The experts you need to solve your stormwater management challenges

Contech is the leader in stormwater management solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

Your Contech Team

STORMWATER CONSULTANT

It's my job to recommend the best solution to meet permitting requirements.

STORMWATER DESIGN ENGINEER

I work with consultants to design the best approved solution to meet your project's needs.

REGULATORY MANAGER

I understand the local stormwater regulations and what solutions will be approved.

SALES ENGINEER

I make sure our solutions meet the needs of the contractor during construction.

Contech is your partner in stormwater management solutions

Unique screening technology for stormwater runoff – CDS®

The CDS hydrodynamic separator uses swirl concentration and continuous deflective separation to screen, separate and trap trash, debris, sediment, and hydrocarbons from stormwater runoff.

At the heart of the CDS system is a unique screening technology used to capture and retain trash and debris. The screen face is louvered so that it is smooth in the downstream direction. The effect created is called "Continuous Deflective Separation." The power of the incoming flow is harnessed to continually shear debris off the screen and to direct trash and sediment toward the center of the separation cylinder. This results in a screen that is self-cleaning and provides 100% removal of floatables and neutrally buoyant material debris 4.7 mm or larger, without blinding.

CDS is used to meet trash Total Maximum Daily Load (TMDL) requirements, for stormwater quality control, inlet and outlet pollution control, and as pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and a variety of green infrastructure practices.

CDS® Features and Benefits

FEATURE	BENEFIT
Captures and retains 100% of floatables and neutrally buoyant debris 4.7mm or larger	Superior pollutant removal
Self-cleaning screen	Ease of maintenance
Isolated storage sump eliminates scour potential	Excellent pollutant retention
Internal bypass	Eliminates the need for additional structures
Multiple pipe inlets and 90-180º angles	Design flexibility
Clear access to sump and stored pollutants	Fast, easy maintenance

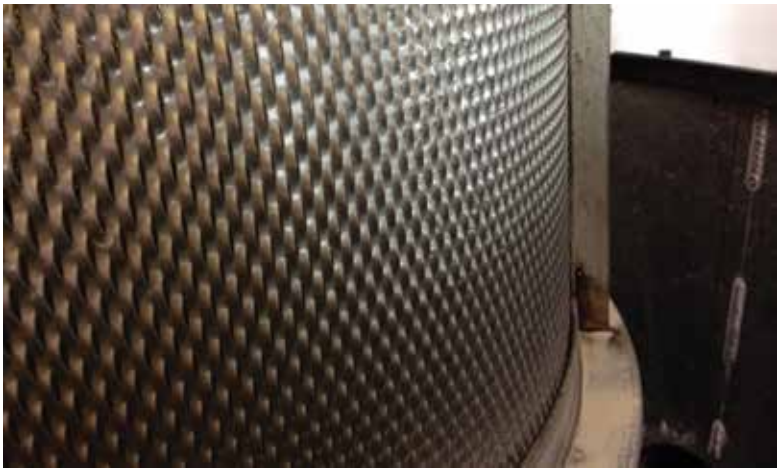
APPLICATION TIPS

- Because of its internal peak bypass weirs, CDS systems can provide cost savings by eliminating the need for additional structures.
- Pretreating detention, infiltration, and green infrastructure practices with CDS can protect downstream structures and provide for easy maintenance.
- The CDS an ideal solution for retrofit applications due to its compact footprint and configuration flexibility.

The CDS® Screen

A fundamentally different approach to trash control ...

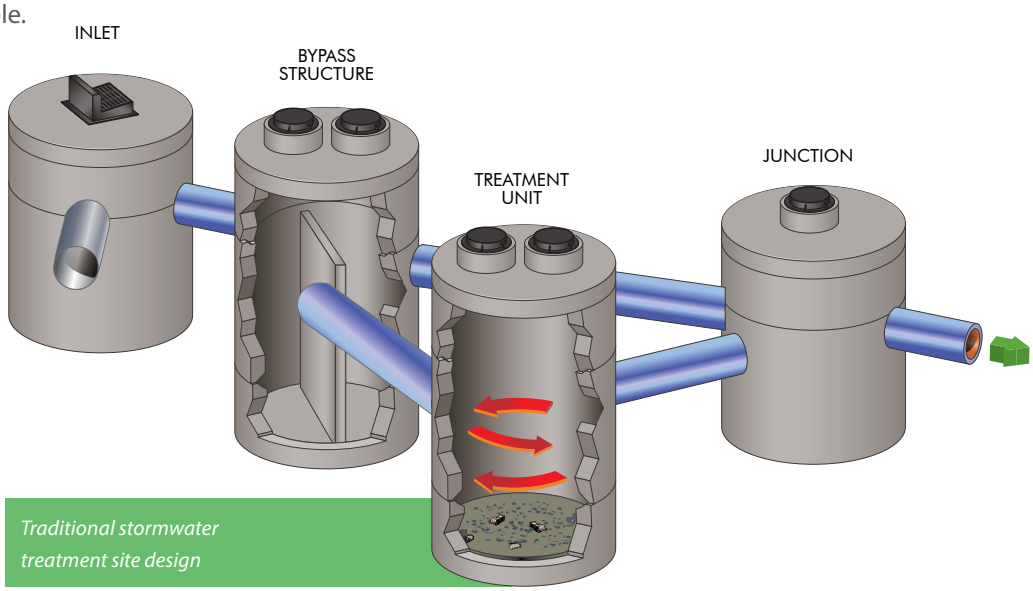
Traditional approaches to trash control typically involve "direct screening" that can easily become clogged, as trash is pinned to the screen as water passes through. Clogged screens can lead to flooding as water backs up. The design of the CDS screen is fundamentally different. Flow is introduced to the screen face which is louvered so that it is smooth in the downstream direction. The effect created is called "Continuous Deflective Separation." The power of the incoming flow is harnessed to continually shear debris off the screen and to direct trash and sediment toward the center of the separation cylinder.



CDS® Design Configuration

Why use traditional stormwater design when ONE system can do it all ...

The CDS effectively treats stormwater runoff while reducing the number of structures on your site. Inline, offline, grate inlet, and drop inlet configurations available. Internal and external peak bypass options also available.

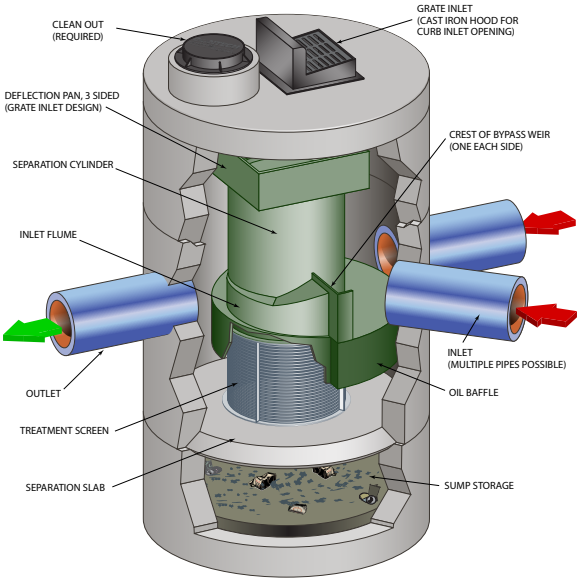


Traditional stormwater treatment site design

A Traditional Stormwater Treatment Site Design would require several structures on your site. With CDS, one system can do it all!

CDS® Advantages

- Grate inlet option available
- Internal bypass weir
- Accepts multiple inlets at a variety of angles
- Advanced hydrodynamic separator
- Captures and retains 100% of floatables and neutrally buoyant debris 4.7 mm or larger
- Indirect screening capability keeps screen from clogging
- Retention of all captured pollutants, even at high flows
- Performance verified by NJCAT, WA Ecology, and ETV Canada



Learn More:
www.ContechES.com/cds

CDS® Applications

CDS is commonly used in the following stormwater applications:

- Stormwater quality control – trash, debris, sediment, and hydrocarbon removal
- Urban retrofit and redevelopment
- Inlet and outlet protection
- Pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and Low Impact Development designs

CDS® provides trash control

CDS® pretreats a bioswale

Select CDS® Certifications and Verifications

CDS has been verified by some of the most stringent stormwater technology evaluation organizations in North America, including:

- Washington State Department of Ecology (GULD) - Pretreatment
- Canadian Environmental Technology Verification (ETV)
- California Statewide Trash Amendments Full Capture System Certified*

**The CDS System has been certified by the California State Water Resources Control Board as a Full Capture System provided that it is sized to treat the peak flow rate from the region specific 1-year, 1-hour design storm, or the peak flow capacity of the corresponding storm drain, whichever is less.*

CDS® Maintenance

Select a cost-effective and easy-to-access treatment system ...

Systems vary in their maintenance needs, and the selection of a cost-effective and easy-to-access treatment system can mean a huge difference in maintenance expenses for years to come.

A CDS unit is designed to minimize maintenance and make it as easy and inexpensive as possible to keep our systems working properly.

Most CDS® units can easily be cleaned within thirty minutes.

INSPECTION

Inspection is the key to effective maintenance. Pollutant deposition and transport may vary from year to year and site to site. Semi-annual inspections will help ensure that the system is cleaned out at the appropriate time. Inspections should be performed more frequently where site conditions may cause rapid accumulation of pollutants.

RECOMMENDATIONS FOR CDS MAINTENANCE

The recommended cleanout of solids within the CDS unit's sump should occur at 75% of the sump capacity. Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection and cleanout of the separation chamber and sump, and another allows inspection and cleanout of sediment captured and retained behind the screen. A vacuum truck is recommended for cleanout of the CDS unit and can be easily accomplished in less than 30 minutes for most installations.

Hydrodynamic Separator Selection & Sizing Tool

Quickly prepare designs for estimates and project meetings ...

Part of the Contech Design Center, this free, online tool fully automates the layout process for identifying the proper hydrodynamic separator for your site.

- Multiple sizing methods available.
- Site-specific questions ensure the selected unit will comply with site constraints.
- Multiple treatment options may be available based on regulations and site parameters.
- Follow up reports contain a site-specific design, sizing summary, standard detail, and specification.

Learn More:
www.ContechES.com/designcenter

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PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

TAKE THE NEXT STEP

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Revision 04/24

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CDS Guide
Operation, Design, Performance and Maintenance

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

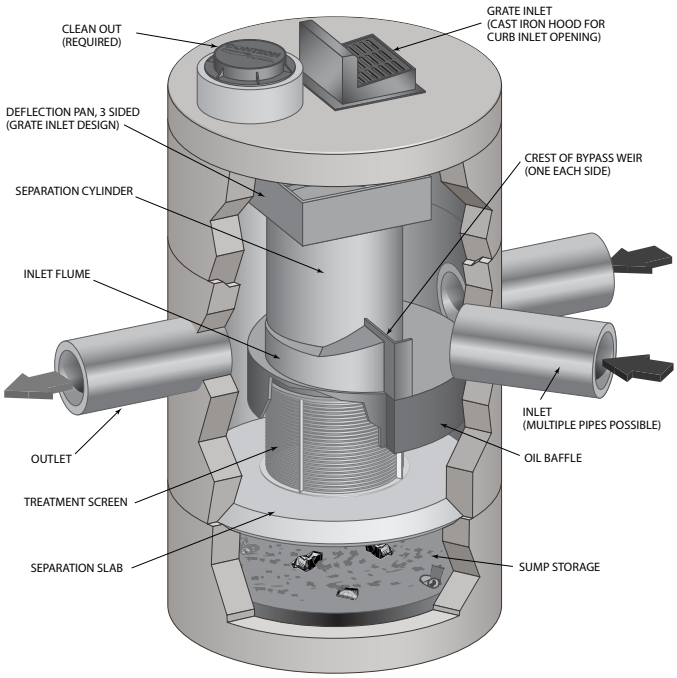
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are

determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

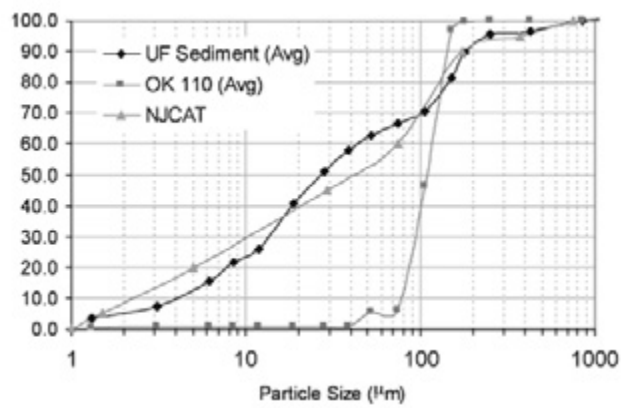


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect

to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

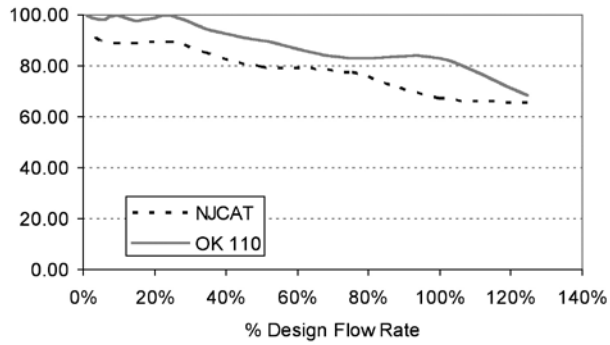


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

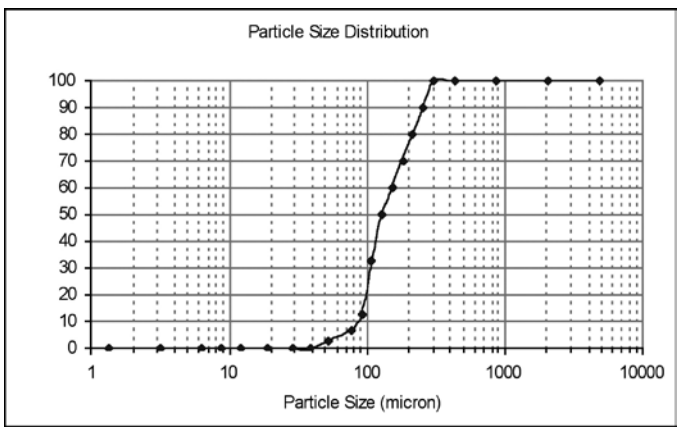


Figure 3. WASDOE PSD

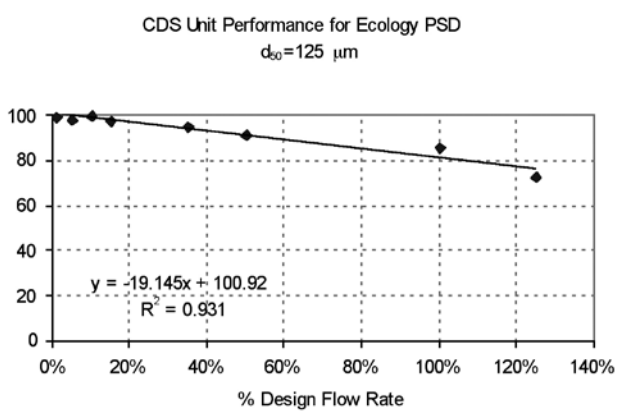


Figure 4. Modeled performance for WASDOE PSD.

