number (if available)	
TOOMEYWATER@AOL.COM		
Consultant email		

Third Party Consultant Surveyor Personnel Information:
To add a surveyor, begin typing the certification ID # in the field below. Pick the license # off the list and then click the "Add Surveyor" button.

MassDEP Certification ID Number [ ]

Third Party Consultant Tester Personnel Information:
To add a tester, begin typing the certification ID # in the field below. Pick the license # off the list and then click the "Add Tester" button.

MassDEP Certification ID Number [ ]

What services does the consultant perform for the town	
[x] Facilities Survey	[x] Testing of Devices
[ ] Device Installation Plan Approval	[ ] Program Management
[ ] Other(explain)	

3. Complete the following table summarizing types and numbers of facilities surveyed during this reporting period.

Type of Facility	Total # of Facilities Served by PWS	# of Facilities Surveyed Prior to this reporting period	# of Facilities with first time surveys during this reporting period	# of Facilities Remaining to be Surveyed	# of Facilities Re-surveyed in this reporting period

	A	B	C	= A - (B+C)	
Commercial	90	90	0	0	0
Industrial	4	4	0	0	0
Institutional	2	2	0	0	0
Municipal	10	10	0	0	0
Residential (Optional)	0	0	0	0	0
Total	106	106	0	0	0

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PWSID#: 2187000
Name: MILLIS WATER DEPT
City: MILLIS
PWS Class: COM

*Use Comment field at the end of this question set (question #16) to provide, clarifications, descriptions or explanations regarding the above data. Please reference the question number and table field in your description.

4. Are there any cross-connection(s) within your systems service area protected by:

Reduced Pressure Backflow Preventer (RPBP):	(•) Yes ( ) No
Double Check Valve Assembly (DCVA):	(•) Yes ( ) No

If the answer is No to both questions go to question 8. If the answer is yes please complete the appropriate section(s) of the following table.

Type of Facility	Total # of devices at the beginning of this reporting period	# of devices installed in this reporting period	# of devices removed & not replaced in this reporting period	Total # of devices	# of seasonal devices in Total
	A	B	C	= A +B-C	
RPBP					
Commercial	35	0	0	35	3
Industrial	7	0	0	7	0
Institutional	7	0	1	6	2
Municipal	13	0	0	13	0
Residential (Optional)	0	0	0	0	0
Total	62	0	1	61	5
DCVA					
Commercial	15	0	0	15	0
Industrial	5	0	0	5	0
Institutional	1	0	0	1	0
Municipal	2	0	0	2	0
Residential (Optional)	0	0	0	0	0
Total	23	0	0	23	0

*Use Comment field at the end of this question set (question #16) to provide, clarifications, descriptions or explanations regarding the above data.
Please reference the question number and table field in your description.
*PWSs must maintain a list of ALL registered cross connections that are being protected by a RPBP or DCVA. The list must contain at a minimum the following information: owner/business name, Cross Connection ID#, types of protection (RPBP or DCVA), brand, model, serial # and exact location within the facility.

5. Provide information on the testing performed in this reporting period by the type of device/assembly.

Type of Protection	# of Initial tests	# of Routine tests	# of Failures	# of Repairs &Re-tests	# Not Tested
RPBP	0	107	0	0	10
DCVA	0	19	0	0	4

Describe any discrepancies between the expected number of tests, based on the total number of devices reported in question #5, and the actual number of tests reported in question #6. If you reported a value greater than 0 for "# Not Tested" in question #6 provide an explanation for why the devices were not tested.

RP'S NOT TESTED: CLYDE BROWN SCHOOL, PARK AVE JULY, SYSTEM OFF 1 TEST; GAF (3 DEVICES) 60 CURVE ST VACANT NO ACCESS 6 TESTS; MICHAEL'S MOTORSPORTS 857 MAIN ST - IRRIGATION WATER NOT ON 1 TEST; 2 MILLIS WELLS $5 & $6, NORFOLK RD JANUARY OFF LINE 2 TESTS TOTAL 10 TESTS DC'S NOT TESTED: GF 1073 MAIN ST. VACANT NO ACCESS (3 TESTS; PHIL BRAMAN TR, 1313 MAIN ST. VACANT NO ACCESS 1 TEST TOTAL 4 TESTS.

6. Can your PWS provide MassDEP with a copy of the list of RPBP and DCVA within 2 hours?

(●) Yes ( ) No

7. Does your PWS approve, permit and/or test PVB and/or SPPVB* devices?

PVB DEVICES	(●) Yes ( ) No	SPPVB DEVICES	( ) Yes ( ) No	
if Yes to either please provide the following details:				
Type of Protection	# of Initial tests	# of Routine tests	# of Failures	# of Repairs &Re-tests
PVB	1	7	0	0
SPPVB				

*Use Comment field at the end of this question set (question #16) to provide, clarifications, descriptions or explanations regarding the above data. Please reference the question number and table field in your description.

8. What is the maximum time allowed to protect a cross connection after the discovery of a violation?

Check one: (●) 14 days ( ) 30 days ( ) 90 days ( ) Greater than 90 days

9. Do you have a fully implemented active cross-connection educational program directed toward residential customers?

(●) Yes ( ) No

If No, is there a date when you plan to have an educational program implemented?
NTNCs may skip this question.

Date(mm/dd/yyyy)

10. Do you have a fully implemented educational program for specific users (ex. Industrial, Commercial, Institutional, Municipal and Residential)?

(●) Yes ( ) No ( ) N/A

"N/A" should be selected only if your system does not have any Industrial, Commercial, Institutional, Municipal or Residential users. If Yes, please list the types of users targeted through your education program. (Check all that apply):

[x] Industrial [x] Commercial [x] Institutional [x] Municipal [x] Residential

If No, when do you plan to have the educational program implemented?

Date(mm/dd/yyyy)

11. Does your system have an atmospheric vacuum breaker (hose bib) program for your customers?

( ) Yes (●) No

If no do you plan to institute one in furure?
If yes go to question13

( ) Yes (●) No

If yes When?
If no go to question 13.

Date(mm/dd/yyyy)

12. Does your system have a local ordinance, by-law or policy statement on cross-connection control?

○ Yes ◉ No

If YES,and you already provided copy to MassDEP in 2008 (2007 ASR) no further action is required.

If YES,and you did not provide a copy to MassDEP please forward a copy to:

MassDEP Boston office, 1 Winter Street, 5th floor, Boston, MA 02108

Attn : Otavio DePaula-Santos

13. Does your water system have a total containment policy?

○ Yes ◉ No

Containment policy means ALL services connections have a device installed at the meter. Containment protects the water main by isolating each facility independently of its activity (residential, commertial, industrial, or municipal).

14. Has there been a cross-connection incident in your water system during the reporting period?

○ Yes ◉ No

If Yes, please provide infomation below:

Date of Incident	Location of the Incident	DESCRIPTION

Comments or additional information regarding this section

ADDITIONAL TESTOR/SURVEYORS: RYAN F. TOOMEY: #31603 EXP 11/1/2015 KENNETH ROBIDOUX #32158 EXP 5/1/2016

Source Protection - Zone II

Zone

1. Mass DEP assigned Zone II ID # :	**126**

2. DEP Source IDs and Names of the withdrawal points in Zone II.

SourceID	Source Name	Zone I Radius(ft)	Zone I Control	Pollution Sources
2187000-03G	WELL 3	400	Y	

3. MassDEP SWAP Program Identified Potential Sources of Contamination (PSC), please update with current water supply protection area inventory information.

PSC Description	Quantity	Ground Threat	Comments
CLANDESTINE DUMPING	2	H	
LARGE QUANTITY HAZARDOUS WASTE GENERATORS	1	H	
SMALL QUANTITY HAZARDOUS WASTE GENERATORS	1	M	
STORMWATER DRAINS / RETENTION BASINS	25	L	
UNDERGROUND STORAGE TANKS	9	H	
VERY SMALL QUANTITY HAZARDOUS WASTE GENERATORS	4	M	
21E OIL OR HAZARDOUS MATERIALS RELEASE	8	-	
LIVESTOCK OPERATIONS	3	M	
AUTO REPAIR SHOP	10	H	
BUS AND TRUCK TERMINAL	2	H	
CAR WASH	2	L	
DRY CLEANER	2	H	
FUNERAL HOME	2	L	
GAS / SERVICE STATION	4	H	
LAUNDROMAT	2	L	
MEDICAL FACILITY	2	M	
NURSING HOME	2	L	
PHOTO PROCESSOR	4	H	
RAILROAD TRACKS/YARDS	2	H	
REPAIR SHOP	10	H	
ASPHALT, COAL TAR OR CONCRETE PLANT	1	M	
FUEL OIL DISTRIBUTOR	2	H	
INDUSTRIAL PARK	3	H	
RESIDENTIAL FUEL OIL STORAGE	25	M	

RESIDENTIAL LAWN CARE/GARDENING	25	M	
RESIDENTIAL SEPTIC/CESSPOOL	25	M	
COMPOSTING FACILTY	2	L	
LANDFILLS AND DUMPS	2	H	
ROAD/MAINTENANCE FACILITY	2	M	
SNOW DUMP	2	M	
TRANSPORTATION CORRIDOR	2	M	
WASTE TRANSFER STATION	2	M	
FERTILIZER STORAGE AND USE	2	M	
LANDSCAPING	4	M	
MANURE SPREADING OR STORAGE	2	H	
PESTICIDE STORAGE OR USE	2	H	
INDUSTRIAL LAGOONS OR PITS	2	H	
HAZARDOUS MATERIALS STORAGE	4	H	
ABOVEGROUND STORAGE TANKS	2	M	

4. Did your inspections of the Zone II identify any new land uses or activities that pose a threat to drinking water quality?

○ Yes ◉ No

If YES, please describe:

5. Did your inspection identify any violations of state or local land use controls?

○ Yes ◉ No

If YES, please describe the violation(s), reporting and resolutions:

6. If YES, did you report those violations to the municipality (i.e. building inspector, board of health, planning board)?

○ Yes ○ No

Zone

1. Mass DEP assigned Zone II ID # :	**127**

2. DEP Source IDs and Names of the withdrawal points in Zone II.

SourceID	Source Name	Zone I Radius(ft)	Zone I Control	Pollution Sources
2187000-04G	WELL 4	400	Y	

3. MassDEP SWAP Program Identified Potential Sources of Contamination (PSC), please update with current water supply protection area inventory information.

PSC Description	Quantity	Ground Threat	Comments
CLANDESTINE DUMPING	2	H	
LARGE QUANTITY HAZARDOUS WASTE GENERATORS	1	H	
SMALL QUANTITY HAZARDOUS WASTE GENERATORS	1	M	
STORMWATER DRAINS / RETENTION BASINS	25	L	
UNDERGROUND STORAGE TANKS	9	H	
VERY SMALL QUANTITY HAZARDOUS WASTE GENERATORS	4	M	
21E OIL OR HAZARDOUS MATERIALS RELEASE	8	-	
LIVESTOCK OPERATIONS	3	M	
AUTO REPAIR SHOP	10	H	
BUS AND TRUCK TERMINAL	2	H	
CAR WASH	2	L	
DRY CLEANER	2	H	
FUNERAL HOME	2	L	
GAS / SERVICE STATION	4	H	
LAUNDROMAT	2	L	
MEDICAL FACILITY	2	M	
NURSING HOME	2	L	
PHOTO PROCESSOR	4	H	
RAILROAD TRACKS/YARDS	2	H	
REPAIR SHOP	10	H	
ASPHALT, COAL TAR OR CONCRETE PLANT	1	M	
FUEL OIL DISTRIBUTOR	2	H	
INDUSTRIAL PARK	3	H	
RESIDENTIAL FUEL OIL STORAGE	25	M	
RESIDENTIAL LAWN CARE/GARDENING	25	M	
RESIDENTIAL SEPTIC/CESSPOOL	25	M	
COMPOSTING FACILTY	2	L	
LANDFILLS AND DUMPS	2	H	
ROAD/MAINTENANCE FACILITY	2	M	
SNOW DUMP	2	M	
TRANSPORTATION CORRIDOR	2	M	
WASTE TRANSFER STATION	2	M	

FERTILIZER STORAGE AND USE	2	M	
LANDSCAPING	4	M	
MANURE SPREADING OR STORAGE	2	H	
PESTICIDE STORAGE OR USE	2	H	
INDUSTRIAL LAGOONS OR PITS	2	H	
HAZARDOUS MATERIALS STORAGE	4	H	
ABOVEGROUND STORAGE TANKS	2	M	

4. Did your inspections of the Zone II identify any new land uses or activities that pose a threat to drinking water quality?

○ Yes ◉ No

If YES, please describe:

5. Did your inspection identify any violations of state or local land use controls?

○ Yes ◉ No

If YES, please describe the violation(s), reporting and resolutions:

6. If YES, did you report those violations to the municipality (i.e. building inspector, board of health, planning board)?

○ Yes ○ No

Zone

1. Mass DEP assigned Zone II ID # :	**324**

2. DEP Source IDs and Names of the withdrawal points in Zone II.

SourceID	Source Name	Zone I Radius(ft)	Zone I Control	Pollution Sources
2187000-02G	WELL 2	400	Y	
2187000-01G	WELL 1	400	Y	

3. MassDEP SWAP Program Identified Potential Sources of Contamination (PSC), please update with current water supply protection area inventory information.