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified

during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

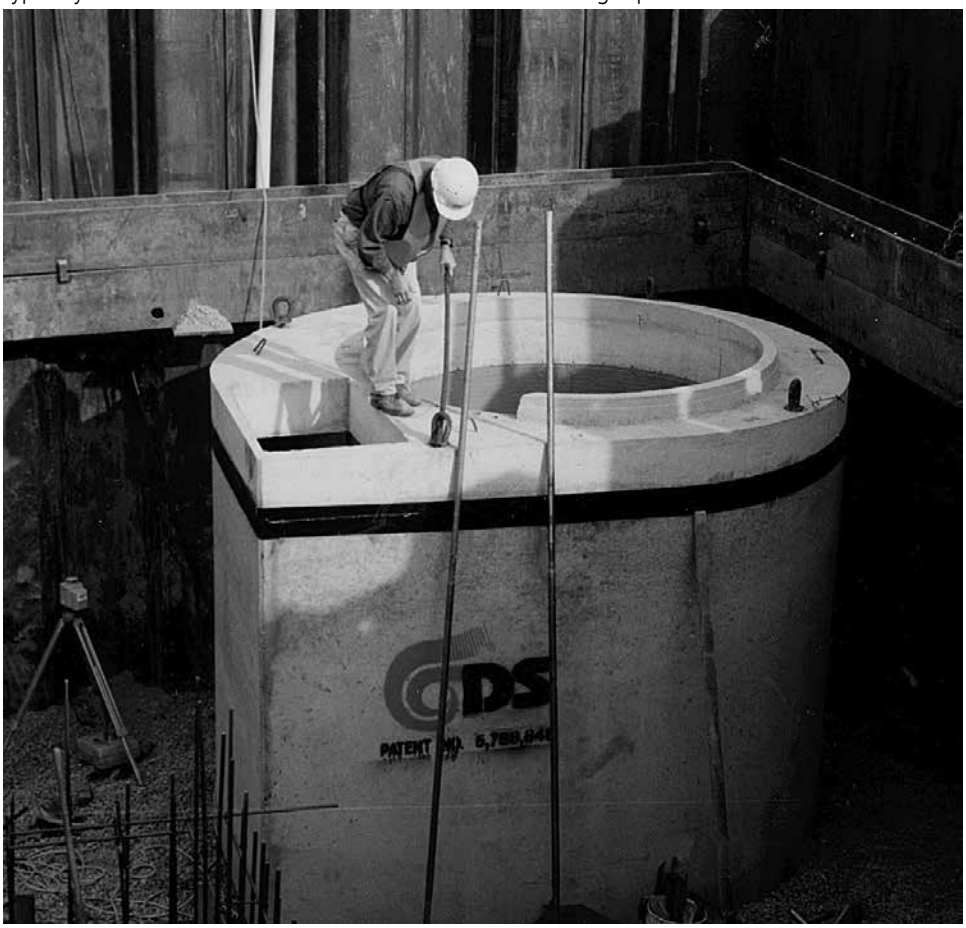
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be cleaned to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile**.

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

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RECYCLED PAPER

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A QUIKRETE® COMPANY

Jellyfish® Filter
Stormwater Treatment

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It's my job to recommend the best solution to meet permitting requirements.

STORMWATER DESIGN ENGINEER

I work with consultants to design the best approved solution to meet your project's needs.

REGULATORY MANAGER

I understand the local stormwater regulations and what solutions will be approved.

SALES ENGINEER

I make sure our solutions meet the needs of the contractor during construction.

Contech is your partner in stormwater management solutions

Setting new standards in Stormwater Treatment – Jellyfish® Filter

The Jellyfish Filter has been tested in the field and laboratory, and has received approval from numerous stormwater regulatory agencies.

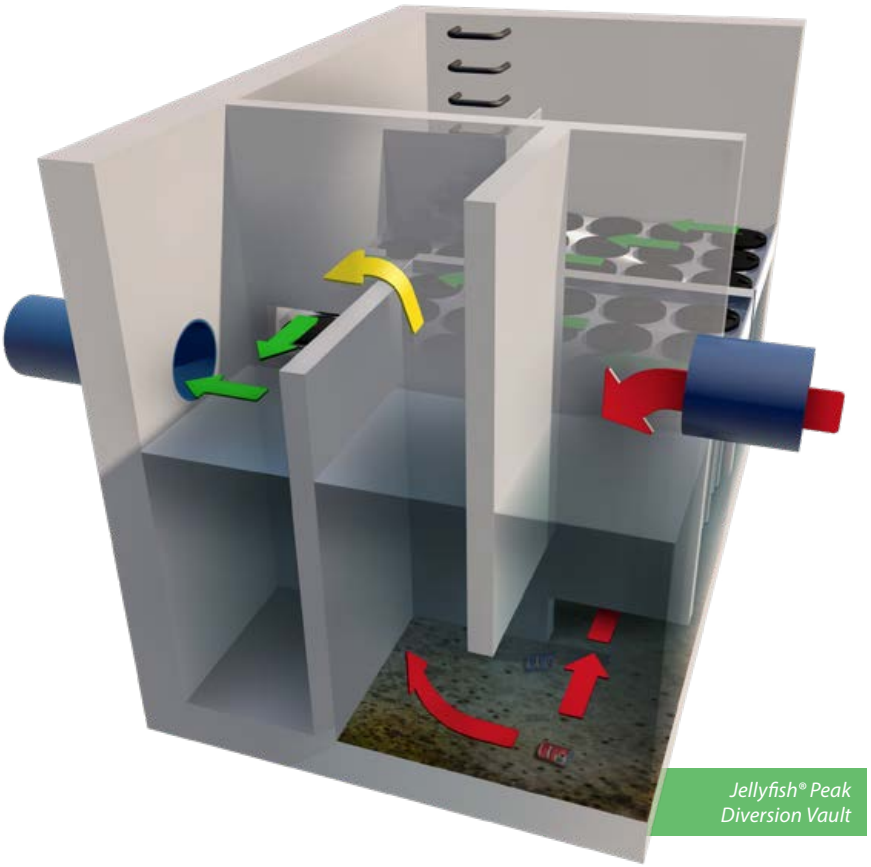
The Jellyfish Filter is a stormwater quality treatment technology featuring high flow pretreatment and membrane filtration in a compact stand-alone system. Jellyfish removes floatables, trash, oil, debris, TSS, fine silt-sized particles, and a high percentage of particulate-bound pollutants; including phosphorus, nitrogen, metals, and hydrocarbons. The high surface area membrane cartridges, combined with up-flow hydraulics, frequent, passive backwashing, and rinseable/reusable cartridges ensure long-lasting performance.

Jellyfish® Filter

How the Jellyfish® Filter Treats Stormwater

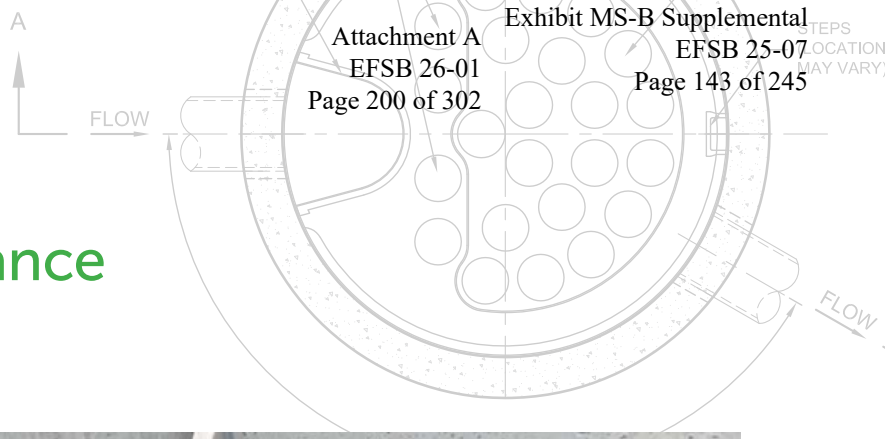
Tested in the field and laboratory ...

- Water enters the vault via an inlet bay where floating pollutants, oil, and grease are trapped behind a baffle wall.
- Water flows through the inlet bay transfer opening into the treatment chamber.
- Water is forced up from the treatment chamber, through the membrane filtration, and into the backwash pool.
- The water then fills and overflows the backwash pool and exits via the outlet bay transfer opening.
- As each storm subsides, the remaining water caught in the backwash pool flows back into the treatment chamber through the cartridges.
- This passive backwash extends cartridge life and prepares them for the next storm event. The draindown cartridges located outside the backwash pool enables water levels to balance.
- During peak flows, the internal weir allows high flows to bypass treatment, eliminating the need for an external bypass structure.



Jellyfish® Peak Diversion Vault

Learn More:
www.ContechES.com/jellyfish



Jellyfish® Filter Performance Testing Results

APPLICATION TIPS

- The Peak Diversion Jellyfish provides treatment and high-flow bypass in one structure, eliminating the need for a separate bypass structure.
- LID and GI are complemented by filtration solutions, as they help keep sites free from fine sediments that can impede performance, remove unsightly trash, and provide a single point of maintenance.
- Selecting a filter with a long maintenance cycle and low maintenance cost will result in healthy waterways and happy property owners.

The pleated tentacles of the Jellyfish® Filter provide a large surface area for pollutant removal.

POLLUTANT OF CONCERN	% REMOVAL
Total Suspended Solids (TSS)	85%
Total Phosphorus (TP)	75%
Total Copper (TCu)	67%
Total Zinc (TZn)	60%

Sources:
WA DOE TAPE Testing: https://fortress.wa.gov/ecy/ezshare/wq/tape/use_designations/JELLYFISHfilterIMBRIUMguld.pdf

Jellyfish® Filter Features and Benefits

FEATURE	BENEFITS
High surface area membrane filtration	Low flux rate promotes cake filtration and slows membrane occlusion
High design treatment flow rate per cartridge (up to 80 gpm (5 L/s))	Compact system with a small footprint, lower construction cost
Low driving head (typically 18-21 inches or less (457-533 mm))	Design flexibility, lower construction cost
Lightweight cartridges with passive backwash	Easy maintenance and low life-cycle cost

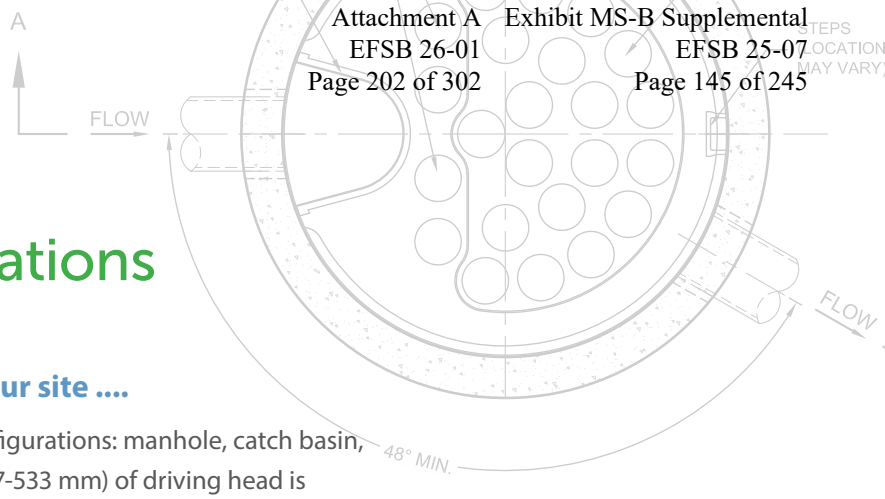
The Jellyfish Filter can be configured in a manhole, catch basin, or vault.

Select Jellyfish® Filter Certifications and Verifications

The Jellyfish Filter has been reviewed by numerous state and federal programs, including:

- New Jersey Corporation for Advanced Technology (NJCAT) – Field Performance per TARP Tier II Protocol
- Washington State Department of Ecology (TAPE – GULD)
- Maryland Department of the Environment (MD DOE)
- Canada ISO 14034 Environmental Management - Environmental Technology Verification (ETV)
- Texas Commission on Environmental Quality (TCEQ)
- Virginia Department of Environmental Quality (VA DEQ)

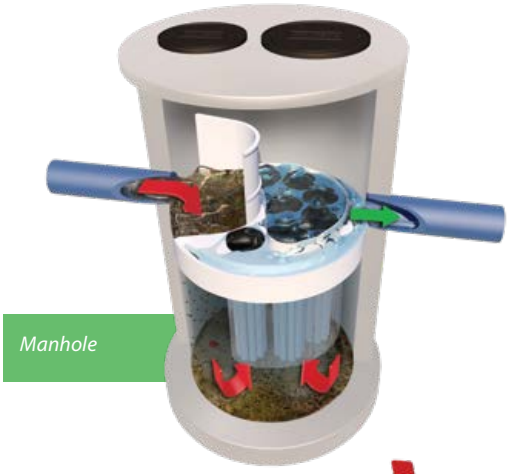
Field tested and performance verified



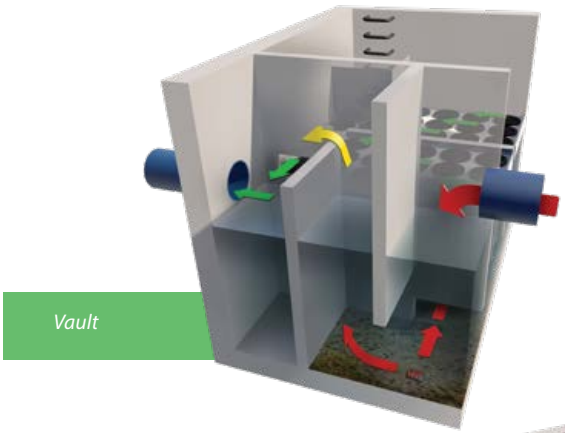
Jellyfish® Filter Configurations

Multiple system configurations to optimize your site ....

The Jellyfish Filter can be manufactured in a variety of configurations: manhole, catch basin, vault, or custom configurations. Typically, 18-21 inches (457-533 mm) of driving head is designed into the system.

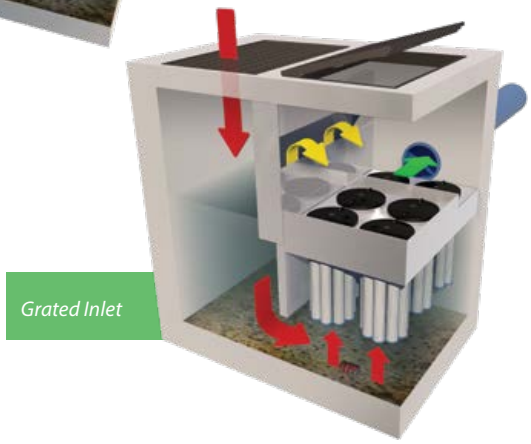


Manhole



Vault

Curb Inlet



Grated Inlet

Jellyfish® Filter Maintenance

- Jellyfish Filter cartridges are light weight and reusable
- Maintenance of the filter cartridges is performed by removing, rinsing and reusing the cartridge tentacles.
- Vacuum extraction of captured pollutants in the sump is recommended at the same time.
- Full cartridge replacement intervals differ by site due to varying pollutant loading and type, and maintenance frequency. Replacement is anticipated every 2-5 years.
- Contech® has created a network of Certified Maintenance Providers to provide maintenance on stormwater BMPs.

The Jellyfish® Filter tentacle is light and easy to clean.

A partner you can rely on

STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

TAKE THE NEXT STEP

For more information: www.ContechES.com

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CONTECH®
ENGINEERED SOLUTIONS

Jellyfish® Filter
Owner's Manual

Jellyfish® Filter

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THANK YOU FOR PURCHASING THE JELLYFISH® FILTER!

Contech Engineered Solutions would like to thank you for selecting the Jellyfish Filter to meet your project's stormwater treatment needs. With proper inspection and maintenance, the Jellyfish Filter is designed to deliver ongoing, high levels of stormwater pollutant removal.

If you have any questions, please feel free to call us or e-mail us:

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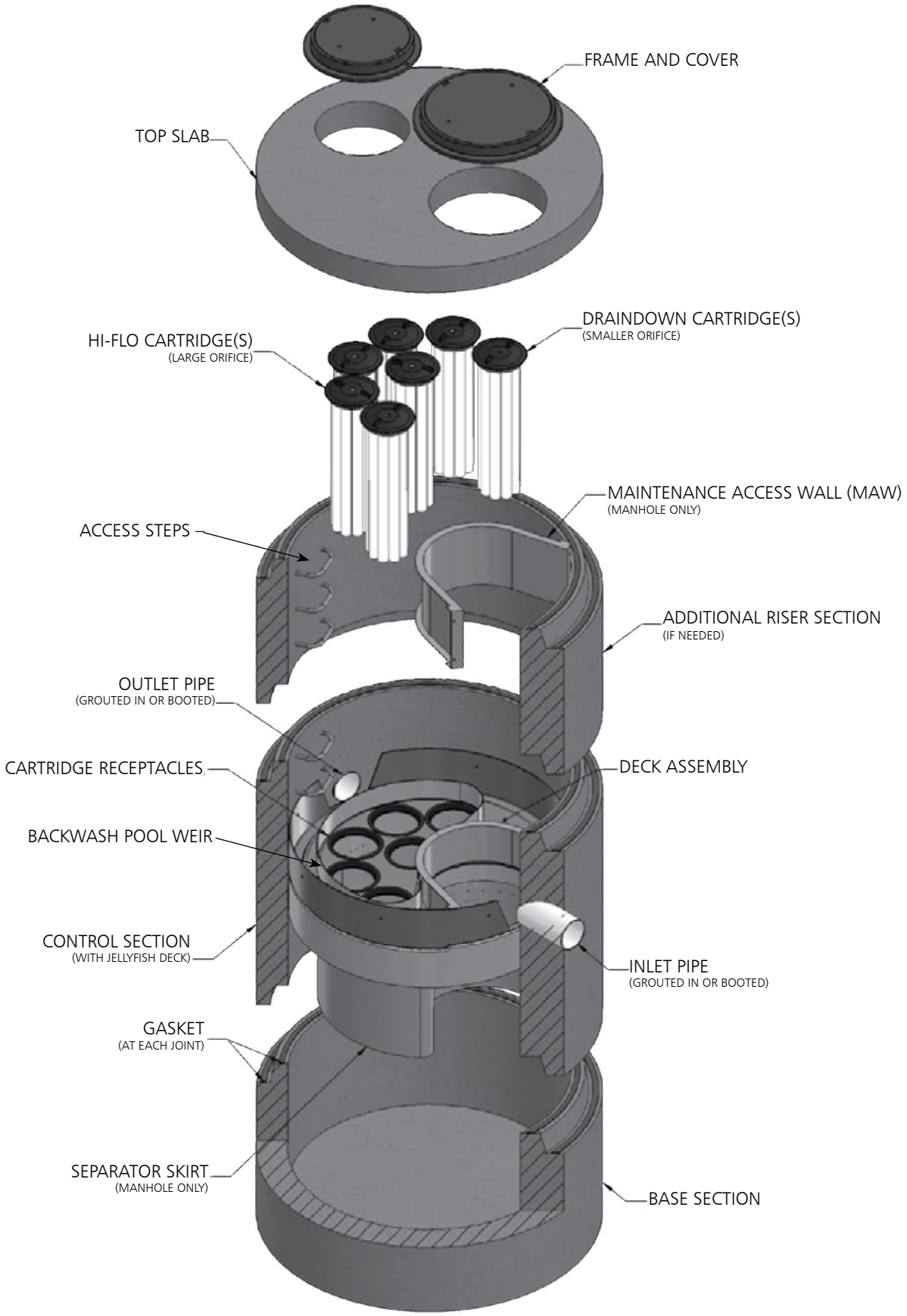

FRAME AND COVER
TOP SLAB
DRAINDOWN CARTRIDGE(S)
(SMALLER ORIFICE)
HI-FLO CARTRIDGE(S)
(LARGE ORIFICE)
MAINTENANCE ACCESS WALL (MAW)
(MANHOLE ONLY)
ACCESS STEPS
ADDITIONAL RISER SECTION
(IF NEEDED)
OUTLET PIPE
(GROUTED IN OR BOOTED)
CARTRIDGE RECEPTACLES
DECK ASSEMBLY
BACKWASH POOL WEIR
CONTROL SECTION
(WITH JELLYFISH DECK)
INLET PIPE
(GROUTED IN OR BOOTED)
GASKET
(AT EACH JOINT)
SEPARATOR SKIRT
(MANHOLE ONLY)
BASE SECTION

WARNINGS / CAUTION

1. FALL PROTECTION may be required.
2. WATCH YOUR STEP if standing on the Jellyfish Filter Deck at any time; Great care and safety must be taken while walking or maneuvering on the Jellyfish Filter Deck. Attentive care must be taken while standing on the Jellyfish Filter Deck at all times to prevent stepping onto a lid, into or through a cartridge hole or slipping on the deck.
3. The Jellyfish Filter Deck can be SLIPPERY WHEN WET.
4. If the Top Slab, Covers or Hatches have not yet been installed, or are removed for any reason, great care must be taken to NOT DROP ANYTHING ONTO THE JELLYFISH FILTER DECK. The Jellyfish Filter Deck and Cartridge Receptacle Rings can be damaged under high impact loads. This type of activity voids all warranties. All damaged items to be replaced at owner's expense.
5. Maximum deck load 2 persons, total weight 450 lbs.

Safety Notice

Jobsite safety is a topic and practice addressed comprehensively by others. The inclusions here are intended to be reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). OSHA and Canadian OSH, and Federal, State/Provincial, and Local Jurisdiction Safety Standards apply on any given site or project. The knowledge and applicability of those responsibilities is the Contractor's responsibility and outside the scope of Contech Engineered Solutions.

Confined Space Entry

Secure all equipment and perform all training to meet applicable local and OSHA regulations regarding confined space entry. It is the Contractor's or entry personnel's responsibility to proceed safely at all times.

Personal Safety Equipment

Contractor is responsible to provide and wear appropriate personal protection equipment as needed including, but not limited to safety boots, hard hat, reflective vest, protective eyewear, gloves and fall protection equipment as necessary. Make sure all equipment is staffed with trained and/or certified personnel, and all equipment is checked for proper operation and safety features prior to use.

- Fall protection equipment
- Eye protection
- Safety boots
- Ear protection
- Gloves
- Ventilation and respiratory protection
- Hard hat
- Maintenance and protection of traffic plan

Chapter 1

1.0 – Owner Specific Jellyfish Filter Product Information

Below you will find a reference page that can be filled out according to your Jellyfish Filter specification to help you easily inspect, maintain and order parts for your system.

Owner Name:	
Phone Number:	
Site Address:	
Site GPS Coordinates/unit location:	
Unit Location Description:	
Jellyfish Filter Model No.:	
Contech Project & Sequence Number	
No. of Hi-Flo Cartridges	
No. of Cartridges:	
Length of Draindown Cartridges:	
No. of Blank Cartridge Lids:	
Bypass Configuration (Online/Offline):	

Notes:

_____

_____

_____

_____

Chapter 2

2.0 – Jellyfish Filter System Operations and Functions

The Jellyfish Filter is an engineered stormwater quality treatment technology that removes a high level and wide variety of stormwater pollutants. Each Jellyfish Filter cartridge consists of eleven membrane - encased filter elements ("filtration tentacles") attached to a cartridge head plate. The filtration tentacles provide a large filtration surface area, resulting in high flow and high pollutant removal capacity.

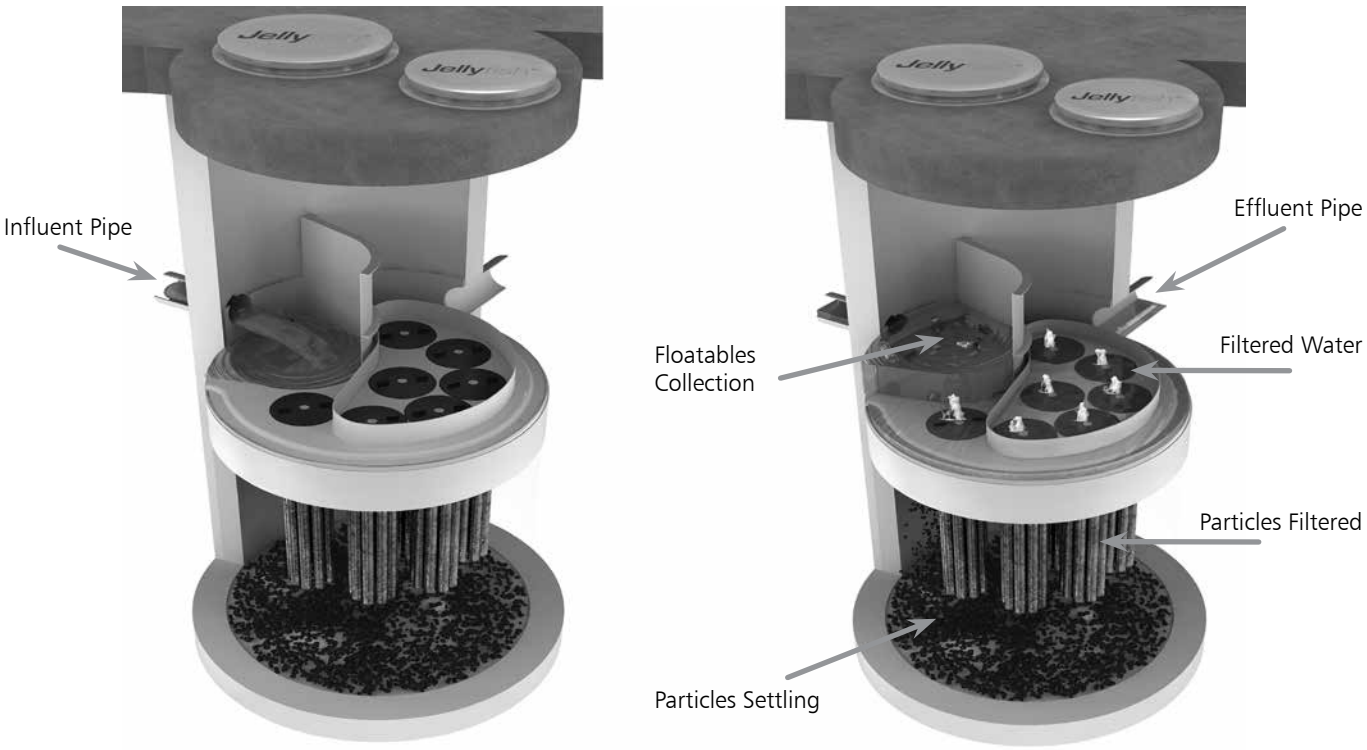
The Jellyfish Filter functions are depicted in Figure 1 below.