PSC Description	Quantity	Ground Threat	Comments
CLANDESTINE DUMPING	2	H	
LARGE QUANTITY HAZARDOUS WASTE GENERATORS	1	H	

SMALL QUANTITY HAZARDOUS WASTE GENERATORS	1	M	
STORMWATER DRAINS / RETENTION BASINS	25	L	
UNDERGROUND STORAGE TANKS	9	H	
VERY SMALL QUANTITY HAZARDOUS WASTE GENERATORS	4	M	
21E OIL OR HAZARDOUS MATERIALS RELEASE	8	-	
LIVESTOCK OPERATIONS	3	M	
AUTO REPAIR SHOP	10	H	
BUS AND TRUCK TERMINAL	2	H	
CAR WASH	2	L	
DRY CLEANER	2	H	
FUNERAL HOME	2	L	
GAS / SERVICE STATION	4	H	
LAUNDROMAT	2	L	
MEDICAL FACILITY	2	M	
NURSING HOME	2	L	
PHOTO PROCESSOR	4	H	
RAILROAD TRACKS/YARDS	2	H	
REPAIR SHOP	10	H	
ASPHALT, COAL TAR OR CONCRETE PLANT	1	M	
FUEL OIL DISTRIBUTOR	2	H	
INDUSTRIAL PARK	3	H	
RESIDENTIAL FUEL OIL STORAGE	25	M	
RESIDENTIAL LAWN CARE/GARDENING	25	M	
RESIDENTIAL SEPTIC/CESSPOOL	25	M	
COMPOSTING FACILTY	2	L	
LANDFILLS AND DUMPS	2	H	
ROAD/MAINTENANCE FACILITY	2	M	
SNOW DUMP	2	M	
TRANSPORTATION CORRIDOR	2	M	
WASTE TRANSFER STATION	2	M	
FERTILIZER STORAGE AND USE	2	M	
LANDSCAPING	4	M	
MANURE SPREADING OR STORAGE	2	H	
PESTICIDE STORAGE OR USE	2	H	
INDUSTRIAL LAGOONS OR PITS	2	H	
HAZARDOUS MATERIALS STORAGE	4	H	

ABOVEGROUND STORAGE TANKS	2	M	

4. Did your inspections of the Zone II identify any new land uses or activities that pose a threat to drinking water quality?

○ Yes ◉ No

If YES, please describe:

5. Did your inspection identify any violations of state or local land use controls?

○ Yes ◉ No

If YES, please describe the violation(s), reporting and resolutions:

6. If YES, did you report those violations to the municipality (i.e. building inspector, board of health, planning board)?

○ Yes ○ No

Zone

1. Mass DEP assigned Zone II ID # :	**425**

2. DEP Source IDs and Names of the withdrawal points in Zone II.

SourceID	Source Name	Zone I Radius(ft)	Zone I Control	Pollution Sources
2187000-05G	WELL 5	400	Y	
2187000-06G	WELL 6	400	Y	

3. MassDEP SWAP Program Identified Potential Sources of Contamination (PSC), please update with current water supply protection area inventory information.

PSC Description	Quantity	Ground Threat	Comments
CLANDESTINE DUMPING	2	H	
LARGE QUANTITY HAZARDOUS WASTE GENERATORS	1	H	
SMALL QUANTITY HAZARDOUS WASTE GENERATORS	1	M	
STORMWATER DRAINS / RETENTION BASINS	25	L	
UNDERGROUND STORAGE TANKS	9	H	
VERY SMALL QUANTITY HAZARDOUS WASTE GENERATORS	4	M	
21E OIL OR HAZARDOUS MATERIALS RELEASE	8	-	

LIVESTOCK OPERATIONS	3	M	
AUTO REPAIR SHOP	10	H	
BUS AND TRUCK TERMINAL	2	H	
CAR WASH	2	L	
DRY CLEANER	2	H	
FUNERAL HOME	2	L	
GAS / SERVICE STATION	4	H	
LAUNDROMAT	2	L	
MEDICAL FACILITY	2	M	
NURSING HOME	2	L	
PHOTO PROCESSOR	4	H	
RAILROAD TRACKS/YARDS	2	H	
REPAIR SHOP	10	H	
ASPHALT, COAL TAR OR CONCRETE PLANT	1	M	
FUEL OIL DISTRIBUTOR	2	H	
INDUSTRIAL PARK	3	H	
RESIDENTIAL FUEL OIL STORAGE	25	M	
RESIDENTIAL LAWN CARE/GARDENING	25	M	
RESIDENTIAL SEPTIC/CESSPOOL	25	M	
COMPOSTING FACILTY	2	L	
LANDFILLS AND DUMPS	2	H	
ROAD/MAINTENANCE FACILITY	2	M	
SNOW DUMP	2	M	
TRANSPORTATION CORRIDOR	2	M	
WASTE TRANSFER STATION	2	M	
FERTILIZER STORAGE AND USE	2	M	
LANDSCAPING	4	M	
MANURE SPREADING OR STORAGE	2	H	
PESTICIDE STORAGE OR USE	2	H	
INDUSTRIAL LAGOONS OR PITS	2	H	
HAZARDOUS MATERIALS STORAGE	4	H	
ABOVEGROUND STORAGE TANKS	2	M	

4. Did your inspections of the Zone II identify any new land uses or activities that pose a threat to drinking water quality?

○ Yes ◉ No

If YES, please describe:

5. Did your inspection identify any violations of state or local land use controls?

○ Yes ◉ No

If YES, please describe the violation(s), reporting and resolutions:

6. If YES, did you report those violations to the municipality (i.e. building inspector, board of health, planning board)?

○ Yes ○ No

Comments or Additional Information regarding this section:

Ground Water Sources

Individual Ground Water Source Statistics

Source ID:	2187000-01G
Source Name:	WELL 1
Location:	WATER ST, MILLIS, MA
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	GAL
Latitude:	42.176636	January:	3,834,843
Longitude: -	71.351662	February:	3,149,428
Source Watershed:	CHARLES	March:	3,636,912
Well Type:	BEDROCK WELL	April:	347,128
Well Depth (ft.):	48	May:	3,426,358
Well Casing Height (ft.):	38	June:	3,746,837
Well Casing Depth (ft.):	38	July:	4,300,730
Screen Length (ft.):	10	August:	4,232,730
		September:	6,094,105
Pump Setting (ft):	0	October:	4,918,773
		November:	3,921,730
Approved Daily Pumping Volume (MGD):	.72	December:	4,156,938
Source Metered:	Yes	Total Amount Pumped:	**45,766,512**
Date of Meter Installation:		Total # of Days Pumped:	365
Type of water metered for source:	RAW	Maximum Single Day Pumped Volume:	319,149
Last Meter Calibration:	3/19/2014	Date of Maximum Amount Pumped:	9/28/2014

Individual Ground Water Source Statistics

Source ID:	2187000-03G
Source Name:	WELL 3
Location:	BIRCH STREET, MILLIS, MA
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	GAL
Latitude:	42.168983	January:	5,002,103
Longitude: -	71.339976	February:	3,963,871
Source Watershed:	CHARLES	March:	4,854,627
Well Type:	GRAVEL-PACKED	April:	3,366,799
Well Depth (ft.):	60	May:	4,416,482
Well Casing Height (ft.):	2	June:	4,999,013
Well Casing Depth (ft.):	40	July:	5,737,100
Screen Length (ft.):	20	August:	5,695,627
		September:	8,756,953
Pump Setting (ft):	0	October:	6,362,364
		November:	5,258,790
Approved Daily Pumping Volume (MGD):	.75	December:	5,808,866
Source Metered:	Yes	Total Amount Pumped:	64,222,595
Date of Meter Installation:		Total # of Days Pumped:	356
Type of water metered for source:	RAW	Maximum Single Day Pumped Volume:	420,613
Last Meter Calibration:	3/19/2014	Date of Maximum Amount Pumped:	9/28/2014

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PWSID#: 2187000
Name: MILLIS WATER DEPT
City: MILLIS
PWS Class: COM

Individual Ground Water Source Statistics

Source ID:	2187000-04G
Source Name:	WELL 4
Location:	NEAR ORCHARD ST, MILLIS, MA
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	GAL
Latitude:	42.193622	January:	3,971,513
Longitude: -	71.351997	February:	3,233,002
Source Watershed:	CHARLES	March:	3,752,385
Well Type:	BEDROCK WELL	April:	3,484,008
Well Depth (ft.):	60	May:	3,634,356
Well Casing Height (ft.):	2	June:	3,847,923
Well Casing Depth (ft.):	50	July:	4,391,395
Screen Length (ft.):	10	August:	4,634,637
		September:	4,413,578
Pump Setting (ft):	0	October:	10,796
		November:	0
Approved Daily Pumping Volume (MGD):	.86	December:	3,602
Source Metered:	Yes	Total Amount Pumped:	35,377,195
Date of Meter Installation:		Total # of Days Pumped:	267
Type of water metered for source:	RAW	Maximum Single Day Pumped Volume:	315,139
Last Meter Calibration:	3/19/2014	Date of Maximum Amount Pumped:	9/2/2014

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PWSID#: 2187000
Name: MILLIS WATER DEPT
City: MILLIS
PWS Class: COM

Individual Ground Water Source Statistics

Source ID:	2187000-02G
Source Name:	WELL 2
Location:	WATER STREET, MILLIS, MA
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	GAL
Latitude:	42.176323	January:	2,134,632
Longitude: -	71.351547	February:	1,755,894
Source Watershed:	CHARLES	March:	2,012,539
Well Type:	BEDROCK WELL	April:	1,827,157
Well Depth (ft.):	46	May:	1,873,430
Well Casing Height (ft.):	36	June:	2,050,420
Well Casing Depth (ft.):	36	July:	2,351,601
Screen Length (ft.):	10	August:	2,356,899
		September:	3,515,179
Pump Setting (ft):	0	October:	2,731,935
		November:	2,205,856
Approved Daily Pumping Volume (MGD):	.5	December:	2,236,317
Source Metered:	Yes	Total Amount Pumped:	27,051,859
Date of Meter Installation:		Total # of Days Pumped:	365
Type of water metered for source:	RAW	Maximum Single Day Pumped Volume:	175,999
Last Meter Calibration:	3/19/2014	Date of Maximum Amount Pumped:	9/28/2014

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Reporting Year 2014

PWSID#: 2187000
Name: MILLIS WATER DEPT
City: MILLIS
PWS Class: COM

Individual Ground Water Source Statistics

Source ID:	2187000-05G
Source Name:	WELL 5
Location:	NEAR NORFOLK RD
	MILLIS
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	GAL
Latitude:	42.14994	January:	3,179,880
Longitude: -	71.340456	February:	3,881,193
Source Watershed:	CHARLES	March:	4,082,176
Well Type:	GRAVEL-PACKED	April:	4,361,215
Well Depth (ft.):	57	May:	3,088,789
Well Casing Height (ft.):	0	June:	0
Well Casing Depth (ft.):	49	July:	0
Screen Length (ft.):	8	August:	3,533
		September:	0
Pump Setting (ft):	0	October:	5,327,953
		November:	4,791,139
Approved Daily Pumping Volume (MGD):	1.5	December:	4,894,769
Source Metered:	Yes	Total Amount Pumped:	33,610,647
Date of Meter Installation:		Total # of Days Pumped:	221
Type of water metered for source:	RAW	Maximum Single Day Pumped Volume:	308,942
Last Meter Calibration:	3/19/2014	Date of Maximum Amount Pumped:	10/6/2014

Individual Ground Water Source Statistics

Source ID:	2187000-06G
Source Name:	WELL 6
Location:	NEAR NORFOLK RD
	MILLIS
Status:	A
Source Availability:	ACTIVE

		Withdrawal Units:	GAL
Latitude:	42.150273	January:	0
Longitude: -	71.34026	February:	0
Source Watershed:	CHARLES	March:	0
Well Type:	GRAVEL-PACKED	April:	0
Well Depth (ft.):	62	May:	2,103,314
Well Casing Height (ft.):	0	June:	7,094,672
Well Casing Depth (ft.):	47	July:	6,624,795
Screen Length (ft.):	15	August:	5,018,795
		September:	21,105
Pump Setting (ft):	0	October:	27,186
		November:	0
Approved Daily Pumping Volume (MGD):	1.5	December:	0
Source Metered:	Yes	Total Amount Pumped:	20,889,867
Date of Meter Installation:		Total # of Days Pumped:	94
Type of water metered for source:	RAW	Maximum Single Day Pumped Volume:	355,823
Last Meter Calibration:	3/19/2014	Date of Maximum Amount Pumped:	7/22/2014

Comments or additional information regarding this section

Surface Water Sources

No Data Found

Comments or additional information regarding this section:

Purchased Water Sources

No Data Found

Comments or additional information regarding this section

Water Production & Consumption Information

How to report in Gallons vs. Million Gallons
When Converting gallons to Million gallons, decimal point moves 6 places to the left.

	If Reporting in Gallons (Gal)	If Reporting in Million Gallons (MG)
Example 1	45,562,100	45.5621
Example 2	340,212	0.340212
Example 3	631,020,000	631.02
Example 4	96,543	0.096543

Volume Units ◉ Gallons (GAL) ○ Million Gallons (MG) ○ No Meter

FINISHED Water Production and Consumption Summary for Reporting Year :

Finished Water means water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as treatment necessary to maintain water quality in the distribution system (e.g. booster disinfection, addition of corrosion control chemicals).

Month	(1) Amount of **finished** water from own sources (GAL)	(2) Amount of **finished** water purchased from other systems (GAL)	(3) Amount of **finished** water sold to other systems (GAL)	(4) Net **finished** Water that entered your distribution system (1) + (2) - (3)= (4) (GAL)
January	1,707,066	0	0	1,707,066
February	15,467,483	0	0	15,467,483
March	17,822,734	0	0	17,822,734
April	16,020,750	0	0	16,020,750
May	18,153,894	0	0	18,153,894
June	21,759,899	0	0	21,759,899
July	23,231,383	0	0	23,231,383
August	21,512,694	0	0	21,512,694
September	22,563,437	0	0	22,563,437
October	19,119,644	0	0	19,119,644
November	15,918,152	0	0	15,918,152
December	16,841,129	0	0	16,841,129
TOTAL	210,118,265	0	0	210,118,265

Maximum Daily Finished Water Consumption: Volume (GAL): 1,009,391 Date: 10/6/2014

Massachusetts Department of Environmental Protection
Bureau of Water Resources (BWR) – Drinking Water Program
Public Water Supply Annual Statistical Report
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RAW Water Production and Consumption Summary for Reporting Year :

Raw Water means water in its natural state, prior to treatment and is usually the water entering the first treatment process of a water treatment plant.

☐ Same as finished water (it is not necessary to complete Table if same volume as above)

Month	(1) Amount of **raw** water pumped from own sources (GAL)	(2) Amount of **raw** water purchased from other systems (GAL)	(3) Amount of **raw** water sold to other systems (GAL)	(4) Net **raw** Water Consumption (1) + (2) - (3) = (4) (GAL)
January	18,122,971	0	0	18,122,971
February	15,983,388	0	0	15,983,388
March	18,338,639	0	0	18,338,639
April	16,386,307	0	0	16,386,307
May	18,542,729	0	0	18,542,729
June	21,738,576	0	0	21,738,576
July	23,405,533	0	0	23,405,533
August	21,942,221	0	0	21,942,221
September	22,799,920	0	0	22,799,920
October	19,379,007	0	0	19,379,007
November	16,177,515	0	0	16,177,515
December	17,100,492	0	0	17,100,492
TOTAL	229,917,298	0	0	229,917,298

Maximum Daily Raw Water Pumping:	Volume (GAL): 1,023,362 Date: 10/6/2014

Summary of Water Sold

Sold Water

System Name	PWS ID#	Total Volume Sold	Water type

Metered Finished Water Consumption by Service Type

U.S. EPA requires every PWS to report what their water is used for in order to characterize each system. In this table, report the percentages of metered water for each category below, ONLY for those categories over 10%. For municipal water suppliers, most of the water will be reported as Residential Area. If any other categories are more than 10% of your metered use, report it in the appropriate category. If any category is less than 10%, do NOT report it. The precentage do NOT have to add to 100%, since water use in some categories will be less than 10% and therefore is not reported.

ONLY report uses for categories over 10% of total metered use. Report ALL metered water use in the Water Management Distribution System Form (if appropriate)

%	Primary Service Area	Type	%	Primary Service Area	Type
	Yes	Day Care Center		Yes	Other Residential
	Yes	Dispenser		Yes	Other Transient
	Yes	Homeowners Association		Yes	Recreation Area
	Yes	Hotel/Motel	90	Yes (selected)	Residential Area
	Yes	Highway Rest Area		Yes	Restaurant
	Yes	Industrial/Agricultural		Yes	Retail Employees
	Yes	Interstate Carrier		Yes	School
	Yes	Institution		Yes	Sanitary Improvement District
	Yes	Medical Facility		Yes	Summer Camp
	Yes	Mobile Home Park		Yes	Secondary Residences
	Yes	Mobile Home Park, Principal Residence		Yes	Service Station
	Yes	Municipality		Yes	Subdivision
	Yes	Other Area		Yes	Water Bottler
	Yes	Other Non-Transient Area		Yes	Wholesaler
	Yes	Commercial			

Summary of Treatment Plant Losses (complete only if finished water volume is less than raw water)

☐ No treatment plant losses (not applicable)

Treatment PlantID:	Total Raw Water into treatment plant last year (raw pumped + raw purchased - raw sold):	-	Total Finished Water from treatment plant last year:	=	Total Water Lost to Treatment Process last year:
	229,917,298		210,118,265		19,799,033

Briefly describe the fate of the waste product (slurry or sludge) produced by your treatment process (discharge to sewer, groundwater discharge, settling lagoons, re-circulate back into treatment plant, etc.):

WATER USED TO MONITOR PH, FLUORIDE AND CHLORINE FOR ALL WELLS.

X. Comments or additional information regarding this section

MAX DAY FOR FINISHED WATER IS A CALCULATED VALUE BASED ON AVERAGE LOSSES TO MONITOR PH, FLUORIDE AND CHLORINE DEDUCTED FROM PUMPED VOLUME.

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Water Management Act Annual Report - Distribution

All public water suppliers distributing 100,000 gallons per day or more must complete Tables DS-1 through DS-5 and Tables DS-7 and DS-8. Tables DS-6 and DS-9 are optional. Instructions for completing Tables DS-1 through DS-8 are included in the ASR Instructions available at MassDEP's website. If you have any questions concerning completion of the Distribution System Report, please contact Richard Friend with the WMA Program at (617) 654-6522 or email him at richard.friend@state.ma.us

Table DS-1 Summary of Leak Detection Activities During the Reporting Year	
1. Total miles of water mains	47.5
2. Miles of mains surveyed this year	47.5
3. Number of leaks found	2
4. Number of leaks repaired	2
5. Estimated volume lost (mg) if a reliable estimate can be made	.026
6. Date of last leak detection survey of entire system:	1/5/2015 (mm/dd/yyyy)

Table DS-2 Water Conservation - Limits on Withdrawals

1. **Did your PWS implement mandatory nonessential outdoor water use restrictions in the reporting year?**

   (x) Yes ( ) No

2. **If yes,why did you institute mandatory restrictions (check all that apply)?**

a. [x] Required by WMA permit

   [x] Calendar trigger in permit

   [ ] Streamflow trigger in permit

   [ ] Other trigger in permit — If "Other Trigger" then describe:

b. [ ] Reason other than permit requirement

   Describe:

3. **Please characterize the type of mandatory restrictions that were in place (Check all that apply)**

   [ ] Total outdoor ban

   [ ] Hand-held only

   [x] Hourly Describe: 9:00 AM - 5:00 PM

   Daily: ( ) Odd/Even ( ) Twice/Week ( ) Once/Week ( ) Other Daily — If "Other Daily" then describe:

4. **If you instituted mandatory restrictions, on what dates were restrictions in place? (you may have had only one period of restriction)**

	Start Date	End Date
Period 1	5/1/2014	9/30/2014
	(mm/dd/yyyy)	(mm/dd/yyyy)
Period 2		
	(mm/dd/yyyy)	(mm/dd/yyyy)
Period 3		
	(mm/dd/yyyy)	(mm/dd/yyyy)

5. **Indicate if you plan or expect to institute nonessential outdoor water use restrictions in the upcoming summer. If you hold a WMA permit with Seasonal Limits on Nonessential Outdoor Water Use conditions, indicate whether you plan on instituting calendar-based or streamflow trigger-based outdoor water use restrictions. Remember that if you plan on instituting calendar restrictions, they must be in place by May 1. Streamflow-based restrictions must be in place once the trigger specified in your WMA permit has been reached for three consecutive days. Refer to your permit for specific nonessential outdoor water use requirements. Indicate if you plan on instituting restrictions even though you do not hold a WMA permit with outdoor water use restriction or do not hold a permit at all.**

- [x] Planning to institute calendar-based nonessential outdoor water use restrictions per WMA permit.
- [ ] Planning to institute streamflow-based nonessential outdoor water use restrictions per WMA permit.
- [ ] Planning to institute nonessential outdoor water use restrictions for reasons other than WMA permit requirements.
- [ ] Do not intend on instituting nonessential outdoor water use restrictions.

Please Note: Enter volumes in Tables DS-3, DS-4, DS-5 and DS-6 in million gallons per year (mgy).
Example 1: if a volume is 654,120,152 gallons, enter 645.120152 mgy.
Example 2: if a volume is 580,123 gallons, enter 0.580123 mgy.
Example 3: if a volume is 86,000 gallons, enter 0.086 mgy.

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PWSID#: 2187000
Name: MILLIS WATER DEPT
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Table DS-3 Metered Finished Water Use Complete Table DS-3 to account for all of your metered water volumes (e.g. permanent and temporary; private and municipal/government; billed and non-billed). Do not include water sold to other PWSs, which is reported on the Water Production & Consumption Information form

Use Category	No. of Service Connections	Total Volume (mgy)	Category Description
Residential	2320	174.9	Water provided to residences in your distribution system, including for-profit apartments, condos, and seasonal homes. All water used for lawn watering at residential buildings belongs in this category.
Residential Institutions	7	.92	Water provided to institutions with residential population such as colleges. It is optional to account institutions volumes separately (may be included in Residential above - see instructions).
Commercial/Business	113	14.79	Water served to businesses and other commercial entities.
Agricultural	3	.19	Water used mainly to grow food, raise animals, or run a garden center.
Industrial	29	2.94	Water used mainly for industrial purposes.
Municipal/Institutional/Non-profits	24	6.6	Water used for municipal purposes, including schools, playing fields, municipal buildings, treatment plant; non-profits such as churches; non-residential institutions such as private schools.
Other*			Water used for purposes not included in above categories.
TOTALS	2496	200.34	Total number of service connections and metered volume.

* If you include a volume under "Other", list the use(s):

UNACCOUNTED FOR WATER (UAW)

Table DS-4 Confidently Estimated Municipal Use volume To qualify as confidently estimated municipal use calculations/documentation for each estimated use must be attached to this ASR or mailed to MassDEP. If no documentation is provided, DEP will count the volumes as unaccounted for water. See ASR Instructions for more detail. Leak detection volumes are not counted as a confidently estimated municipal use. Optional Excel spreadsheets for calculating confidently estimated use can be found at the MADEP website at http://www.mass.gov/eea/agencies/massdep/water/approvals/drinking-water-forms.html#16

Confidently Estimated Municipal Use (CEMU)	Estimated million gallons per year
Fire protection & training	3.09
Hydrant/water main flushing/main construction	+ 3.81
Flow testing	+
Bleeders/ Blow offs	+
Tank overflow & drainage	+
Sewer & stormwater system flushing	+
Street cleaning	+ .06
Source meter calibration adjustments	+ .075
Major water main breaks (not leak detection)	+ 1.38
Total Confidently Estimated Municipal Use	= 8.415

YOU <u>MUST</u> PROVIDE DOCUMENTATION FOR ALL OF YOUR CEMU VOLUMES.

Are you attaching electronic files to the eASR that document your CEMU volumes?

(•) Yes ( ) No

Paper copies of CEMU volumes may be mailed to:
Mass DEP
1 Winter St.
Boston MA 02108
Attn: Water Management Act Program

Table DS-5 Unaccounted for Water To calculate UAW, subtract total metered use and confidently estimated municipal use volumes from the total volume of finished water entering your distribution system.

	Million Gallons/Year (MGY)	% of Total Water Available for Distribution
Total Finished Water Available for Distribution **(Total Net Finished Water from Production Form)**	226.09	100%
Total Metered Use **(System Total Metered Use from Table DS-3)**	- 200.34	- 88.6 %
Total Confidently Estimated Municipal Use **(Total from Table DS-4)**	- 8.415	- 3.7 %
Unaccounted for Water (UAW)	= 17.3	= 7.7 %

Table DS-6 Sources of Unaccounted for Water (Optional) Use this table to provide estimated volumes of your unaccounted for water.

Known or Suspected Source of Unaccounted for Water	Estimated Volume (MGY)
Leak Detection	9.46
Water Theft	
Meter Malfunction/mis-registration	
Other (specify):	
Other (specify):	
Total:	9.46

RESIDENTIAL GALLONS PER CAPITA DAY (RGPCD)
RGPCD is a performance standard for public water suppliers serving municipalities and is a measure of the average amount of water a resident uses each day during the reporting period. High RGPCD values are associated with unrestricted outdoor water use, especially lawn watering. See ASR Instructions for further explanation and examples. There are two steps to determine your RGPCD number: Step 1: Determine the residential population served by your system (2 options to choose from). Step 2: Calculate RGPCD from population served and residential metered water volume.

RGPCD Step 1 - Choose one of two options to determine Population Served

Population Option 1: Accurate Count (census data): If your PWS serves an entire municipality, then use the most recent local or Federal census number for the total residential population. Click Here for 2010 U.S. census populations for MA cities and towns. Partially served communities can use the most recent local or Federal census if private well users and/or those served by other PWS systems are subtracted out (attach documentation to this ASR). Communities with high seasonal fluctuations can pro-rate the population for the duration of the influx. See ASR Instructions for further detail and examples.