FIGURE 1

Jellyfish Filter Treatment Functions

Membrane Filtration

Section View with Maintenance Access Wall (MAW) Cutaway



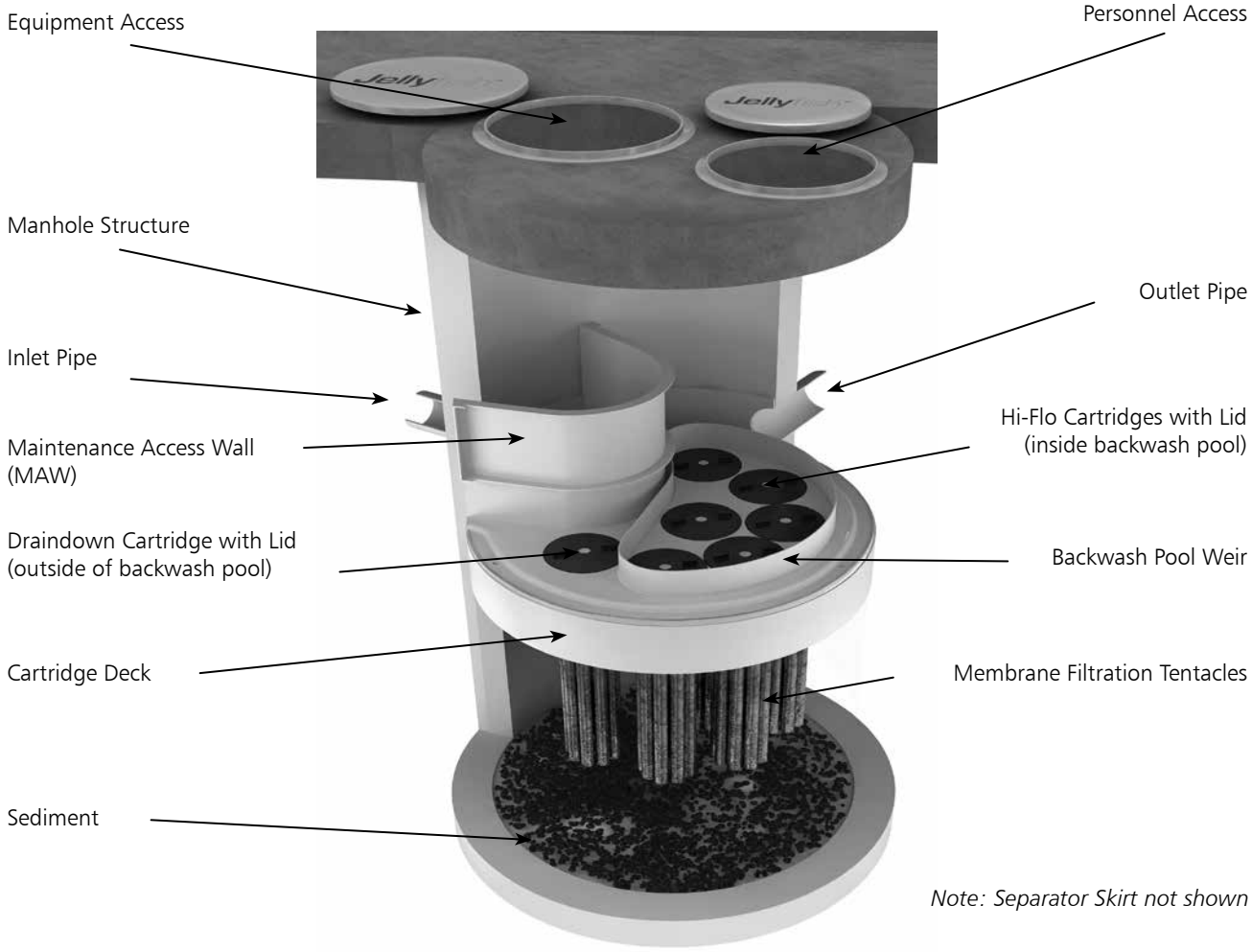
Jellyfish Filter cartridges are backwashed after each peak storm event, which removes accumulated sediment from the membranes. This backwash process extends the service life of the cartridges and increases the time between maintenance events.

For additional details on the operation and pollutant capabilities of the Jellyfish Filter please refer to additional details on our website at www.ContechES.com.

2.1 – Components and Cartridges

The Jellyfish Filter and components are depicted in Figure 2 below.

FIGURE 2 **Jellyfish Filter Components**



Tentacles are available in various lengths as depicted in Table 1 below.

Table 1 – Cartridge Lengths / Weights and Cartridge Lid Orifice Diameters

Cartridge Lengths	Dry Weight	Hi-Flo Orifice Diameter	Draindown Orifice Diameter
15 inches (381 mm)	10 lbs (4.5 kg)	35 mm	20 mm
27 inches (686 mm)	14.5 lbs (6.6 kg)	45 mm	25 mm
40 inches (1,016 mm)	19.5 lbs (8.9 kg)	55 mm	30 mm
54 inches (1,372 mm)	25 lbs (11.4 kg)	70 mm	35 mm

2.2 – Jellyfish Membrane Filtration Cartridge Assembly

The Jellyfish Filter utilizes multiple membrane filtration cartridges. Each cartridge consists of removable cylindrical filtration "tentacles" attached to a cartridge head plate. Each filtration tentacle has a threaded pipe nipple and o-ring. To attach, insert the top pipe nipples with the o-ring through the head plate holes and secure with locking nuts. Hex nuts to be hand tightened and checked with a wrench as shown below.

2.3 – Jellyfish Membrane Filtration Cartridge Installation

- Cartridge installation will be performed by trained individuals and coordinated with the installing site Contractor. Flow diversion devices are required to be in place until the site is stabilized (final paving and landscaping in place). Failure to address this step completely will reduce the time between required maintenance.
- Descend to the cartridge deck (see Safety Notice and page 3).
- Refer to Contech's submittal drawings to determine proper quantity and placement of Hi-Flo, Draindown and Blank cartridges with appropriate lids. Lower the Jellyfish membrane filtration cartridges into the cartridge receptacles within the cartridge deck. It is possible that not all cartridge receptacles will be filled with a filter cartridge. In that case, a blank headplate and blank cartridge lid (no orifice) would be installed.

Cartridge Assembly

Do not force the tentacles down into the cartridge receptacle, as this may damage the membranes. Apply downward pressure on the cartridge head plate to seat the lubricated rim gasket (thick circular gasket surrounding the circumference of the head plate) into the cartridge receptacle. (See Figure 3 for details on approved lubricants for use with rim gasket.)

- Examine the cartridge lids to differentiate lids with a small orifice, a large orifice, and no orifice.
  - Lids with a small orifice are to be inserted into the Draindown cartridge receptacles, outside of the backwash pool weir.
  - Lids with a large orifice are to be inserted into the Hi-Flo cartridge receptacles within the backwash pool weir.
  - Lids with no orifice (blank cartridge lids) and a blank headplate are to be inserted into unoccupied cartridge receptacles.
- To install a cartridge lid, align both cartridge lid male threads with the cartridge receptacle female threads before rotating approximately 1/3 of a full rotation until firmly seated. Use of an approved rim gasket lubricant may facilitate installation.

3.0 Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Additional maintenance activities may be required in the event of non-storm event runoff, such as base-flow or seasonal flow, an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

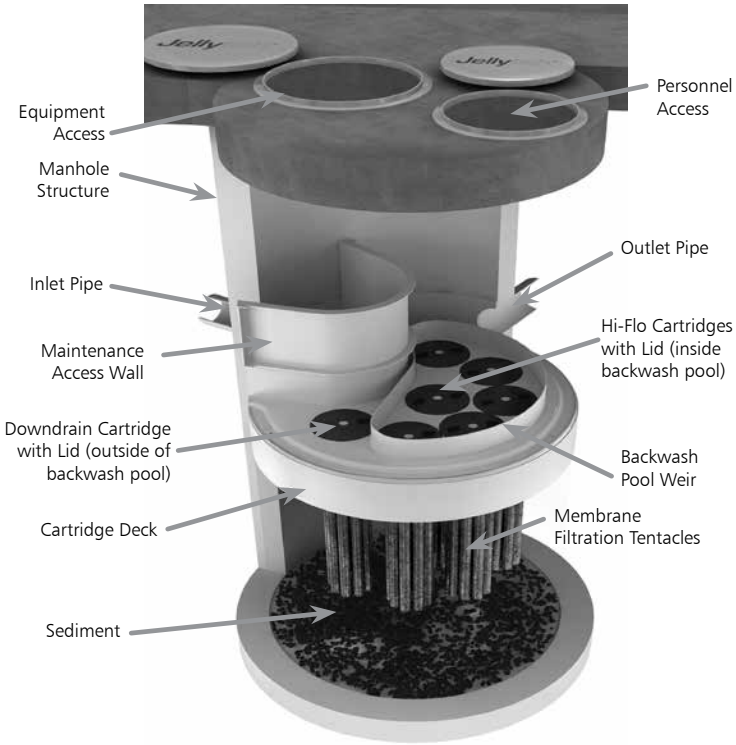
- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW) or inlet bay for vault systems

Maintenance activities include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed

4.0 Inspection Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of, the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent*.



Note: Separator Skirt not shown

1. A minimum of quarterly inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
2. Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
3. Inspection is recommended after each major storm event.
4. Inspection is required immediately after an upstream oil, fuel or other chemical spill.

5.0 Inspection Procedure

The following procedure is recommended when performing inspections:

1. Provide traffic control measures as necessary.
2. Inspect the MAW or inlet bay for floatable pollutants such as trash, debris, and oil sheen.
3. Measure oil and sediment depth in several locations, by lowering a sediment probe until contact is made with the floor of the structure. Record sediment depth, and presences of any oil layers.
4. Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
5. Inspect the MAW (where appropriate), cartridge deck and receptacles, and backwash pool weir, for damaged or broken components.

5.1 Dry weather inspections

- Inspect the cartridge deck for standing water, and/or sediment on the deck.
- No standing water under normal operating conditions.
- Standing water inside the backwash pool, but not outside the backwash pool indicates, that the filter cartridges need to be rinsed.

Inspection Utilizing Sediment Probe

- Standing water outside the backwash pool is not anticipated and may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- Any appreciable sediment (≥1/16") accumulated on the deck surface should be removed.

5.2 Wet weather inspections

- Observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW or inlet bay.
- Less than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
- Greater than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
- 18 inches or greater and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges need to be rinsed.

6.0 Maintenance Requirements

Required maintenance for the Jellyfish Filter is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

1. Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.
2. Floatable trash, debris, and oil removal.
3. Deck cleaned and free from sediment.
4. Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
5. Replace tentacles if rinsing does not restore adequate hydraulic capacity, remove accumulated sediment, or if damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
6. Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
7. The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged or compromised by the spill.

7.0 Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

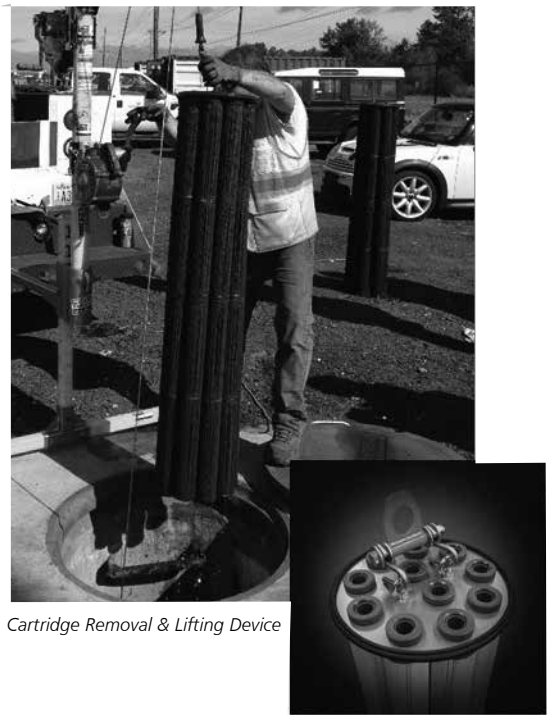
1. Provide traffic control measures as necessary.
2. Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures. *Caution: Dropping objects onto the cartridge deck may cause damage*.
3. Perform Inspection Procedure prior to maintenance activity.
4. To access the cartridge deck for filter cartridge service, descend into the structure and step directly onto the deck. Caution: Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
5. Maximum weight of maintenance crew and equipment on the cartridge deck not to exceed 450 lbs.

7.1 Filter Cartridge Removal

1. Remove a cartridge lid.
2. Remove cartridges from the deck using the lifting loops in the cartridge head plate. Rope or a lifting device (available from Contech) should be used. *Caution: Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Wet cartridges typically weigh between 100 and 125 lbs*.
3. Replace and secure the cartridge lid on the exposed empty receptacle as a safety precaution. Contech does not recommend exposing more than one empty cartridge receptacle at a time.