Population Option 2: Estimate from Households Served If your PWS serves a portion of one or more communities and you cannot obtain a reliable census, click on the following link to open an excel spreadsheet for estimating your population. Click Here. This estimate is calculated from the number of households connected to your distribution system and the average household size. Save the spreadsheet onto your computer for use in subsequent years' reporting. If you are using a spreadsheet from your assessor's office or planning board to estimate number of households served, attach the spreadsheet or mail it to DEP and report the population served on Table DS-7 below.

If mailing Population Calculations or documentation send to:
Mass DEP
1 Winter St.
Boston MA 02108
Attn: Water Management Act Program

Table DS-7 Residential Population Served	
Community(ies) served by PWS is (are) :	Fully Served
Method of Determining Population Served:	Option 1(Census)
Census Type (Federal or Local):	Local
Census year:	2014
Population Served:	8390

RGPCD Step 2 – Calculate RGPCD
Table DS-8 Residential Gallons per Capita Day To determine RGPCD, your metered residential volume (million gallons/year) is divided by 365 days. The result in then divided by the population served and multiplied by 1,000,000 to obtain gallons per person per day. If you include Residential Institutions volume in your RGPCD volume, also include the Residential Institutions population. See ASR instructions

Residential Water Use (million gallons)	/ 365	/ Population Served	X 1,000,000	=	Residential Gallons per Capita Day (gallons/person/day)
174.9	/ 365	/ 8390	X1,000,000	=	57

Table DS-9: Use this table to provide comments or additional information regarding this section of the ASR. You may explain discrepancies, provide supplemental information, or provide any other information to assist MassDEP in processing the data in your ASR.

Water Management Act Annual Report - Basin Withdrawal

Instructions for completing Tables BW-1 through BW-4 are included in the ASR Instructions available at MassDEP's website. If you have any questions concerning completion of the Water Management Act Annual Report, please contact Richard Friend with the WMA Program at (617) 654-6522 or email him at richard.friend@state.ma.us

Table BW-1 Permit & Registration Information

River Basin (Watershed)	Registration Number	Permit Number
20-CHARLES	22018702	9P422018703

Water Withdrawal by Watershed

Calculation of Daily Average Withdrawal: Use Table BW-2 to document the reporting year withdrawal volume(s) by watershed. Table BW-3 compare's the reporting year actual withdrawal volume(s) to the volume(s) authorized under your WMA registration (s) and/or permit(s). The total volumes for each source and their respective watershed are reported in the Ground Water Sources and for Surface Water Sources report forms. Enter the total of all sources for each watershed in Table BW-2.

Enter volumes in million gallons per year(MGY). Example: If you pumped 400,512,000 gallons in the year, enter 400.512.

Table BW-2 Average Daily Withdrawal by Watershed

River Basin	Total Raw Water Pumped in the reporting year (mgy)	/ 365 =	Watershed Average Daily Withdrawal (mgd)
20-CHARLES	229.9	/ 365 =	0.63

Table BW-3 WMA Authorized Volume vs. Actual Withdrawal Volume

River Basin	Registered Volume (mgd)	+	Permitted Volume (mgd)	=	WMA Authorized Withdrawal Volume (mgd)	-	Daily Avg. Water Use (mgd) (from Table BW-2 above)	=	Difference*
20-CHARLES	0.63	+	0.36	=	0.99	-	0.63	=	0.36

*** A positive difference indicates that the volume withdrawn is less than the authorized volume. A negative value indicates that more water was pumped than is authorized and that your PWS may be out of compliance.**

Table BW-4 Permit Special Conditions

Review your WMA permit and list any Special Conditions of your WMA permit that require submission of an annual report to MassDEP. If the required report is being submitted with this ASR, please note in Table BW-4. If a required report was submitted earlier in the year, please provide the date submitted.

WMA Permit Special Condition Requiring Annual Report to MassDEP	Report Attached to ASR	If not attached, date submitted to MassDEP
	○ Yes ○ No	(mm\dd\yyyy)

If mailing annual report, send to:
MADEP
1 Winter St.
Boston MA 02108
Attn: Water Management Act Program

Table BW-5 Use this table to provide comments or additional information regarding this section of the ASR. You may explain discrepancies, provide supplemental information, or provide any other information to assist MassDEP in processing the data in your ASR.

Technical Appendix H

GHG Calculations

GHG Emissions Summary

Consistent with guidance from the MEPA GHG Policy and Protocol, this summary presents expected actual GHG emissions associated with direct and indirect sources (fuel consumption and electricity use). The totals are therefore not comparable with those presented in the MassDEP comprehensive air plans application, which addresses potential (worst-case) direct emissions.

	Baseline CO2 tons/year, expected actual	*Proposed CO2 tons/year, expected actual*
Prime Mover (CTG), direct emissions	377,000	377,000
Auxiliary Electric loads, indirect emissions (except transformers)	12,400	11,300
Transformers, indirect emissions	1,819	1,324
Transportation, direct emissions	77	77
Building electricity use, indirect emissions	78	57
Building heat (baseline indirect, proposed direct emissions)	24	17
Engines, direct emissions	16	16
Methane leaks*	13	13
SF6 leaks*	0	0
Total, rounded	391,414	389,791
Reduction from Baseline		0.41%

Prime Mover

	Baseline & Proposed	*Notes*
Gross emission rate firing gas, lb/MWh:	1,294	Proposed from MCPA application, Appendix C, scaled from CO2e to CO2. Base scaled from the rated NG gross heat rate Trent 60/LMS100
Gross emission rate firing ULSD, lb/MWh:	1,726	Proposed from MCPA application, Appendix C. Base scaled from the rated ULSD gross heat rate Trent 60/LMS100
Expected actual gas operation, MWh/year:	522,128	33% capacity factor total, 10 days on ULSD
Expected actual ULSD operation, MWh/year:	45,192	10 days on ULSD (full load equivalent)
Expected actual operating hours/year:	3,730	33% capacity factor, 77.5% annual average load while operating
Total direct CO2 emissions, tons/year, rounded	377,000	

EXELON - WEST MEDWAY - AUXILIARY POWER LOADS AND LOSSES TO POI

EQUIPMENT	*Average KW*		*NOTES*
Continuous loads	*Base*	*Proposed*	
AIR COOLED HEAT EXCHANGER FOR INTERCOOLER	1,190	1,170	Savings via efficient motors
AMMONIA SKID ELECTRIC HEATER	599.6	599.6	Reviewing options with GE for use of hot gas recirculation
FIN FAN COOLER FOR LUBE OIL	590	580	Savings via efficient motors
TURBINE INTERCOOLER/LUBE OIL COOLING WATER PUMP	447.4	447.4	
BALANCE - SYSTEM PUMPS, AIR COMPRESSOR, ENCL FANS	322	307	Savings via optimization
AIR COMPRESSORS AND AUXILIARIES	310	290	Savings via common system
LUBE OIL COOLING WATER PUMP	188	188	
LIGHTING & LOW VOLTAGE DISTRIBUTION SYSTEM PANELS	180	180	
BLDG., PDCs, HVAC, INDOOR/OUTDOOR LIGHTS, DCS, UPS, CEMS*	180	160	Savings via LED outdoor lights
MINERAL L.O. A/C PUMP	150	150	
NOX WATER INJECTION PUMP	150	150	
TURBINE HYDRAULIC JACKING OIL PUMP	112	112	
TURBINE ENCLOSURE VENT FAN	93	93	avg. based on 50% load diversity
115 kV LINE LOSSES	75	75	
AMMONIA SKID DILUTION AIR FAN MOTOR	45	45	
POWER TURBINE SHAFT COOLING FAN	44	44	
POWERTRAIN CONTROL MODULE	40	40	
DEMIN WATER FORWARDING PUMPS	42	36	Savings via common system
MINERAL L.O. AIR/OIL SEPARATOR FAN	29.8	29.8	
AMMONIA SKID CONTROL PANEL	20.8	20.8	
GAS GEN/SUPERCORE AIR/OIL SEPARATOR FAN	15	15	
SYNTHETIC L.O. AIR/OIL SEPARATOR FANS	15	15	
AQUEOUS AMMONIA PUMP	20	15	Savings via common system
SERVICE WATER PUMPS	14	12	Savings via common system
GENERATOR ENCLOSURE VENT FAN	7.5	7.5	avg. based on 50% load diversity
GAS GEN/SUPERCORE AIR/OIL SEPARATOR HEAT EXCHANGER FAN	1.5	1.5	
SYNTHETIC L.O. AIR/OIL SEPARATOR HEAT EXCHANGER FAN	1.5	1.5	
Fuel-specific loads	*Base*	*Proposed*	
GAS COMPRESSOR AUX COOLING AND ENCL. VENT FANS	110	110	avg. based on 50% load diversity
GAS COMPRESSORS AND AUXILIARIES	3,600	2,800	Savings via slide valve
FUEL OIL FORWARDING EQUIPMENT	180	180	
Intermittent loads (not included in total)	*Base*	*Proposed*	
TEMPERING AIR FAN MOTOR	372.8	372.8	Operates during startup only
240 VDC PUMP BATTERY CHARGER #5	62.8	62.8	
24 VDC CONTROL BATTERY CHARGER	18	18	
125 VDC CONTROL BATTERY CHARGER	2.6	2.6	
Totals	*Base*	*Proposed*	
Total normal operation during Natural gas firing	8,592.9	7,695.1	
Total normal operation during ULSD firing	5,062.9	4,965.1	
Total load in standby operations (not running)	560	560	

*includes some loads duplicative with the building energy use calculation, below.

Hours firing natural gas, estimated actual	3,490
Hours firing ULSD, estimated actual	240
Hours not running, by difference	5,030

	Base	Proposed
MWh/year	34,022	30,865
Total indirect CO2 emissions, tons/year, rounded**	**12,400**	**11,300**

**CO2 based on 730 pounts of CO2 per megawatt hour electricity used, the current Marginal Emission Factor for the ISO -NE.

EXELON WEST MEDWAY - TRANSFORMERS

Hours firing natural gas, estimated actual	3490
Hours firing ULSD, estimated actual	240
Marginal CO2 emission rate, lb/MWhr	730

GSU Transformer				
Vendor	Hyundai	Hitachi	GE (Prolec)	Siemens
Total losses at 318 MVA, kW	879	1,243	850	1,097
Losses at expected operating rate, MWh/yea	3,279	4,635	3,171	4,092
Indirect GHG emissions, tons/year	1,197	1,692	1,157	1,494

Auxiliary Transformer				
Vendor	Hyundai	Niagara Transformer	GE	VTC
Total losses at 85C at max nameplate KVA and rated voltage	93	80	76	94
Losses at expected operating rate, MWh/yea	347	298	282	349
Indirect GHG emissions, tons/year	127	109	103	127

EXELON WEST MEDWAY - EFFECT OF EVAPORATIVE COOLING

Natural gas CO_2 emission rate: 119 lb CO2/MMBtu HHV
131.971 lb CO2/Mmbtu LHV

Ambient Dry Bulb Temperature, F:	70	75	80	85	90	95	100
Without Evaporative Cooling							
Heat Rate, Btu/KWh, gross LHV at 100% load:	7,930	7,971	8,011	8,042	8,073	8,121	8,168
Estimated kW Gross generation rate, per unit:	108,440	106,350	104,260	102,287	100,313	97,207	94,101
CO2 emissions, pounds/hour per unit	113,486	111,867	110,226	108,558	106,874	104,174	101,435
With Evaporative Cooling							
Heat Rate, Btu/KWh, gross LHV at 100% load:	7,890	7,940	7,989	8,003	8,017	8,049	8,081
Estimated kW Gross generation rate:	110,280	107,945	105,610	104,242	102,873	100,336	97,798
CO2 emissions, pounds/hour per unit	114,829	113,103	111,346	110,096	108,841	106,580	104,297
Water use for evap. cooling, gallons/hour per unit	1,118	1,118	1,118	1,054	992	2,506	3,962
Typical hours per year in this temperature range*:	680	446	232	89	17	1	0
% of time operating	65%	75%	85%	90%	90%	100%	100%
Expected operating hours/year:	442	335	197	80	15	1	0
* Worcester meteorological record 1980 – 2015							

lb water/lb dry air without evap cooling*	0.00941	0.01259	0.01576	0.01946	0.02316	0.02026	0.01736
lb water/lb dry air with evap cooling*	0.01460	0.01786	0.02111	0.02456	0.02800	0.03272	0.03744
exhaust mass, lb/hr	1796305	1769460	1742614	1725762	1708910	1677283	1645655
water injected, lb/hr	9323	9325	9323	8793	8271	20899	33045

* from http://www.daytonashrae.org/psychrometrics_imp.html#start based on dry bulb temp, % RH on GE Base Data

kW Delta	1,840	1,595	1,350	1,955	2,560	3,129	3,697			
CO2 lb/hr delta	1,343	1,236	1,121	1,538	1,967	2,406	2,862			
Btu/kWh %reduction	-0.50%	-0.39%	-0.27%	-0.48%	-0.69%	-0.88%	-1.07%			
								One unit	Two units	Two units, rounded
MWh add'l	813	534	266	157	39	3	0	1,812	3,624	3,600
CO2 ton add'l	297	207	110	62	15	1	0	692	1,384	1,400
gallons add'l	494,087	374,008	220,443	84,448	15,174	2,506	-	1,190,666	2,381,333	2,400,000
weighted avg Btu/kWh % reduction	-0.21%	-0.12%	-0.05%	-0.04%	-0.01%	0.00%	0.00%	-0.43%	-0.43%	-0.4%

26,459 gpd avg over 90 days

Transportation

unchanged from DEIR

Trip Type	*Trips per year*	*Miles Per Round Trip*	*CO2 emissions, pounds per mile*	*Annual CO2 emissions, tons*
Employee commute (6 employees, 5 day/week, 50 week/year)	1500	25	0.8	15.0
ULSD deliveries (expected 10 days ULSD firing)	405	70	3.85	54.6
Ammonia deliveries	17	100	3.85	3.3
Water system delivery	23	20	3.85	0.9
Other deliveries	156	40	1.14	3.6
			Total	77.3

Heavy truck emission factor from MOVES Emission Factors, 2017 - Norfolk County, MA, Rural Unrestricted Roadway - Long Haul Combination Diesel Trucks, average 30-65mph

Passenger vehicle, light duty truck from Salem Harbor Redevelopment (Footprint) DEIR, 2013

Exelon West Medway
MOVES Emission Factors
2017 - Norfolk County, MA
Rural Unrestricted Roadway - Long Haul Combination Diesel Trucks

Speed	*Total CO2e*			
65 MPH	1,701.91	g/Veh-Mile	3.75	lb/Veh-Mile
60 MPH	1,576.35	g/Veh-Mile	3.48	lb/Veh-Mile
55 MPH	1,599.40	g/Veh-Mile	3.53	lb/Veh-Mile
50 MPH	1,672.94	g/Veh-Mile	3.69	lb/Veh-Mile
45 MPH	1,735.11	g/Veh-Mile	3.83	lb/Veh-Mile
40 MPH	1,763.14	g/Veh-Mile	3.89	lb/Veh-Mile
35 MPH	1,799.18	g/Veh-Mile	3.97	lb/Veh-Mile
30 MPH	2,112.47	g/Veh-Mile	4.66	lb/Veh-Mile
25 MPH	2,148.40	g/Veh-Mile	4.74	lb/Veh-Mile
20 MPH	2,300.68	g/Veh-Mile	5.07	lb/Veh-Mile
15 MPH	2,600.76	g/Veh-Mile	5.73	lb/Veh-Mile
10 MPH	2,875.75	g/Veh-Mile	6.34	lb/Veh-Mile
5 MPH	4,422.39	g/Veh-Mile	9.75	lb/Veh-Mile
0 MPH	7,819.85	g/veh-hr	17.24	lb/Veh-hr

Emergency Engines Expected Actual CO2 Emissions

unchanged from DEIR

		CAT C-15 or equal	*Clarke JU4H-UFAD97 or equal*
Stack Exhaust Data		450 kw EDG	175 HP/147 kW Fire Pump
Heat Input	gph	34.9	9.3
Heat Input	MMBTU/hr	4.7	1.3
CO2	lb/MMBTU	162.30	162.30
CO2	lb/hr	765	204
Hours/year*		34	34
CO2	ton/year	13.0	3.5
Total CO2	ton/year	16.5	

*half-hour per week test, one 8-hour test per year

Methane Leak

unchanged from DEIR

Parameter	*Units*	*Value*
Natural Gas Composition		
Methane (CH_4)	mole fraction	0.968
Carbond Dioxide (CO_2)	mole fraction	0.008
Component Count (Estimate rounded up from Perryman App)		
Valves	N/A	250
Pressure Relief Valves	N/A	25
Flanges	N/A	300
Emission Factors (from Perryman App)		
Valves (1)	standard ft^3/hr/component	0.027
Pressure Relief Valves (1)	standard ft^3/hr/component	0.04
Flanges (1)	standard ft^3/hr/component	0.003
Global Warming Potential		
CO_2 (2)	N/A	1
CH_4 (2)	N/A	25
Operating Time		
Total hours	hours/yr	8760
Capacity Factor	%	33%
Operating Hours	hours/yr	2890.8
Methane Leak (ft^3/yr)		
Valves	standard ft^3/yr	18889
Pressure Relief Valves	standard ft^3/yr	2799
Flanges	standard ft^3/yr	2519
CO_2 Leak (ft^3/yr)		
Valves	standard ft^3/yr	157
Pressure Relief Valves	standard ft^3/yr	24
Flanges	standard ft^3/yr	21
Density (kg/ft^3) (at 14.7 psia and 68°F)		
Methane	kg/ft^3	0.0192
Carbon Dioxide (CO2)	kg/ft^3	0.0526
Density (lb/ft^3) (at 14.7 psia and 68°F)		
Methane	lb/ft^3	0.0423
Carbon Dioxide (CO2)	lb/ft^3	0.1160
Methane Leak (tons CO_2e/yr)		
Valves	tons CO_2e/yr	9.994
Pressure Relief Valves	tons CO_2e/yr	1.481
Flanges	tons CO_2e/yr	1.333
CO_2 Leak (tons CO_2e/yr)		
Valves	tons CO_2e/yr	0.0091
Pressure Relief Valves	tons CO_2e/yr	0.0014
Flanges	tons CO_2e/yr	0.0012
Total GHG Emissions	**tons CO_2e/yr**	**12.82**

(1) Emission factor for equipment leak source from EPA Table W-1 to

(2) Global warming potential (GWP) from EPA Table A-1 to Subpart A

Sulfur Hexafluoride Leak

unchanged from DEIR

Perryman SF6 Charge (lb)	66
Perryman Power (MW)	120
Medway Power (MW)	200

SF6 Charge (Scaled from Perryman) (lb)
110.0

Parameter	*Units*	*Value*
Circuit Breaker SF6 Leak Rate*	%/yr	0
SF6 GWP[(1)]	-	22,800
SF6 emissions	lb/yr	0.000
	ton/yr	0.00000
SF6 emissions as CO2e	lb/yr	-
	ton/yr	0.00

*expected actual includes no leaks

(1) Global warming potential (GWP) from EPA Table A-1 to Subpart A of 40 CFR part 98

Expected Direct Emissions

	Potential Emissions based on 43% CF and 30 days ULSD (tpy)	*Potential Emissions with 34.5% CF and 15 days ULSD (tpy)*	*Potential Emissions with 33% CF and 10 days ULSD (tpy)*	*Notes*
Prime Mover				
Gross emission rate firing gas, lb/MWh:	1294	1294	1294	Proposed from MCPA application, Appendix C, scaled from CO2e to CO2.
Gross emission rate firing ULSD, lb/MWh:	1726	1726	1726	Proposed from MCPA application, Appendix C.
Expected actual gas operation, MWh/year:	600128	548010	522128	33% capacity factor total, 10 days on ULSD
Expected actual ULSD operation, MWh/year:	135576	45192	45192	10 days on ULSD (full load equivalent)
Total direct CO2 emissions, tons/year, rounde	505,000	394,000	377,000	

Building Energy Use

Building Area	*Size, square feet*	
Administration/offices	5,148	
Electrical equipment room	1,154	conditioned
Battery room	66	1,220
Warehouse and Water Treatment Are	9,340	
Total	15,708	

Model Input Parameter	Baseline	Proposed (one of the options below to be determined in final design)			
	Electric Resistive Heating	Propane	Natural Gas	Cold-climate air source heat pumps	notes
Administration/offices energy use	60.0	2390	220	28.6	MWh/yr, gal/yr, MMBtu/yr
Electric room/battery room energy use	5.3	211	19	2.5	MWh/yr, gal/yr, MMBtu/yr
Total energy use	65.3	2601	239	31.1	
CO2 emission factor	730	13.1	119	730	lb/MWh, lb/gal, lb/MMBtu
CO2 emission rate	23.8	17.1	14.2	11.4	ton/year
CO2 reduction from baseline:		28%			

Energy Use Index (EUI)			
	Baseline	Proposed	notes
heating energy use, kBtu/yr	222971	236691	0.091 Mmbtu/gal propane
total conditioned square feet	6368	6368	
Heating EUI, kBtu/sf-yr	35	37	
air conditioning, MWhr/yr	57	57	No credit taken for EER, IPLV improvements
water heater, MWhr/yr	2	2	
lighting, MWhr/yr	66	26	from separate lighting calculation, conditioned space only
plug load, MWhr/yr	40	40	from separate plug load calculation
total electricity, MWhr/yr	165	124	
total electricity, kBtu/yr	562667	424809	
Electricity EUI, kBtu/sf-yr	88	67	
Total EUI, kBtu/sf-yr	123	104	

AC, DHW, Plug Load Electricity Use		
	Baseline & proposed	notes
air conditioning, MWhr/yr	57	No credit taken for EER, IPLV improvements
water heater, MWhr/yr	2	
plug load, MWhr/yr	40	from separate plug load calculation below
total electricity, MWhr/yr	99	
indirect emissions, tons CO2/yr	36	

plug load W/SF	1	Gemma, 1/13/2016
office space, SF	5148	
Plug load, MWh/year	40	calculated from above

Lighting

Lit Time Inputs	*Baseline*	*Proposed*
Hours/Day	24	12
Days/Week	7	7
Weeks/Year	52	52

CO_2 savings (lb/MWh)	730

Zone	*Description*	*Area (sf.)*	*Light Power Density*[1] [fluorescent] (W/sf.)	*Baseline*[2]: Fluorescent Lighting power use (kW-hr/year)	*Proposed*[3]: LED Lighting power use (kW-hr/year)	*Proposed: Savings in LED alternative (kW-hr/year)*	*Proposed*[4]: CO_2 Savings (tons/year)
1A	Administration/offices	5,148	1.1	49,470	34,629	14,841	5.4
1B	Electrical equipment room	1,154	1.6	16,130	5,646	10,485	3.8
2	Battery room	66	0.6	346	121	225	0.1
3	Warehouse & water treatment area	9,340	0.6	48,957	17,135	31,822	11.6
TOTAL		15,708		114,903	57,531	57,372	20.9

Notes:
1. Fluorescent lighting power density estimates based on space use provided from Internation Energy Conservation Code
2. Baseline calculations based on lit spaces 24 hr/day, 7 days/wk for a full year
3. Proposed calculations based on lit spaces 24 hr/day, 7 days/wk for a full year in Zone 1A. Proposed calculations for Zones 1B, 2, and 3 are based on 12 hrs/day, 7 days/wk for a full year
4. CO_2 emission savings calculations based on 730 lb/MWh

Lighting

	Baseline	*Proposed*	*Savings*	
Indoor Lighting Power Use (kW-hr/yr)	114,903	57,531	57,372	49.9%
Indoor Lighting CO2 Emissions (ton/year)	41.9	21.0	20.9	49.9%
Outdoor Lighting Power Use (kW-hr/yr)	399,360	279,552	119,808	30.0%
Outdoor Lighting CO2 Emissions (ton/year)	145.8	102.0	43.7	30.0%
Total Lighting Power Use (kW-hr/yr)	514,263	337,083	177,180	34.5%
Total Lighting CO2 Emissions (ton/year)	187.7	123.0	64.7	34.5%

CO2 savings (lb/MWh)	730

	Baseline	*Proposed*
Outdoor Lighting Power Use (kw)	91.4	64
Outdoor Lighting Operating Hours per Day	12	12
Outdoor Lighting Operating Days per Week	7	7
Outdoor Lighting Operating Weeks per Year	52	52

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Commercial*Energy*Calculator Comprehensive Report

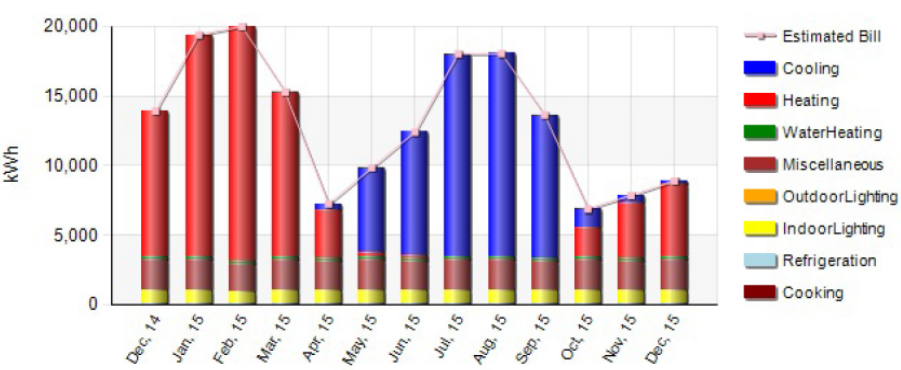
Your Inputs

	Base Facility
Building Type	Office (small suite) (EL2)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	5148
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Electric
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	Low E Tinted
Cooking Equipment	None
Refrigeration	Yes
Elevators/Escalators	No
Parking Garage	No