7.2 Filter Cartridge Rinsing

1. Remove all 11 tentacles from the cartridge head plate. Take care not to lose or damage the O-ring seal as well as the plastic threaded nut and connector.
2. Position tentacles in a container (or over the MAW), with the threaded connector (open end) facing down, so rinse water is flushed through the membrane and captured in the container.



Cartridge Removal & Lifting Device

3. Using the Jellyfish rinse tool (available from Contech) or a low-pressure garden hose sprayer, direct water spray onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. *Caution: Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane*.
4. Collected rinse water is typically removed by vacuum hose.

5. Reassemble cartridges as detailed later in this document. Reuse O-rings and nuts, ensuring proper placement on each tentacle.

7.3 Sediment and Flotables Extraction

1. Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning only through the maintenance access wall (MAW) opening. Be careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck on manhole systems. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.
2. Vacuum floatable trash, debris, and oil, from the MAW opening or inlet bay. Alternatively, floatable solids may be removed by a net or skimmer.
3. Pressure wash cartridge deck and receptacles to remove all

Rinsing Cartridge with Contech Rinse Tool

sediment and debris. Sediment should be rinsed into the sump area. Take care not to flush rinse water into the outlet pipe.

4. Remove water from the sump area. Vacuum or pump equipment should only be introduced through the MAW or inlet bay.
5. Remove the sediment from the bottom of the unit through the MAW or inlet bay opening.
6. For larger diameter Jellyfish Filter manholes (≥8-ft) and some

Vacuuming Sump Through MAW

vaults complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle.

7.4 Filter Cartridge Reinstallation and Replacement

1. Cartridges should be installed after the deck has been cleaned. It is important that the receptacle surfaces be free from grit and debris.
2. Remove cartridge lid from deck and carefully lower the filter cartridge into the receptacle until head plate gasket is seated squarely in receptacle. *Caution: Do not force the cartridge downward; damage may occur.*
3. Replace the cartridge lid and check to see that both male threads are properly seated before rotating approximately 1/3 of a full rotation until firmly seated. Use of an approved rim gasket lubricant may facilitate installation. See next page for additional details.
4. If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.

7.5 Chemical Spills

Caution: If a chemical spill has been captured, do not attempt maintenance. Immediately contact the local hazard response agency and contact Contech.

7.6 Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Jellyfish Filter Components & Filter Cartridge Assembly and Installation

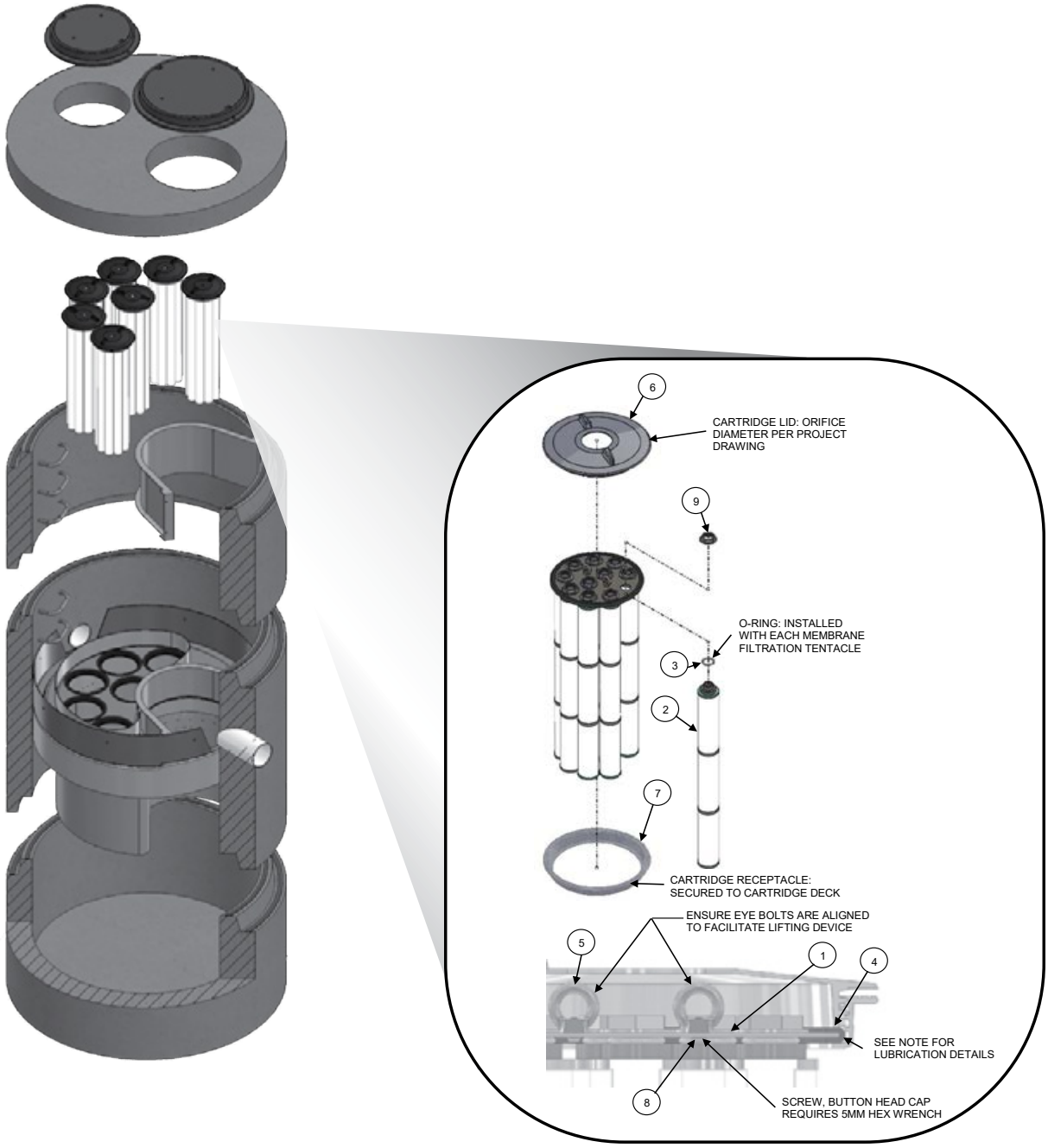


TABLE 1: BOM

ITEM NO.	DESCRIPTION
1	JF HEAD PLATE
2	JF TENTACLE
3	JF O-RING
4	JF HEAD PLATE GASKET
5	JF CARTRIDGE EYELET
6	JF 14IN COVER
7	JF RECEPTACLE
8	BUTTON HEAD CAP SCREW M6X14MM SS
9	JF CARTRIDGE NUT

TABLE 2: APPROVED GASKET LUBRICANTS

PART NO.	MFR	DESCRIPTION
78713	LA-CO	LUBRI-JOINT
40501	HERCULES	DUCK BUTTER
30600	OATEY	PIPE LUBRICANT
PSLUBXL1Q	PROSELECT	PIPE JOINT LUBRICANT

NOTES:

Head Plate Gasket Installation:
Install Head Plate Gasket (Item 4) onto the Head Plate (Item 1) and liberally apply a lubricant from Table 2: Approved Gasket Lubricants onto the gasket where it contacts the Receptacle (Item 7) and Cartridge Lid (Item 6). Follow Lubricant manufacturer's instructions.

Lid Assembly:
Rotate Cartridge Lid counter-clockwise until both male threads drop down and properly seat. Then rotate Cartridge Lid clock-wise approximately one-third of a full rotation until Cartridge Lid is firmly secured, creating a watertight seal.

Jellyfish Filter Inspection and Maintenance Log

Owner: _____ Jellyfish Model No.:_____

Location: _____ GPS Coordinates: _____

Land Use: Commercial:_____ Industrial: _____ Service Station:_____

Road/Highway:____ Airport: _____ Residential: _____ Parking Lot:_____

Date/Time:					
Inspector:					
Maintenance Contractor:					
Visible Oil Present: (Y/N)					
Oil Quantity Removed					
Floatable Debris Present: (Y/N)					
Floatable Debris removed: (Y/N)					
Water Depth in Backwash Pool					
Cartridges externally rinsed/re-commissioned: (Y/N)					
New tentacles put on Cartridges: (Y/N)					
Sediment Depth Measured: (Y/N)					
Sediment Depth (inches or mm):					
Sediment Removed: (Y/N)					
Cartridge Lids intact: (Y/N)					
Observed Damage:					
Comments:					