Monthly Electric Energy Usage Table

Date	Avg. Temp	Days	Cooling	Heating	Refrig.	Indr Lights	Outdr Lights	Cook	Water Heat	Misc.	Total
Dec, 15	50.4°F	31	245	5,225	66	993	0	0	153	2,214	8,896
Nov, 15	52.9°F	30	538	3,999	63	961	0	0	148	2,143	7,852
Oct, 15	57.7°F	31	1,357	2,103	66	993	0	0	153	2,214	6,886
Sep, 15	73.4°F	30	10,311	0	63	961	0	0	148	2,143	13,626
Aug, 15	78.4°F	31	14,624	0	66	993	0	0	153	2,214	18,050
Jul, 15	78.4°F	31	14,599	0	66	993	0	0	153	2,214	18,025
Jun, 15	71.1°F	30	8,877	222	63	961	0	0	148	2,143	12,414
May, 15	67.2°F	31	6,125	274	66	993	0	0	153	2,214	9,825
Apr, 15	53.8°F	30	435	3,487	63	961	0	0	148	2,143	7,237
Mar, 15	37.6°F	31	0	11,848	66	993	0	0	153	2,214	15,274
Feb, 15	24.7°F	28	0	16,906	59	897	0	0	138	2,000	20,000
Jan, 15	29.8°F	31	0	15,979	66	993	0	0	153	2,214	19,405
Dec, 14	40.2°F	31	0	10,496	66	993	0	0	153	2,214	13,922
Annual Tot		365	57,112	60,042	772	11,688	0	0	1,802	26,068	157,484
Mthly Avg		**30**	**4,759**	**5,004**	**64**	**974**	**0**	**0**	**150**	**2,172**	**13,123**

Monthly Electric Energy Usage Chart



CommercialEnergyCalculator
Comprehensive Report

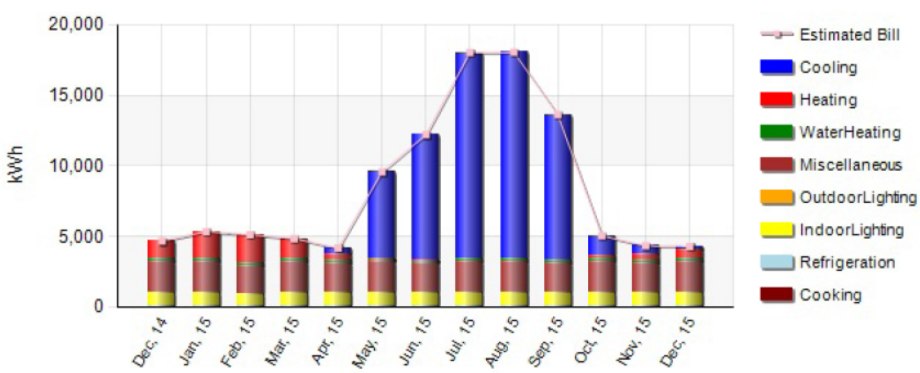
Your Inputs

	Base Facility
Building Type	Office (small suite) (EL2)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	5148
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Gas
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	Low E Tinted
Cooking Equipment	None
Refrigeration	Yes
Elevators/Escalators	No
Parking Garage	No

Monthly Electric Energy Usage Table

Date	Avg. Temp	Days	Cooling	Heating	Refrig.	Indr Lights	Outdr Lights	Cook	Water Heat	Misc.	Total
Dec, 15	50.4°F	31	245	627	66	993	0	0	153	2,214	4,298
Nov, 15	52.9°F	30	538	480	63	961	0	0	148	2,143	4,333
Oct, 15	57.7°F	31	1,357	252	66	993	0	0	153	2,214	5,035
Sep, 15	73.4°F	30	10,311	0	63	961	0	0	148	2,143	13,626
Aug, 15	78.4°F	31	14,624	0	66	993	0	0	153	2,214	18,050
Jul, 15	78.4°F	31	14,599	0	66	993	0	0	153	2,214	18,025
Jun, 15	71.1°F	30	8,877	27	63	961	0	0	148	2,143	12,219
May, 15	67.2°F	31	6,125	33	66	993	0	0	153	2,214	9,584
Apr, 15	53.8°F	30	435	418	63	961	0	0	148	2,143	4,168
Mar, 15	37.6°F	31	0	1,422	66	993	0	0	153	2,214	4,848
Feb, 15	24.7°F	28	0	2,029	59	897	0	0	138	2,000	5,123
Jan, 15	29.8°F	31	0	1,917	66	993	0	0	153	2,214	5,343
Dec, 14	40.2°F	31	0	1,260	66	993	0	0	153	2,214	4,686
Annual Tot		365	57,112	7,205	772	11,688	0	0	1,802	26,068	104,647
Mthly Avg		**30**	**4,759**	**600**	**64**	**974**	**0**	**0**	**150**	**2,172**	**8,719**

Monthly Electric Energy Usage Chart



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Your Inputs

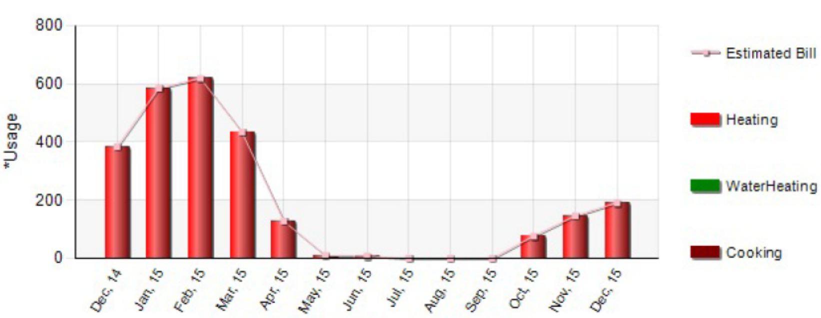
	Base Facility
Building Type	Office (small suite) (EL2)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	5148
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Gas
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	Low E Tinted
Cooking Equipment	None
Refrigeration	Yes
Elevators/Escalators	No
Parking Garage	No

Monthly Fuel Energy Usage Table

Date	Avg. Temp	Days	Heating	Cooking	Water Heating	Total
Dec, 15	50.4°F	31	191	0	0	191
Nov, 15	52.9°F	30	146	0	0	146
Oct, 15	57.7°F	31	77	0	0	77
Sep, 15	73.4°F	30	0	0	0	0
Aug, 15	78.4°F	31	0	0	0	0
Jul, 15	78.4°F	31	0	0	0	0
Jun, 15	71.1°F	30	8	0	0	8
May, 15	67.2°F	31	10	0	0	10
Apr, 15	53.8°F	30	128	0	0	128
Mar, 15	37.6°F	31	434	0	0	434
Feb, 15	24.7°F	28	619	0	0	619
Jan, 15	29.8°F	31	585	0	0	585
Dec, 14	40.2°F	31	384	0	0	384
Annual Tot		365	2,199	0	0	2,199
Mthly Avg		**30**	**183**	**0**	**0**	**183**

*Natural Gas in Therms; Propane and Oil in gallons

Monthly Fuel Energy Usage Chart



*Natural Gas in Therms; Propane and Oil in gallons

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Commercial*Energy*Calculator
Comprehensive Report

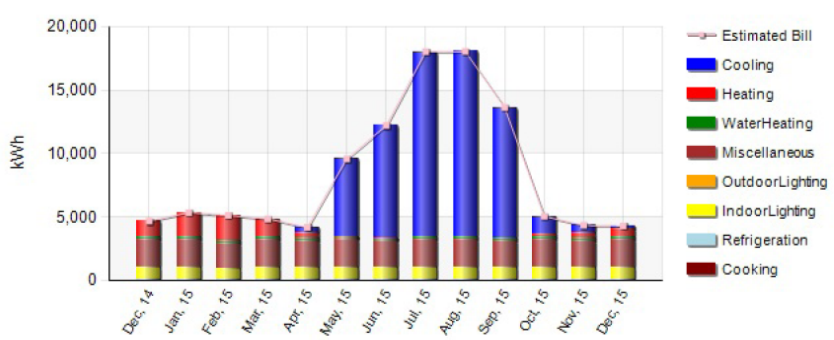
Your Inputs

	Base Facility
Building Type	Office (small suite) (EL2)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	5148
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Propane
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	Low E Tinted
Cooking Equipment	None
Refrigeration	Yes
Elevators/Escalators	No
Parking Garage	No

Monthly Electric Energy Usage Table

Date	Avg. Temp	Days	Cooling	Heating	Refrig.	Indr Lights	Outdr Lights	Cook	Water Heat	Misc.	Total
Dec, 15	50.4°F	31	245	627	66	993	0	0	153	2,214	4,298
Nov, 15	52.9°F	30	538	480	63	961	0	0	148	2,143	4,333
Oct, 15	57.7°F	31	1,357	252	66	993	0	0	153	2,214	5,035
Sep, 15	73.4°F	30	10,311	0	63	961	0	0	148	2,143	13,626
Aug, 15	78.4°F	31	14,624	0	66	993	0	0	153	2,214	18,050
Jul, 15	78.4°F	31	14,599	0	66	993	0	0	153	2,214	18,025
Jun, 15	71.1°F	30	8,877	27	63	961	0	0	148	2,143	12,219
May, 15	67.2°F	31	6,125	33	66	993	0	0	153	2,214	9,584
Apr, 15	53.8°F	30	435	418	63	961	0	0	148	2,143	4,168
Mar, 15	37.6°F	31	0	1,422	66	993	0	0	153	2,214	4,848
Feb, 15	24.7°F	28	0	2,029	59	897	0	0	138	2,000	5,123
Jan, 15	29.8°F	31	0	1,917	66	993	0	0	153	2,214	5,343
Dec, 14	40.2°F	31	0	1,260	66	993	0	0	153	2,214	4,686
Annual Tot		365	57,112	7,205	772	11,688	0	0	1,802	26,068	104,647
Mthly Avg		**30**	**4,759**	**600**	**64**	**974**	**0**	**0**	**150**	**2,172**	**8,719**

Monthly Electric Energy Usage Chart



Commercial*Energy*Calculator Comprehensive Report

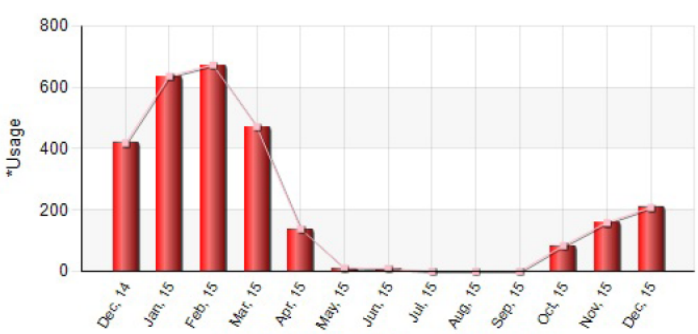
Your Inputs

	Base Facility
Building Type	Office (small suite) (EL2)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	5148
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Propane
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	Low E Tinted
Cooking Equipment	None
Refrigeration	Yes
Elevators/Escalators	No
Parking Garage	No

Monthly Fuel Energy Usage Table

Date	Avg. Temp	Days	Heating	Cooking	Water Heating	Total
Dec, 15	50.4°F	31	208	0	0	208
Nov, 15	52.9°F	30	159	0	0	159
Oct, 15	57.7°F	31	84	0	0	84
Sep, 15	73.4°F	30	0	0	0	0
Aug, 15	78.4°F	31	0	0	0	0
Jul, 15	78.4°F	31	0	0	0	0
Jun, 15	71.1°F	30	9	0	0	9
May, 15	67.2°F	31	11	0	0	11
Apr, 15	53.8°F	30	139	0	0	139
Mar, 15	37.6°F	31	472	0	0	472
Feb, 15	24.7°F	28	673	0	0	673
Jan, 15	29.8°F	31	636	0	0	636
Dec, 14	40.2°F	31	418	0	0	418
Annual Tot		365	2,390	0	0	2,390
Mthly Avg		**30**	**199**	**0**	**0**	**199**

Monthly Fuel Energy Usage Chart



*Natural Gas in Therms; Propane and Oil in gallons

conEdison **Commercial*Energy*Calculator Comprehensive Report**

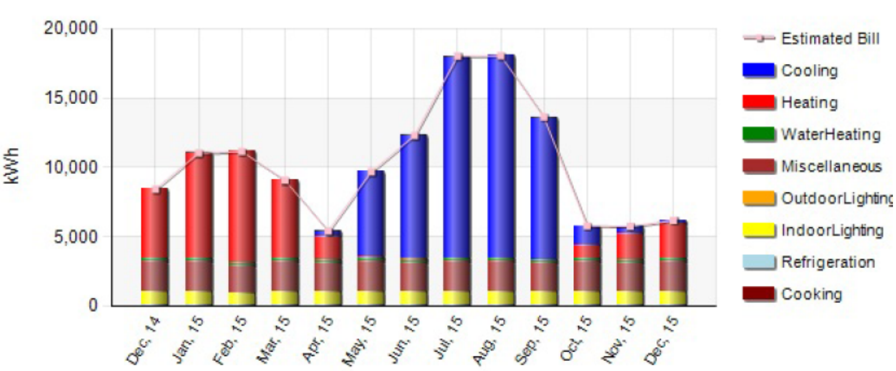
Your Inputs

	Base Facility
Building Type	Office (small suite) (EL2)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	5148
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Heat Pump (Air)
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	Low E Tinted
Cooking Equipment	None
Refrigeration	Yes
Elevators/Escalators	No
Parking Garage	No