Appendix K: Rainfall Data

NOAA Atlas 14, Volume 10, Version 3
Location name: Oakham, Massachusetts, USA*
Latitude: 42.3625°, Longitude: -72.0429°
Elevation: 986 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.341 (0.269-0.428)	0.397 (0.312-0.498)	0.488 (0.383-0.615)	0.564 (0.440-0.715)	0.669 (0.503-0.886)	0.749 (0.550-1.01)	0.831 (0.590-1.16)	0.917 (0.620-1.33)	1.04 (0.672-1.56)	1.13 (0.713-1.74)
10-min	0.483 (0.380-0.606)	0.563 (0.442-0.706)	0.693 (0.544-0.873)	0.800 (0.623-1.01)	0.948 (0.713-1.26)	1.06 (0.780-1.44)	1.18 (0.836-1.65)	1.30 (0.879-1.88)	1.47 (0.953-2.21)	1.60 (1.01-2.46)
15-min	0.568 (0.448-0.713)	0.662 (0.521-0.831)	0.815 (0.638-1.03)	0.942 (0.734-1.19)	1.12 (0.839-1.48)	1.25 (0.917-1.69)	1.38 (0.983-1.94)	1.53 (1.03-2.22)	1.72 (1.12-2.60)	1.88 (1.19-2.90)
30-min	0.764 (0.602-0.958)	0.890 (0.700-1.12)	1.10 (0.860-1.38)	1.27 (0.988-1.61)	1.50 (1.13-1.99)	1.68 (1.24-2.28)	1.87 (1.33-2.62)	2.06 (1.40-2.99)	2.33 (1.51-3.51)	2.54 (1.60-3.91)
60-min	0.960 (0.756-1.20)	1.12 (0.880-1.40)	1.38 (1.08-1.74)	1.60 (1.24-2.02)	1.89 (1.42-2.50)	2.12 (1.56-2.87)	2.35 (1.67-3.30)	2.59 (1.75-3.76)	2.93 (1.90-4.41)	3.19 (2.02-4.92)
2-hr	1.21 (0.956-1.50)	1.42 (1.12-1.77)	1.77 (1.40-2.21)	2.06 (1.61-2.59)	2.46 (1.86-3.25)	2.75 (2.05-3.73)	3.07 (2.22-4.35)	3.45 (2.34-4.98)	4.01 (2.61-6.01)	4.49 (2.85-6.88)
3-hr	1.37 (1.09-1.70)	1.63 (1.29-2.02)	2.04 (1.62-2.55)	2.39 (1.88-3.00)	2.86 (2.18-3.78)	3.21 (2.40-4.36)	3.59 (2.62-5.10)	4.06 (2.76-5.85)	4.79 (3.12-7.16)	5.42 (3.45-8.26)
6-hr	1.71 (1.37-2.11)	2.05 (1.64-2.53)	2.61 (2.08-3.23)	3.07 (2.43-3.83)	3.71 (2.85-4.88)	4.18 (3.14-5.64)	4.69 (3.44-6.65)	5.34 (3.64-7.64)	6.36 (4.16-9.45)	7.26 (4.63-11.0)
12-hr	2.10 (1.70-2.58)	2.55 (2.06-3.13)	3.29 (2.64-4.05)	3.90 (3.11-4.82)	4.74 (3.66-6.19)	5.35 (4.05-7.19)	6.03 (4.44-8.48)	6.88 (4.70-9.77)	8.20 (5.38-12.1)	9.35 (5.98-14.1)
24-hr	2.50 (2.03-3.04)	3.06 (2.48-3.73)	3.98 (3.21-4.87)	4.74 (3.80-5.83)	5.79 (4.50-7.52)	6.57 (4.99-8.76)	7.41 (5.48-10.4)	8.46 (5.81-11.9)	10.1 (6.64-14.8)	11.5 (7.38-17.2)
2-day	2.87 (2.35-3.47)	3.54 (2.88-4.28)	4.62 (3.75-5.61)	5.52 (4.46-6.74)	6.76 (5.28-8.73)	7.67 (5.87-10.2)	8.67 (6.45-12.0)	9.92 (6.84-13.9)	11.9 (7.84-17.3)	13.6 (8.73-20.1)
3-day	3.14 (2.57-3.77)	3.86 (3.16-4.64)	5.03 (4.10-6.08)	6.01 (4.87-7.31)	7.36 (5.76-9.46)	8.34 (6.40-11.0)	9.43 (7.04-13.1)	10.8 (7.46-15.1)	12.9 (8.55-18.7)	14.8 (9.53-21.9)
4-day	3.37 (2.77-4.04)	4.13 (3.39-4.96)	5.38 (4.40-6.48)	6.41 (5.20-7.77)	7.83 (6.15-10.0)	8.87 (6.82-11.7)	10.0 (7.49-13.8)	11.5 (7.93-16.0)	13.7 (9.07-19.8)	15.6 (10.1-23.1)
7-day	4.04 (3.34-4.82)	4.87 (4.02-5.82)	6.24 (5.13-7.48)	7.37 (6.02-8.90)	8.93 (7.04-11.4)	10.1 (7.78-13.2)	11.3 (8.49-15.5)	12.9 (8.95-17.8)	15.3 (10.2-21.9)	17.3 (11.2-25.4)
10-day	4.70 (3.89-5.58)	5.57 (4.61-6.63)	7.00 (5.77-8.36)	8.18 (6.70-9.83)	9.81 (7.75-12.4)	11.0 (8.51-14.3)	12.3 (9.22-16.7)	13.9 (9.68-19.2)	16.3 (10.8-23.3)	18.3 (11.9-26.8)
20-day	6.70 (5.60-7.91)	7.62 (6.35-9.01)	9.12 (7.57-10.8)	10.4 (8.54-12.4)	12.1 (9.57-15.1)	13.4 (10.3-17.1)	14.7 (10.9-19.5)	16.2 (11.4-22.1)	18.2 (12.2-25.9)	19.9 (13.0-28.9)
30-day	8.39 (7.03-9.86)	9.33 (7.81-11.0)	10.9 (9.05-12.8)	12.1 (10.0-14.4)	13.9 (11.0-17.2)	15.2 (11.8-19.2)	16.6 (12.3-21.7)	18.0 (12.6-24.4)	19.8 (13.3-27.9)	21.1 (13.8-30.5)
45-day	10.5 (8.83-12.3)	11.5 (9.64-13.4)	13.1 (10.9-15.4)	14.4 (11.9-17.0)	16.2 (12.9-19.9)	17.6 (13.6-22.1)	19.0 (14.0-24.5)	20.2 (14.3-27.4)	21.8 (14.7-30.6)	22.9 (14.9-33.0)
60-day	12.3 (10.3-14.3)	13.3 (11.2-15.5)	14.9 (12.5-17.5)	16.3 (13.6-19.2)	18.2 (14.5-22.2)	19.7 (15.2-24.5)	21.1 (15.6-27.0)	22.3 (15.8-30.0)	23.7 (16.0-33.2)	24.6 (16.1-35.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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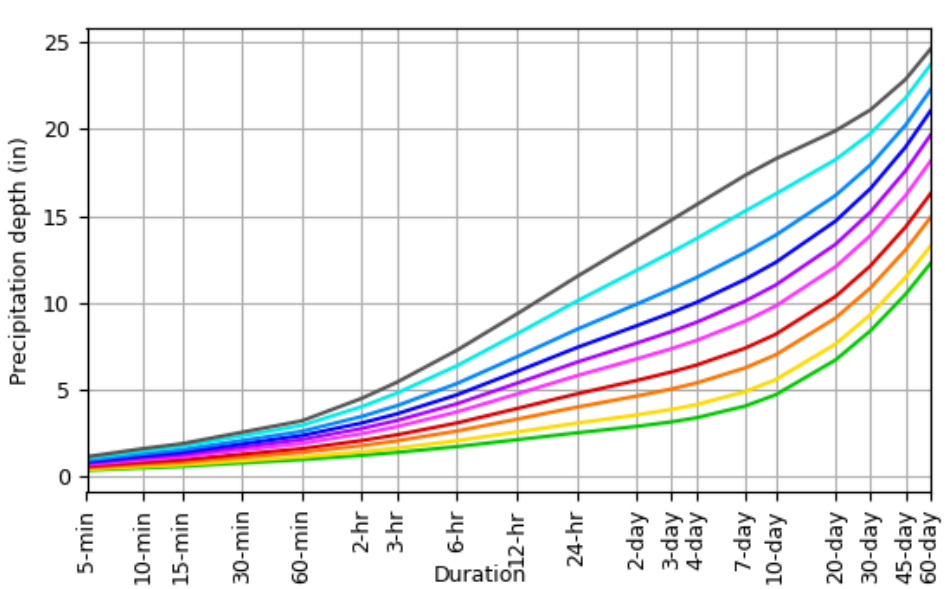
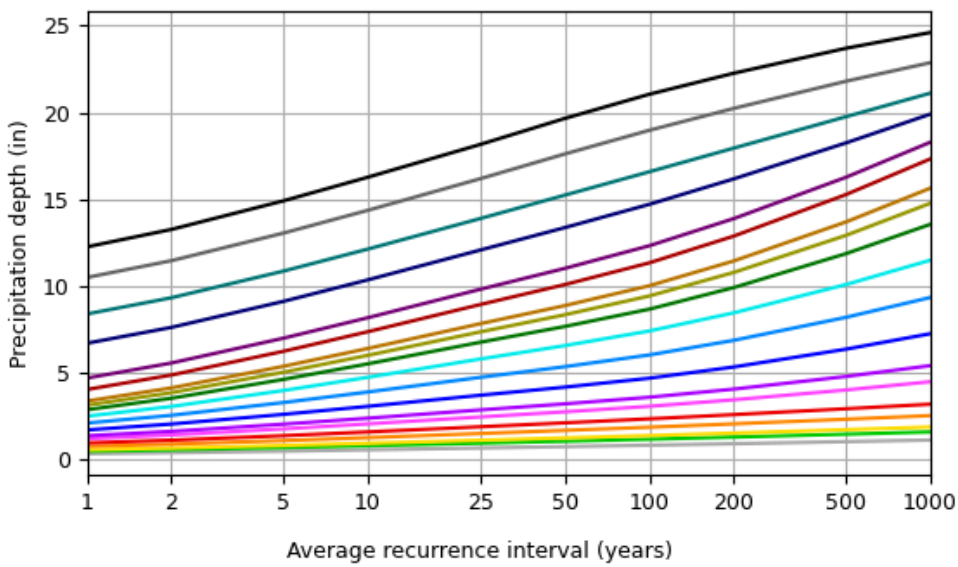
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.3625°, Longitude: -72.0429°





NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Wed Feb 5 20:47:22 2025

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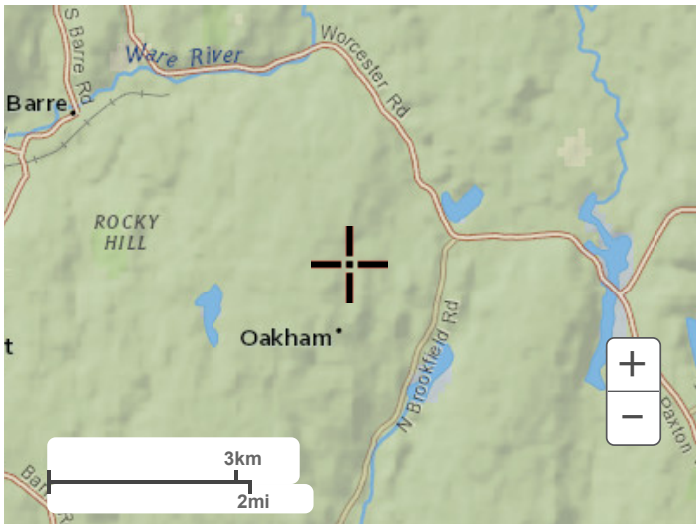
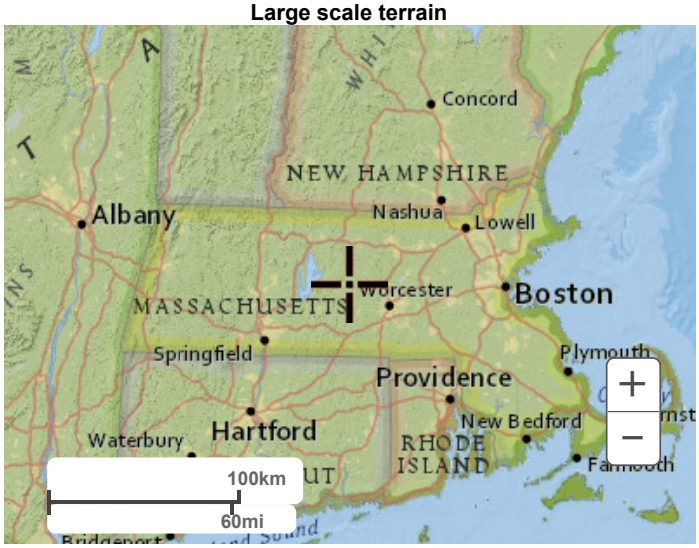
Maps & aerials

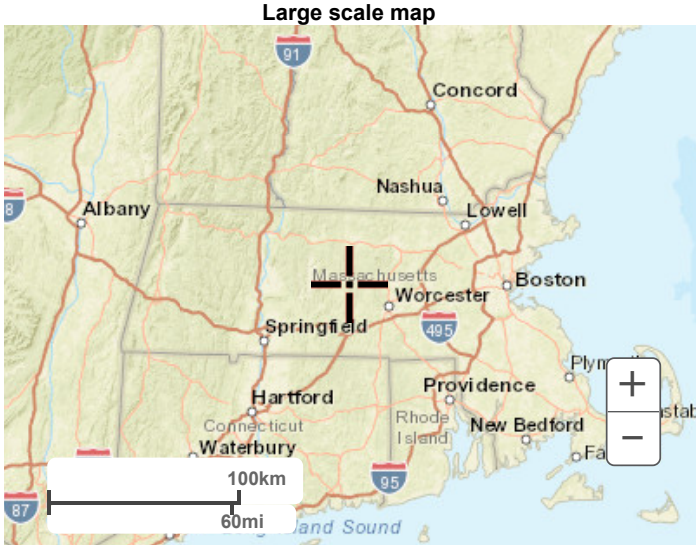
Small scale terrain



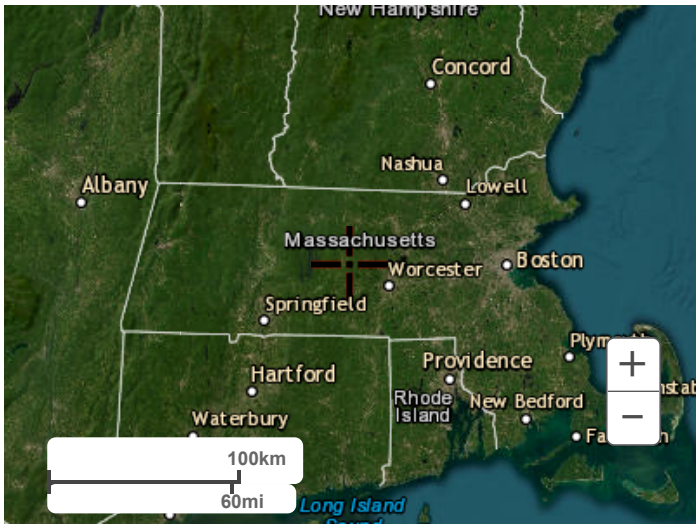
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Site	Year	Duration	R_1yr_50th	R_2yr_50th	R_5yr_50th	R_10yr_50th	R_25yr_50th	[illegible]	[illegible]	[illegible]	[illegible]	R_100yr_50th
Site 3633	2050	45m	1.2 (1.1 - 1.3)	1.4 (1.3 - 1.5)	1.8 (1.6 - 1.9)	2 (1.8 - 2.2)	2.4 (2.2 - 2.6)	2.7 (2.4 - 2.9)	3 (2.7 - 3.2)	[illegible]	[illegible]	4.1 (3.7 - 4.4)
Site 3633	2050	60h	1.5 (1.4 - 1.6)	1.8 (1.6 - 1.9)	2.2 (2 - 2.4)	2.6 (2.4 - 2.8)	3.1 (2.8 - 3.3)	3.5 (3.1 - 3.7)	[illegible]	[illegible]	[illegible]	5.7 (5.1 - 6.1)
Site 3633	2050	03h	1.7 (1.6 - 1.9)	2.1 (1.9 - 2.2)	2.6 (2.3 - 2.8)	3 (2.7 - 3.2)	3.6 (3.3 - 3.9)	4.1 (3.7 - 4.3)	4.5 [illegible]	5.1 [illegible]	6 [illegible] (4.3)	6.8 (6.2 - 7.3)
Site 3633	2050	06h	2.2 (2 - 2.3)	2.6 (2.3 - 2.8)	3.3 (3 - 3.5)	3.9 (3.5 - 4.2)	4.7 (4.2 - 5)	5.3 (4.8 - 5.6)	5.9 (5.4 - [illegible])	6.7 [illegible]	8 [illegible] (6.6)	9.2 (8.3 - 9.8)
Site 3633	2050	12h	2.7 (2.4 - 2.9)	3.2 (2.9 - 3.5)	4.2 (3.8 - 4.5)	4.9 (4.5 - 5.3)	6 (5.4 - 6.4)	6.8 (6.1 - 7.3)	7.7 [illegible]	8.7 [illegible]	10.4 (9.6 - 11.2)	11.9 (10.8 - 12.7)
Site 3633	2050	24h	3.2 (2.9 - 3.4)	3.9 (3.5 - 4.2)	5.1 (4.6 - 5.4)	6 (5.4 - 6.5)	7.4 (6.7 - 7.9)	8.4 (7.5 - 8.9)	9.4 (8.5 - 10.1)	10.8 (9.7 - 11.5)	12.9 (11.6 - 13.8)	14.7 (13.3 - 15.7)
Site 3633	2050	48h	3.6 (3.3 - 3.9)	4.5 (4.1 - 4.8)	5.9 (5.3 - 6.3)	7 (6.3 - 7.5)	8.6 (7.8 - 9.2)	9.8 (8.8 - 10.4)	11 (10 - 11.8)	12.6 (11.4 - 13.5)	15.1 (13.7 - 16.2)	17.3 (15.6 - 18.5)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Appendix L: Epsilon Wetland Mapping

Abbreviated Notice of Resource Area Delineation

Massachusetts Wetlands Protection Act (M.G.L. c.131 § 40)

358 Coldbrook Road
Oakham, Massachusetts

Submitted to:
Oakham Conservation Commission
2 Coldbrook Road, Unit 7
Oakham, MA 01068

MassDEP Central Regional Office
8 New Bond Street
Worcester, MA 01606

Prepared for:
Moraga Storage LLC
750 Lexington Avenue, 9th Floor
New York, NY 10022

Submitted by:
Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

Epsilon ASSOCIATES INC.

October 2, 2024

Epsilon ASSOCIATES INC.

October 1, 2024

Oakham Conservation Commission
2 Coldbrook Road, Unit 7
Oakham, MA 01068

Subject: Abbreviated Notice of Resource Area Delineation
358 Coldbrook Road, Oakham, MA

Dear Members of the Oakham Conservation Commission:

On behalf of Moraga Storage LLC ("the Applicant") please find enclosed an Abbreviated Notice of Resource Area Delineation ("ANRAD") for property identified as 358 Coldbrook Road ("the Subject Parcel") in Oakham, Massachusetts. The enclosed ANRAD has been prepared in accordance with the Massachusetts Wetlands Protection Act ("MWPA") (G.L. c. 131 § 40) and its implementing Regulations (310 CMR 10.00). As presented herein the Subject Parcel contains wetland resource areas regulated under the MWPA including Bordering Vegetated Wetlands and Inland Bank.

Enclosed please find two complete copies of the ANRAD, as well as a check made payable to the Town of Oakham for the local share of the requisite filing fee.

If the Commission has any questions regarding this ANRAD, please do not hesitate to contact me at 978-461-6253 or via email at mbergeron@epsilonassociates.com. Please use this contact information to provide details regarding the public hearing date and time, once available. Thank you.

Sincerely,
EPSILON ASSOCIATES, INC.

Marc Bergeron
Project Manager/Principal

cc: MADEP, Wetland Reviewer, Central Regional Office
Gus Hadidi, Moraga Storage LLC
Andrew Kaplan, Pierce Atwood LLP

Abbreviated Notice of Resource Area Delineation

Massachusetts Wetlands Protection Act (M.G.L. c.131§ 40)

358 Coldbrook Road
Oakham, MA

Prepared for:
Moraga Storage LLC
750 Lexington Avenue, 9th Floor
New York, NY 10022

Submitted to:
Oakham Conservation Commission
2 Coldbrook Road, Unit 7
Oakham, MA 01068

Prepared by:
Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, Massachusetts 01754

October 1, 2024

Epsilon
ASSOCIATES INC.

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Attachment C – Abutter Information

Attachment D – Filing Fees

Attachment E – Wetland Determination Data Forms

Attachment F – Site Plans

Attachment G – USGS StreamStats Reports

Attachment H - ILSF

Abbreviated Notice of Resource Area Delineation – WPA Form 4A

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Oakham
City/Town

A. General Information

1. Project Location (**Note:** electronic filers will click on button for GIS locator):

358 Coldbrook Road — a. Street Address
Oakham — b. City/Town
01068 — c. Zip Code

Latitude and Longitude:
42.362319 — d. Latitude
-72.041833 — e. Longitude

406 — f. Assessors Map/Plat Number
106.3 — g. Parcel /Lot Number

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

2. Applicant:

Gus — a. First Name
Hadidi — b. Last Name
Moraga Storage LLC — c. Organization
750 Lexington Avenue, 9th Floor — d. Mailing Address
New York — e. City/Town
NY — f. State
10022 — g. Zip Code
(401) 215-4000 — h. Phone Number
i. Fax Number
ghadidi@rhynland.com — j. Email Address

3. Property owner (if different from applicant):

☐ Check if more than one owner (attach additional sheet with names and contact information)

a. First Name
b. Last Name
ZOVL Properties, LLC — c. Organization
5555 Anglers Avenue — d. Mailing Address
Fort Lauderdale — e. City/Town
FL — f. State
33312 — g. Zip Code
h. Phone Number
i. Fax Number
j. Email Address

Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

4. Representative (if any):

Marc — a. Contact Person First Name
Bergeron — b. Contact Person Last Name
Epsilon Associates, Inc. — c. Organization
3 Mill & Main Place, Suite 250 — d. Mailing Address
Maynard — e. City/Town
MA — f. State
01754 — g. Zip Code
(978) 897-7100 — h. Phone Number
i. Fax Number
mbergeron@epsilonassociates.com — j. Email Address

Fees will be calculated for online users.

5. Total WPA Fee Paid (from attached ANRAD Wetland Fee Transmittal Form):

$2,000 — a. Total Fee Paid
$987.50 — b. State Fee Paid
$1,012.50 — c. City/Town Fee Paid

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Oakham
City/Town

B. Area(s) Delineated

1. Bordering Vegetated Wetland (BVW) — 6,600 Linear Feet of Boundary Delineated

2. Check all methods used to delineate the Bordering Vegetated Wetland (BVW) boundary:

   a. ☒ MassDEP BVW Field Data Form (attached)

   b. ☒ Other Methods for Determining the BVW boundary (attach documentation):

      1. ☒ 50% or more wetland indicator plants
      2. ☒ Saturated/inundated conditions exist
      3. ☒ Groundwater indicators
      4. ☒ Direct observation
      5. ☒ Hydric soil indicators
      6. ☐ Credible evidence of conditions prior to disturbance

3. Indicate any other resource area boundaries that are delineated:

a. Resource Area	b. Linear Feet Delineated
c. Resource Area	d. Linear Feet Delineated

C. Additional Information

Applicants must include the following plans with this Abbreviated Notice of Resource Area Delineation. See instructions for details. **Online Users:** Attach the Document Transaction Number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ ANRAD (Delineation Plans only)
2. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
3. ☒ Plans identifying the boundaries of the Bordering Vegetated Wetlands (BVW) (and/or other resource areas, if applicable).
4. ☒ List the titles and final revision dates for all plans and other materials submitted with this Abbreviated Notice of Resource Area Delineation.

D. Fees

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Oakham
City/Town

understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

I hereby grant permission, to the Agent or member of the Conservation Commission and the Department of Environmental Protection, to enter and inspect the area subject to this Notice at reasonable hours to evaluate the wetland resource boundaries subject to this Notice, and to require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

I acknowledge that failure to comply with these certification requirements is grounds for the Conservation Commission or the Department to take enforcement action.

Joseph Song
1. Signature of Applicant

9/09/2024

3. Signature of Property Owner (if different)

4. Date

Marc Bergen
5. Signature of Representative (if any)

10/01/2024
6. Date

For Conservation Commission:
Two copies of the completed Abbreviated Notice of Resource Area Delineation (Form 4A), including supporting plans and documents; two copies of the ANRAD Wetland Fee Transmittal Form; and the city/town fee payment must be sent to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Abbreviated Notice of Resource Area Delineation (Form 4A), including supporting plans and documents; one copy of the ANRAD Wetland Fee Transmittal Form; and a copy of the state fee payment must be sent to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery. (E-filers may submit these electronically.)

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Attachment A

Project Narrative

ATTACHMENT A – PROJECT NARRATIVE

1.0 Introduction

Epsilon Associates, Inc. ("Epsilon") was retained by Moraga Storage LLC ("the Applicant") to delineate wetland resource areas on a parcel of land identified as 358 Coldbrook Road in Oakham, MA, Map 406, Lot 106.3 (the "Subject Parcel"). This report describes the general environmental conditions and potential jurisdictional status for each delineated wetland resource area within the Subject Parcel. The wetland resource areas described in further detail below were field delineated by Epsilon on July 21, 2023, and March 26, 2024.

2.0 Existing Conditions

The Subject Parcel is approximately 42.9 acres in size and is comprised of forest, marsh, and unmaintained developed area. The Subject Parcel is bordered by the following: residential properties and undeveloped forest to the west; undeveloped forest and a Massachusetts Electric d/b/a National Grid maintained power line easement to the northeast; and undeveloped forest, marsh, and Peg Millpond to the south. The property to the northeast is owned by the Department of Conservation and Recreation (DCR) and Division of Water Supply Protection (DWSP). Land uses near the Subject Parcel include conservational, recreational, municipal, agricultural, and residential.

The Subject Parcel was formerly used as an automobile salvage storage facility. A paved road between two residential properties provides access to the Subject Parcel from Coldbrook Road. At the end of the access road there is a one-story, two bay service garage, an attached one-story office or reception building, and a separate shed. Much of the site is covered by unpaved access roads and former car storage areas which are becoming overgrown with shrubs and herbaceous vegetation. Other areas of the site (e.g., the southeast corner) remain largely forested but are still scattered with overgrown access roads, tire ruts, and abandoned cars. Vegetation in these areas is predominantly northern hardwood forest.

The topography west of the Subject Parcel slopes down to the western property boundary. A north-south swale separates this slope from the rest of the Subject Parcel. In the west, the Subject parcel is generally level, but the microtopography includes small manmade drainage channels, mounds, depressions, and berms. To the northeast, the topography gradually slopes down in a northeasterly direction. To the southeast, there is a steep decline that becomes shallower going eastward.

Plant species observed in the upland portions of the property include northern red oak (Quercus rubra), white oak (Quercus alba), eastern white pine (Pinus strobus), red maple (Acer rubrum), yellow birch (Betula alleghaniensis), shagbark hickory (Carya ovata), gray birch (Betula populifolia), black birch (Betula lenta), black cherry (Prunus serotina) trees and/or saplings; poison ivy (Toxicodendron radicans), asiatic bittersweet (Celastrus orbiculatus), fox grape (Vitis labrusca) climbing woody vines; American witch-hazel (Hamamelis virginiana), highbush blueberry (Vaccinium corymbosum), mountain laurel (Kalmia latifolia), beaked hazel-nut (Corylus cornuta), black huckleberry (Gaylussacia baccata), multiflora rose (Rosa multiflora), gray birch, black cherry shrubs; and poison ivy, marginal wood fern (Dryopteris marginalis), bracken fern (Pteridium aquilinum), hayscented fern (Dennstaedtia punctilobula), teaberry (Gaultheria procumbens), partridge-berry (Mitchella repens), princess pine (Lycopodium obscurum) ground cover.

The USDA Natural Resources Conservation Service's (NRCS) Web Soil Survey maps the Subject Parcel as predominantly Woodbridge-Paxton association (910C) with small areas of Ridgebury-Whitman association (918B) and Montauk-Scituate-Canton association (927C). The Woodbridge soils are classified as moderately well drained, the Montauk soils are classified as well drained, and Ridgebury soils are classified as poorly drained (see Attachment B, Figure 5).

No portion of the Subject Parcel is mapped as an Area of Critical Environmental Concern (ACEC) or an Outstanding Resource Water (ORW) (see Attachment B, Figure 6).

No portion of the Subject Parcel is located within areas of mapped Priority Habitat of Rare Species and/or Estimated Habitat of Rare Wildlife by the Natural Heritage and Endangered Species Program (NHESP). Furthermore, the Subject Parcel does not currently contain any mapped Certified Vernal Pools (CVPs) or Potential Vernal Pools (PVPs).

According to Federal Emergency Management Agency (FEMA), community panel 2503240005B with an effective date of April 3, 1984, there are no mapped Zone A or AE 100-year flood hazard areas associated with the Subject Parcel (see Attachment B, Figure 4).

3.0 Wetland Resource Areas

3.1 Wetland Delineation Methodology & Regulatory Framework

Wetlands within the Subject Parcel were delineated in accordance with the following guidance manuals and regulatory processes:

- U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987);
- Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Environmental Laboratory, Version 2.0, January 2012);
- Massachusetts Wetlands Protection Act ("WPA") and implementing regulations (310 CMR 10.00);
- Massachusetts Department of Environmental Protection (MassDEP), Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (MassDEP, 2nd Edition, September 2022); and
- The Town of Oakham does not have a wetlands protection bylaw or wetland delineation methodology that differs from the state methodology.

The wetland delineation methodologies referenced above generally prescribe a multi-parameter approach, where hydrophytic vegetation and hydrology (including hydric soils) are reviewed in conjunction with one another when delineating a wetland boundary.

The boundaries of the wetland resource areas were delineated in the field by tying brightly colored survey flagging to woody vegetation or other relatively permanent vegetation/structures. The flags were placed sufficiently close together to clearly identify wetland/resource area edges and to allow survey crews to see adjacent flags from one another. Flags were labeled successively using unique numeric identifiers for each wetland series.

3.2 Results

The wetland resource areas delineated or otherwise identified by Epsilon are described below.

3.2.1 Bordering Vegetated Wetlands

According to the WPA Regulations, Bordering Vegetated Wetlands (BVWs) are "freshwater wetlands that border on creeks, rivers, streams, ponds and lakes and include wet meadows, marshes, swamps and bogs. Generally, the soils are saturated and/or inundated conditions exist such that these areas support a predominance of wetland indicator plants." Under the Act, a BVW has a 100-foot Buffer Zone extending from its edge. As mentioned above, the Oakham Conservation Commission does not have a bylaw.

BVW Flag Series W1 (flags W1-100 through W1-111 & W1-200 through W1-204)

The W1 Series delineates a palustrine, forested ("PFO") wetland system located in the southeast portion of the Subject Parcel. It begins as a depressional, ponded area and flows east via braided channels to the unnamed tributary of Lake Dean and Fivemile River. Dominant wetland vegetation includes yellow birch, winterberry holly (*Ilex verticillata*), and sensitive fern (*Onoclea sensibilis*).

According to the WPA regulations, a perennial stream (aka "river") is defined (in part), as follows:

- A river or stream shown as perennial on the current USGS map or more recent map provided by MassDEP is perennial.
- A river or stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size greater than or equal to one square mile, is perennial.
- A stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size less than one square mile, is intermittent unless:
    - The stream has a watershed size of at least ½ (0.50) square mile and has a predicted flow rate greater than or equal to 0.01 cubic feet per second at the 99% flow duration using the USGS StreamStats method; or
    - When the USGS StreamStats method cannot be used because the stream does not have a mapped and digitized centerline… and the stream has a watershed size of at least ½ (0.50) square mile, and the surficial geology of the contributing drainage area to the stream at the project site contains 75% or more stratified drift, the issuing authority shall find such streams to be perennial.