Monthly Electric Energy Usage Table

Date	Avg. Temp	Days	Cooling	Heating	Refrig.	Indr Lights	Outdr Lights	Cook	Water Heat	Misc.	Total
Dec, 15	50.4°F	31	245	2,488	66	993	0	0	153	2,214	6,159
Nov, 15	52.9°F	30	538	1,904	63	961	0	0	148	2,143	5,757
Oct, 15	57.7°F	31	1,357	1,001	66	993	0	0	153	2,214	5,784
Sep, 15	73.4°F	30	10,311	0	63	961	0	0	148	2,143	13,626
Aug, 15	78.4°F	31	14,624	0	66	993	0	0	153	2,214	18,050
Jul, 15	78.4°F	31	14,599	0	66	993	0	0	153	2,214	18,025
Jun, 15	71.1°F	30	8,877	106	63	961	0	0	148	2,143	12,298
May, 15	67.2°F	31	6,125	130	66	993	0	0	153	2,214	9,681
Apr, 15	53.8°F	30	435	1,661	63	961	0	0	148	2,143	5,411
Mar, 15	37.6°F	31	0	5,642	66	993	0	0	153	2,214	9,068
Feb, 15	24.7°F	28	0	8,050	59	897	0	0	138	2,000	11,144
Jan, 15	29.8°F	31	0	7,609	66	993	0	0	153	2,214	11,035
Dec, 14	40.2°F	31	0	4,998	66	993	0	0	153	2,214	8,424
Annual Tot		365	57,112	28,592	772	11,688	0	0	1,802	26,068	126,034
Mthly Avg		**30**	**4,759**	**2,383**	**64**	**974**	**0**	**0**	**150**	**2,172**	**10,502**

Monthly Electric Energy Usage Chart

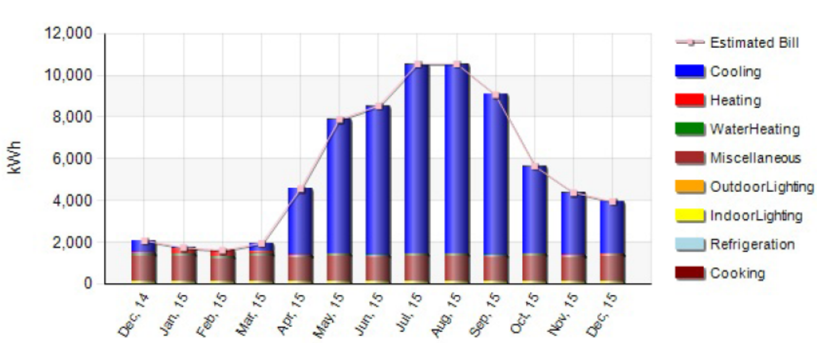


Your Inputs

	Base Facility
Building Type	Computer Rooms (EL9)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	1220
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Gas
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	No Windows
Cooking Equipment	None
Refrigeration	No
Elevators/Escalators	No
Parking Garage	No

Date	Avg. Temp	Days	Cooling	Heating	Refrig.	Indr Lights	Outdr Lights	Cook	Water Heat	Misc.	Total
Dec, 15	50.4°F	31	2,509	3	0	138	0	0	16	1,287	3,953
Nov, 15	52.9°F	30	2,983	2	0	134	0	0	15	1,245	4,379
Oct, 15	57.7°F	31	4,210	0	0	138	0	0	16	1,287	5,651
Sep, 15	73.4°F	30	7,674	0	0	134	0	0	15	1,245	9,068
Aug, 15	78.4°F	31	9,116	0	0	138	0	0	16	1,287	10,557
Jul, 15	78.4°F	31	9,109	0	0	138	0	0	16	1,287	10,550
Jun, 15	71.1°F	30	7,146	0	0	134	0	0	15	1,245	8,540
May, 15	67.2°F	31	6,454	0	0	138	0	0	16	1,287	7,895
Apr, 15	53.8°F	30	3,169	1	0	134	0	0	15	1,245	4,564
Mar, 15	37.6°F	31	413	91	0	138	0	0	16	1,287	1,945
Feb, 15	24.7°F	28	0	307	0	125	0	0	14	1,162	1,608
Jan, 15	29.8°F	31	61	231	0	138	0	0	16	1,287	1,733
Dec, 14	40.2°F	31	582	50	0	138	0	0	16	1,287	2,073
Annual Tot		365	52,845	635	0	1,629	0	0	183	15,152	70,444
Mthly Avg		**30**	**4,404**	**53**	**0**	**136**	**0**	**0**	**15**	**1,263**	**5,871**

Monthly Electric Energy Usage Chart



conEdison CommercialEnergyCalculator Comprehensive Report

Your Inputs

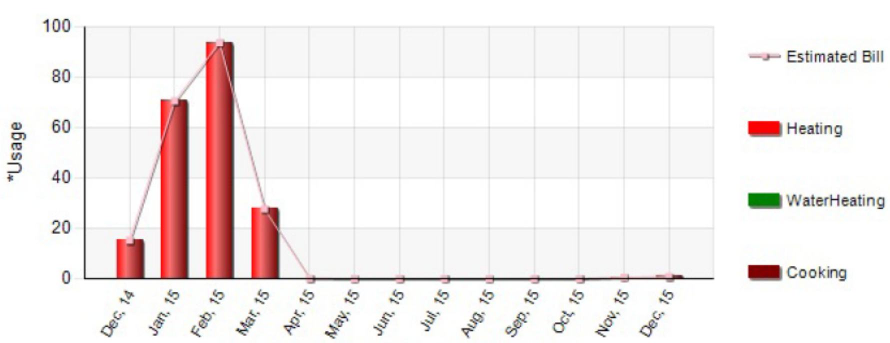
	Base Facility
Building Type	Computer Rooms (EL9)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	1220
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Gas
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	No Windows
Cooking Equipment	None
Refrigeration	No
Elevators/Escalators	No
Parking Garage	No

Monthly Fuel Energy Usage Table

Date	Avg. Temp	Days	Heating	Cooking	Water Heating	Total
Dec, 15	50.4°F	31	1	0	0	1
Nov, 15	52.9°F	30	1	0	0	1
Oct, 15	57.7°F	31	0	0	0	0
Sep, 15	73.4°F	30	0	0	0	0
Aug, 15	78.4°F	31	0	0	0	0
Jul, 15	78.4°F	31	0	0	0	0
Jun, 15	71.1°F	30	0	0	0	0
May, 15	67.2°F	31	0	0	0	0
Apr, 15	53.8°F	30	0	0	0	0
Mar, 15	37.6°F	31	28	0	0	28
Feb, 15	24.7°F	28	94	0	0	94
Jan, 15	29.8°F	31	71	0	0	71
Dec, 14	40.2°F	31	15	0	0	15
Annual Tot		365	194	0	0	194
Mthly Avg		**30**	**16**	**0**	**0**	**16**

*Natural Gas in Therms; Propane and Oil in gallons

Monthly Fuel Energy Usage Chart



*Natural Gas in Therms; Propane and Oil in gallons

CommercialEnergyCalculator
Comprehensive Report

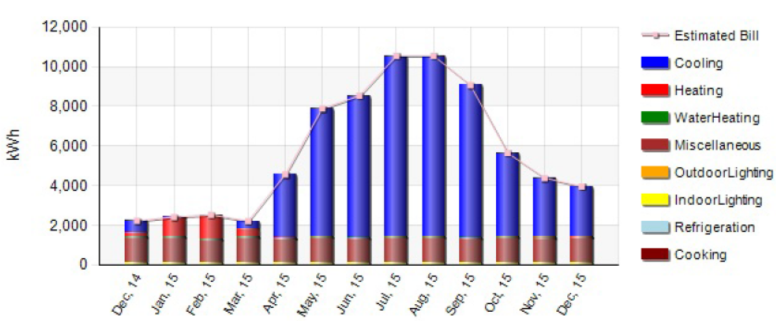
Your Inputs

	Base Facility
Building Type	Computer Rooms (EL9)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	1220
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Heat Pump (Air)
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	No Windows
Cooking Equipment	None
Refrigeration	No
Elevators/Escalators	No
Parking Garage	No

Monthly Electric Energy Usage Table

Date	Avg. Temp	Days	Cooling	Heating	Refrig.	Indr Lights	Outdr Lights	Cook	Water Heat	Misc.	Total
Dec, 15	50.4°F	31	2,509	11	0	138	0	0	16	1,287	3,961
Nov, 15	52.9°F	30	2,983	8	0	134	0	0	15	1,245	4,385
Oct, 15	57.7°F	31	4,210	0	0	138	0	0	16	1,287	5,651
Sep, 15	73.4°F	30	7,674	0	0	134	0	0	15	1,245	9,068
Aug, 15	78.4°F	31	9,116	0	0	138	0	0	16	1,287	10,557
Jul, 15	78.4°F	31	9,109	0	0	138	0	0	16	1,287	10,550
Jun, 15	71.1°F	30	7,146	0	0	134	0	0	15	1,245	8,540
May, 15	67.2°F	31	6,454	0	0	138	0	0	16	1,287	7,895
Apr, 15	53.8°F	30	3,169	3	0	134	0	0	15	1,245	4,566
Mar, 15	37.6°F	31	413	361	0	138	0	0	16	1,287	2,215
Feb, 15	24.7°F	28	0	1,219	0	125	0	0	14	1,162	2,520
Jan, 15	29.8°F	31	61	917	0	138	0	0	16	1,287	2,419
Dec, 14	40.2°F	31	582	199	0	138	0	0	16	1,287	2,222
Annual Tot		365	52,845	2,518	0	1,629	0	0	183	15,152	72,327
Mthly Avg		**30**	**4,404**	**210**	**0**	**136**	**0**	**0**	**15**	**1,263**	**6,028**

Monthly Electric Energy Usage Chart



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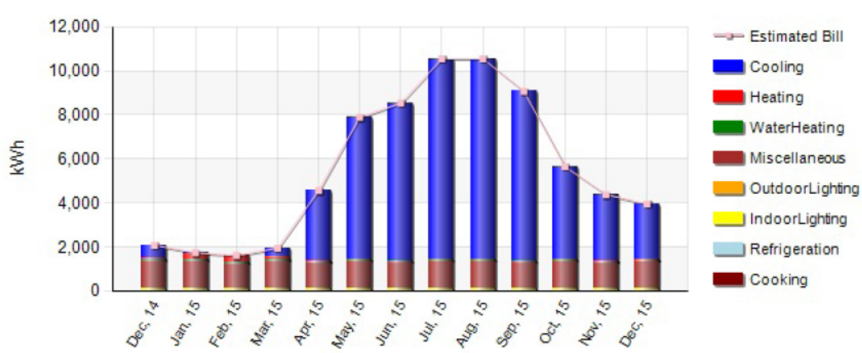
Your Inputs

	Base Facility
Building Type	Computer Rooms (EL9)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	1220
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Propane
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	No Windows
Cooking Equipment	None
Refrigeration	No
Elevators/Escalators	No
Parking Garage	No

Monthly Electric Energy Usage Table

Date	Avg. Temp	Days	Cooling	Heating	Refrig.	Indr Lights	Outdr Lights	Cook	Water Heat	Misc.	Total
Dec, 15	50.4°F	31	2,509	3	0	138	0	0	16	1,287	3,953
Nov, 15	52.9°F	30	2,983	2	0	134	0	0	15	1,245	4,379
Oct, 15	57.7°F	31	4,210	0	0	138	0	0	16	1,287	5,651
Sep, 15	73.4°F	30	7,674	0	0	134	0	0	15	1,245	9,068
Aug, 15	78.4°F	31	9,116	0	0	138	0	0	16	1,287	10,557
Jul, 15	78.4°F	31	9,109	0	0	138	0	0	16	1,287	10,550
Jun, 15	71.1°F	30	7,146	0	0	134	0	0	15	1,245	8,540
May, 15	67.2°F	31	6,454	0	0	138	0	0	16	1,287	7,895
Apr, 15	53.8°F	30	3,169	1	0	134	0	0	15	1,245	4,564
Mar, 15	37.6°F	31	413	91	0	138	0	0	16	1,287	1,945
Feb, 15	24.7°F	28	0	307	0	125	0	0	14	1,162	1,608
Jan, 15	29.8°F	31	61	231	0	138	0	0	16	1,287	1,733
Dec, 14	40.2°F	31	582	50	0	138	0	0	16	1,287	2,073
Annual Tot		365	52,845	635	0	1,629	0	0	183	15,152	70,444
Mthly Avg		**30**	**4,404**	**53**	**0**	**136**	**0**	**0**	**15**	**1,263**	**5,871**

Monthly Electric Energy Usage Chart



Commercial*Energy*Calculator
Comprehensive Report

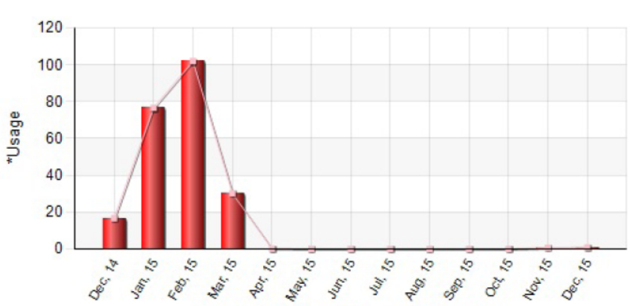
Your Inputs

	Base Facility
Building Type	Computer Rooms (EL9)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	1220
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Propane
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	No Windows
Cooking Equipment	None
Refrigeration	No
Elevators/Escalators	No
Parking Garage	No

Monthly Fuel Energy Usage Table

Date	Avg. Temp	Days	Heating	Cooking	Water Heating	Total
Dec, 15	50.4°F	31	1	0	0	1
Nov, 15	52.9°F	30	1	0	0	1
Oct, 15	57.7°F	31	0	0	0	0
Sep, 15	73.4°F	30	0	0	0	0
Aug, 15	78.4°F	31	0	0	0	0
Jul, 15	78.4°F	31	0	0	0	0
Jun, 15	71.1°F	30	0	0	0	0
May, 15	67.2°F	31	0	0	0	0
Apr, 15	53.8°F	30	0	0	0	0
Mar, 15	37.6°F	31	30	0	0	30
Feb, 15	24.7°F	28	102	0	0	102
Jan, 15	29.8°F	31	77	0	0	77
Dec, 14	40.2°F	31	17	0	0	17
Annual Tot		365	211	0	0	211
Mthly Avg		**30**	**18**	**0**	**0**	**18**

Monthly Fuel Energy Usage Chart



*Natural Gas in Therms; Propane and Oil in gallons

conEdison Commercial*Energy*Calculator Comprehensive Report

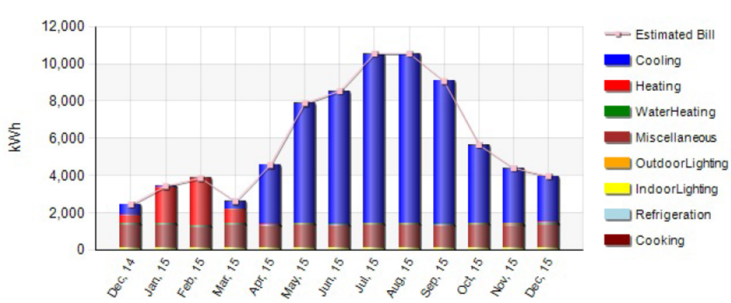
Your Inputs

	Base Facility
Building Type	Computer Rooms (EL9)
Building Age	0 - 9 years
Annual Operating Hours	8736
Sqft Heat/Cool	1220
Sqft Parking	0
Cool Setting	75
Heat Setting	70
Heat Type	Electric
Water Heat Type	Electric
Air Conditioning	Electric (Typical)
Lighting (Watts/SF)	0.77
Lighting Inventory	LED: 100 %
Windows (Panes)	No Windows
Cooking Equipment	None
Refrigeration	No
Elevators/Escalators	No
Parking Garage	No

Monthly Electric Energy Usage Table

Date	Avg. Temp	Days	Cooling	Heating	Refrig.	Indr Lights	Outdr Lights	Cook	Water Heat	Misc.	Total
Dec, 15	50.4°F	31	2,509	23	0	138	0	0	16	1,287	3,973
Nov, 15	52.9°F	30	2,983	16	0	134	0	0	15	1,245	4,393
Oct, 15	57.7°F	31	4,210	0	0	138	0	0	16	1,287	5,651
Sep, 15	73.4°F	30	7,674	0	0	134	0	0	15	1,245	9,068
Aug, 15	78.4°F	31	9,116	0	0	138	0	0	16	1,287	10,557
Jul, 15	78.4°F	31	9,109	0	0	138	0	0	16	1,287	10,550
Jun, 15	71.1°F	30	7,146	0	0	134	0	0	15	1,245	8,540
May, 15	67.2°F	31	6,454	0	0	138	0	0	16	1,287	7,895
Apr, 15	53.8°F	30	3,169	6	0	134	0	0	15	1,245	4,569
Mar, 15	37.6°F	31	413	758	0	138	0	0	16	1,287	2,612
Feb, 15	24.7°F	28	0	2,560	0	125	0	0	14	1,162	3,861
Jan, 15	29.8°F	31	61	1,926	0	138	0	0	16	1,287	3,428
Dec, 14	40.2°F	31	582	418	0	138	0	0	16	1,287	2,441
Annual Tot		365	52,845	5,288	0	1,629	0	0	183	15,152	75,097
Mthly Avg		**30**	**4,404**	**441**	**0**	**136**	**0**	**0**	**15**	**1,263**	**6,259**

Monthly Electric Energy Usage Chart



Project PV Potential

	Annual Generation	GHG Reduction
	MWh	tons/yr
Existing Roof	67.0	24.5
Planned Roof	67.0	24.5
Existing + Planned Parking Canopy	115.7	42.2
Total	249.7	91.1

Existing Roof array	51.8	kW Peak DC
Planned Roof array	51.8	kW Peak DC
Canopy potential	88.8	kW Peak DC
Total potential array size:	192.5	kW Peak DC

Problem:

Estimate annual output of potential PV array for Medway - Rooftop

Given:

Total roof area	14,400	sf
CO_2 coversion [1]	730	lbs/MWh

[1] 2013 New England Electric Generator Air Emissions Report, Table1.1, 2013 value

Assumptions:

Available roof area[1]	50%	7,200	sf
panel area[2]	60%	4,320	sf
W/sf	12		
Arrangement			
tilt	20	deg	
azimouth	180	deg true	

[1] available area allows for skylights and HVAC equipment, breaking up the roof

[2] panel area allows for set-backs from roof edge, and maintenance and row spacing

Calculation:

Array size	52	kW peak DC	
Annual generation	67.0	MWh	(see PVWatts output)
Annual GHG reduction	**24.5**	**tons**	

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Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at http://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

ROOF

RESULTS

66,963 kWh per Year *

System output may range from 61,794 to 68,678kWh per year near this location.

Month	Solar Radiation ($kWh / m^2 / day$)	AC Energy (kWh)	Energy Value ($)
January	2.69	3,802	567
February	3.68	4,702	701
March	4.49	6,128	914
April	4.96	6,361	948
May	5.68	7,185	1,071
June	5.92	7,033	1,049
July	6.13	7,474	1,114
August	5.54	6,773	1,010
September	4.76	5,736	855
October	3.84	5,045	752
November	2.68	3,548	529
December	2.28	3,175	473
Annual	**4.39**	**66,962**	**$ 9,983**

Location and Station Identification

Requested Location	9 Summer St, Medway, MA 02053	
Weather Data Source	(TMY2) WORCESTER, MA	24 mi
Latitude	42.27° N	
Longitude	71.87° W	

PV System Specifications *(Residential)*

DC System Size	52 kW
Module Type	Standard
Array Type	Fixed (roof mount)
Array Tilt	20°
Array Azimuth	180°
System Losses	14%
Inverter Efficiency	96%
DC to AC Size Ratio	1.1

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.15 $/kWh
Initial Cost	3.30 $/Wdc
Cost of Electricity Generated by System	0.21 $/kWh

These values can be compared to get an idea of the cost-effectiveness of this system. However, system costs, system financing options (including 3rd party ownership) and complex utility rates can significantly change the relative value of the PV system.

Problem:

Estimate annual output of potential PV array for Medway - Parking Canopy

Given:

Total canopy area	7,400	sf
CO_2 coversion [1]	730	lbs/MWh

[1] 2013 New England Electric Generator Air Emissions Report, Table1.1, 2013 value

Assumptions:

Available canopy area		7,400	sf
panel area	100%	7,400	sf
W/sf	12		
Arrangement			
tilt	20	deg	
azimouth	180	deg true	

Calculation:

Array size	89	kW peak DC	
Annual generation	115.7	MWh	(see PVWatts output)
Annual GHG reduction	**42.2**	**tons**	

CANOPY

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The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

115,709 kWh per Year *

System output may range from 106,777 to 118,672kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	2.69	6,546	976
February	3.68	8,103	1,208
March	4.49	10,580	1,577
April	4.96	10,986	1,638
May	5.68	12,428	1,853
June	5.92	12,183	1,816
July	6.13	12,947	1,930
August	5.54	11,733	1,749
September	4.76	9,931	1,481
October	3.84	8,703	1,298
November	2.68	6,107	911
December	2.28	5,463	815
Annual	**4.39**	**115,710**	**$ 17,252**

Location and Station Identification

Requested Location	9 Summer St, Medway, MA 02053
Weather Data Source	(TMY2) WORCESTER, MA 24 mi
Latitude	42.27° N
Longitude	71.87° W

PV System Specifications *(Residential)*

DC System Size	89 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	20°
Array Azimuth	180°
System Losses	14%
Inverter Efficiency	96%
DC to AC Size Ratio	1.1

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.15 $/kWh
Initial Cost	3.30 $/Wdc
Cost of Electricity Generated by System	0.21 $/kWh

These values can be compared to get an idea of the cost-effectiveness of this system. However, system costs, system financing options (including 3rd party ownership) and complex utility rates can significantly change the relative value of the PV system.

Solar Photovoltaic Project Simple Financial Model

RPS Solar Carve-Out II Program v1.0

Medway

DATA ENTRY AND FINANCIAL SUMMARY

Items shaded in beige are Proponent's inputs that differ from the default values.

Key

Entry Cells

Calculation Cells (Not for Entry)

Pre-populated entries in these cells are for sample purposes only and do not reflect information or opinions of DOER. Users should enter values that are specific to their own projects or market information.

Select Taxable or Non-Taxable Entity: Taxable

Project and Customer Cost Assumptions

Solar Photovoltaic System Size	192500	Watts (DC STC)
Total System Cost/Watt	$ 3.000	$/Watt (DC STC)
Total System Cost	$ 577,500.00	

CEC Rebate Assumptions

Rebate$ per/Watt	$ -	$/Watt (DC STC)
Total Rebate		

Project Performance and Savings/ Cost Assumptions

Annual Net Capacity Factor	13.21%	kW (DC STC) to kWh AC
Annual Production Degradation	0.50%	%
Project Life	25	Years
Depreciation Life	20	Years
Electricity Revenue (Avoided Costs)	$ 0.13	$/kWh
Electricity Revenue (Avoided Costs) Annual Adjustor	5.0%	%
Solar Renewable Energy Certificate (SREC) Auction Price	$ 0.271	$/kWh (2017)
SREC Factor	0.9	
SREC Term (40 Quarters)	10	Years (must be equal to or less than project life)
SREC Revenue Annual Adjustor	-5.0%	%
SREC Contract Price		$/kWh
SREC Contract Term		Years (must be equal to or less than project life)
Post SREC Term REC Value	$ 0.030	$/kWh
Annual Operations and Maintenance Cost Factor	$ 19.00	$/kW/Year
Annual Operations and Maintenance Cost	$ 3,658	$/Year
Annual Operations and Maintenance Adjustor	3.0%	%
Future Inverter Replacement Cost	$ 0.25	$/Watt (DC STC)
Inverter Life, Replace Every X Years	10	Year (must be equal to or less than project life)

Tax Assumptions

Federal Tax Rate	35%		
State Tax Rate	10%		
Effective Tax Rate	42%		
Federal Tax Credit	30%		
State Tax Deduction	100%		
5 Year Accelerated Depreciation Schedule (MACRS)	20.00%	32.00%	19.20%
Depreciation	20.00%	32.00%	19.20%
Asset Basis			
Gross Cost	$ 577,500		
Rebate	$ -		
Less 50% of Federal Tax Credit	$ (86,625)		
Asset Basis	$ 490,875		

Financing Assumptions

% Financed w/ Cash	100%	
% Financed w/ Loan	0%	
Loan Interest Rate	7.00%	
Loan Period	10	Years (must be ≤ project life)
Net Cost	$ 577,500	
Customer Discount Rate	5.00%	
Loan	$ -	

Solar Project Financial Analysis Summary

Net Present Value	**$ 305,462**
Simple Payback (100% Cash only)	**Year 5**
Estimated Return on Equity	**15.7%**

Disclaimer: This Unofficial Cash Flow Model is intended to provide non-residential entities that are considering the purchase and installation of solar energy equipment with a general understanding of possible financial implications of such purchase and installation. Those entities interested in learning more about the financial implications of the purchase and installation of solar energy equipment are urged to consult their own tax and financial experts. The information contained in the Unofficial Cash Flow Model may not be relied on by anyone for any purposes. Furthermore, the information contained in this model does not necessarily reflect the views of the Department of Energy Resources or the Commonwealth of Massachusetts, and reference to any specific method does not constitute an implied or expressed recommendation or endorsement of it. Neither the Department of Energy Resources nor the Commonwealth of Massachusetts make any warranties or representations, expressed or implied, as to the usefulness, completeness, or accuracy of any processes, methods or other information contained, described, disclosed, or referred to in this model. Finally, neither the Department of Energy Resources nor the Commonwealth of Massachusetts makes any representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned property rights and assumes no liability of any kind or nature for any loss, injury, or damage directly or indirectly resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this Unofficial Cash Flow Model.