The braided channels associated with the wetland are not shown on the current USGS map and do not contain a digitized centerline in USGS StreamStats. According to the 2018 USGS Surficial Materials Map the Subject Parcel is located in an area characterized by thin till and swamp deposits (see Attachment B, Figure 7). Therefore, the braided channels do not meet the definition of a perennial stream and would be considered intermittent.

BVW Flag Series W2 (flags W2-100 through W2-148)

The W2 Series delineates a PFO wetland system located in the northwest portion of the Subject Parcel. This BVW system borders on an intermittent stream which flows into the Subject Parcel from upgradient, abutting properties to the west. Dominant wetland vegetation includes yellow birch, red maple, Northern arrowwood, highbush blueberry, burning bush (*Euonymus alatus*), spicebush (*Lindera benzoin*), winterberry holly, speckled alder (*Alnus incana*), cinnamon fern (*Osmunda cinnamomea*), skunk cabbage (*Sympolcarpus foetidus*), sensitive fern, and sphagnum moss (*Sphagnum sp*).

The stream at this location is considered intermittent. It is not shown on the current USGS map, does not contain a digitized centerline in USGS StreamStats, and is in an area characterized by thin till and swamp deposits according to the 2018 USGS Surficial Materials Map (see Attachment B, Figure 7).

BVW Flag Series W3 (flags W3-100 through W3-162)

The W3 Series delineates a PFO wetland system located in the southwest portion of the Subject Parcel. This BVW system borders on Peg Millpond (located on an abutting property south of the Subject Parcel) as well as an intermittent stream which flows out of the W2 wetland system. Dominant wetland vegetation includes yellow birch, red maple, Northern arrowwood, highbush blueberry, burning bush, spicebush, winterberry holly, cinnamon fern, skunk cabbage, sensitive fern, and sphagnum moss.

The stream at this location is considered intermittent. The channel at this location is depicted on the current USGS maps as intermittent, does not contain a digitized centerline in USGS StreamStats, and is located in an area characterized by thin till and swamp deposits according to the 2018 USGS Surficial Materials Map (see Attachment B, Figure 7). The outlet of Peg Millpond is shown on the USGS map as a perennial stream; however, the mean annual high water associated with the stream is greater than 200-feet from the Subject Parcel and it was not delineated.

BVW Flag Series W6 & W7 (flags W6-100 through W6-116, W6-200 through W6-250 & W7-100 through W7-123, W7-101A-W7101E)

The W6 & W7 Series delineates a PFO & Palustrine, scrub/shrub ("PSS") wetland system located in the northwest & central portion of the Subject Parcel. This BVW system borders on an intermittent stream which flows out of the W2 wetland system in a northerly direction. Dominant wetland vegetation within W6 and W7 includes yellow birch, red maple, Northern arrowwood, highbush blueberry, burning bush, spicebush, winterberry holly, cinnamon fern, skunk cabbage, sensitive fern, soft rush and sphagnum moss.

The associated stream is not shown on the current USGS map; however, it has a digitized centerline in USGS StreamStats. A USGS StreamStats analysis and/or watershed analysis was conducted for this stream just before crossing the northerly property boundary to determine if the stream meets the definition to be perennial. Through this analysis, it was determined that this stream is intermittent and does not have a 200-foot RFA, as prescribed by the regulations. The model results confirm that this stream does not meet the criteria outlined in 310 CMR 10.58(2) to be regulated as a perennial stream with a 200-foot RFA

because it is (a) depicted as intermittent on the applicable USGS quadrangle, and/or not shown; and (b) has a watershed areas less than 0.50 square miles. The watershed size was determined to be only 0.07 square miles (see Attachment G).

3.2.2 Isolated Vegetated Wetlands (Non-Jurisdictional)

Isolated Vegetated Wetlands (IVW) are not regulated under the WPA unless they have the requisite flood storage capacity to be regulated as Isolated Land Subject to Flooding (ILSF), as defined under 310 CMR 10.57. ILSF is an isolated depression or a closed basin which serves as a ponding area for run-off or high ground water which has risen above the ground surface. It is an area which at least once a year confines standing water to a volume of at least ¼ acre-feet and to an average depth of at least six inches. ILSF does not have a 100-foot Buffer Zone under the WPA.

Certain IVWs may be regulated by the U.S. Army Corps of Engineers as waters of the U.S. under Section 404 of the Clean Water Act. Waters of the U.S. do not have regulated Buffer Zones.

BVW Flag Series W4 (flags W4-100 through W4-129)

The W4 Series delineates a palustrine, emergent ("PEMB") wetland system located in the southwest portion of the Subject Parcel. Dominant wetland vegetation includes soft rush (*Juncus effusus*), straw-colored flatsedge (*Cyperus strigosus*), and woolgrass (*Scirpus cyperinus*).

Calculations conducted by the project engineer show that the IVW does not hold the requisite volume of water to be regulated as ILSF under the WPA. (See Attachment H)

IVW Flag Series W5 (flags W5-100 through W5-131)

IVW Flag Series W5 is a PFO wetland located in the south-central portion of the Subject Parcel. It does not border on nor have a hydrologic connection to a surface water body. Dominant wetland vegetation includes red maple, gray birch, winterberry holly, speckled alder, spicebush, and sensitive fern.

Calculations conducted by the project engineer show that the IVW does not hold the requisite volume of water to be regulated as ILSF under the WPA. (See Attachment H)

4.0 Conclusion

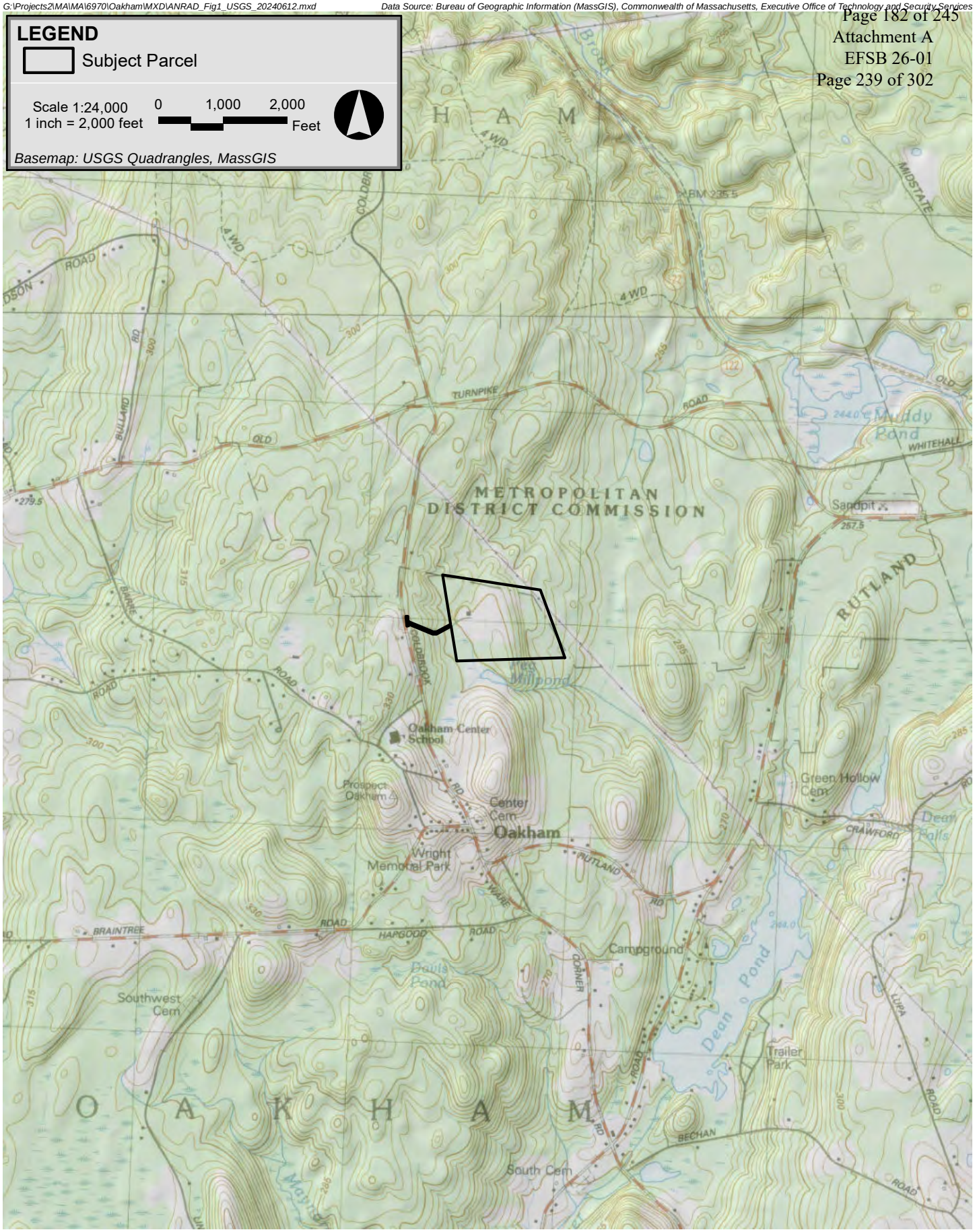
The information contained in this ANRAD describes the wetland resource areas delineated within the Subject Parcel, in accordance with state and federal delineation methodologies, where hydrophytic vegetation and hydrology (including hydric soils) were reviewed in conjunction with one another. The Applicant therefore respectfully requests that the Commission issue an Order of Resource Area Delineation approving the delineated boundaries in accordance M.G.L. c. 131 §40.

Attachment B

Figures

G:\Projects2\MA\MA\6970\Oakham\MXD\ANRAD_Fig1_USGS_20240612.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



358 Coldbrook Road Oakham, Massachusetts

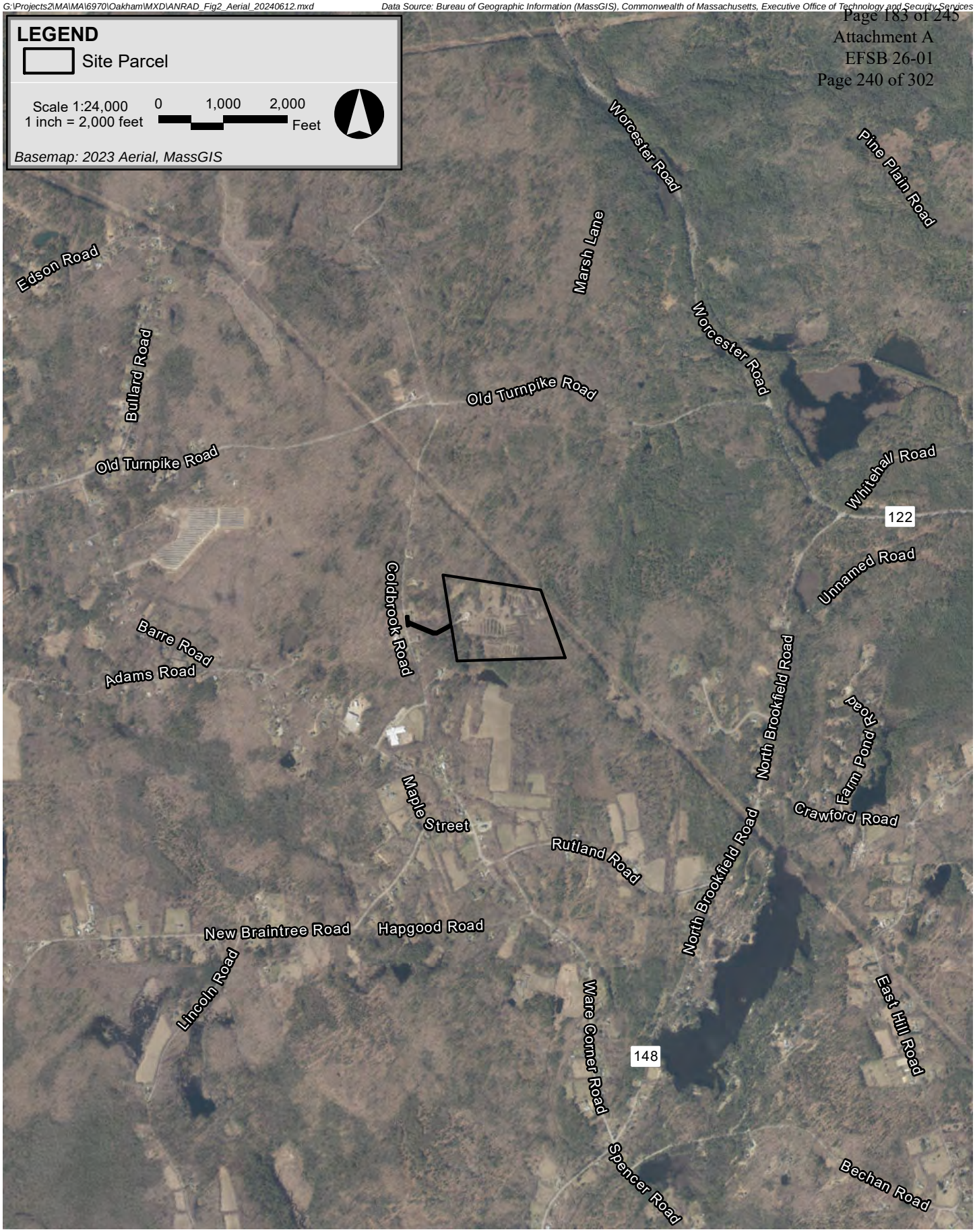
Epsilon Associates Inc.

Figure 1

USGS Locus Map

G:\Projects2\MA\MA\6970\Oakham\MXD\ANRAD_Fig2_Aerial_20240612.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Rhynland BESS New England - ZOVL Site **Oakham, Massachusetts**

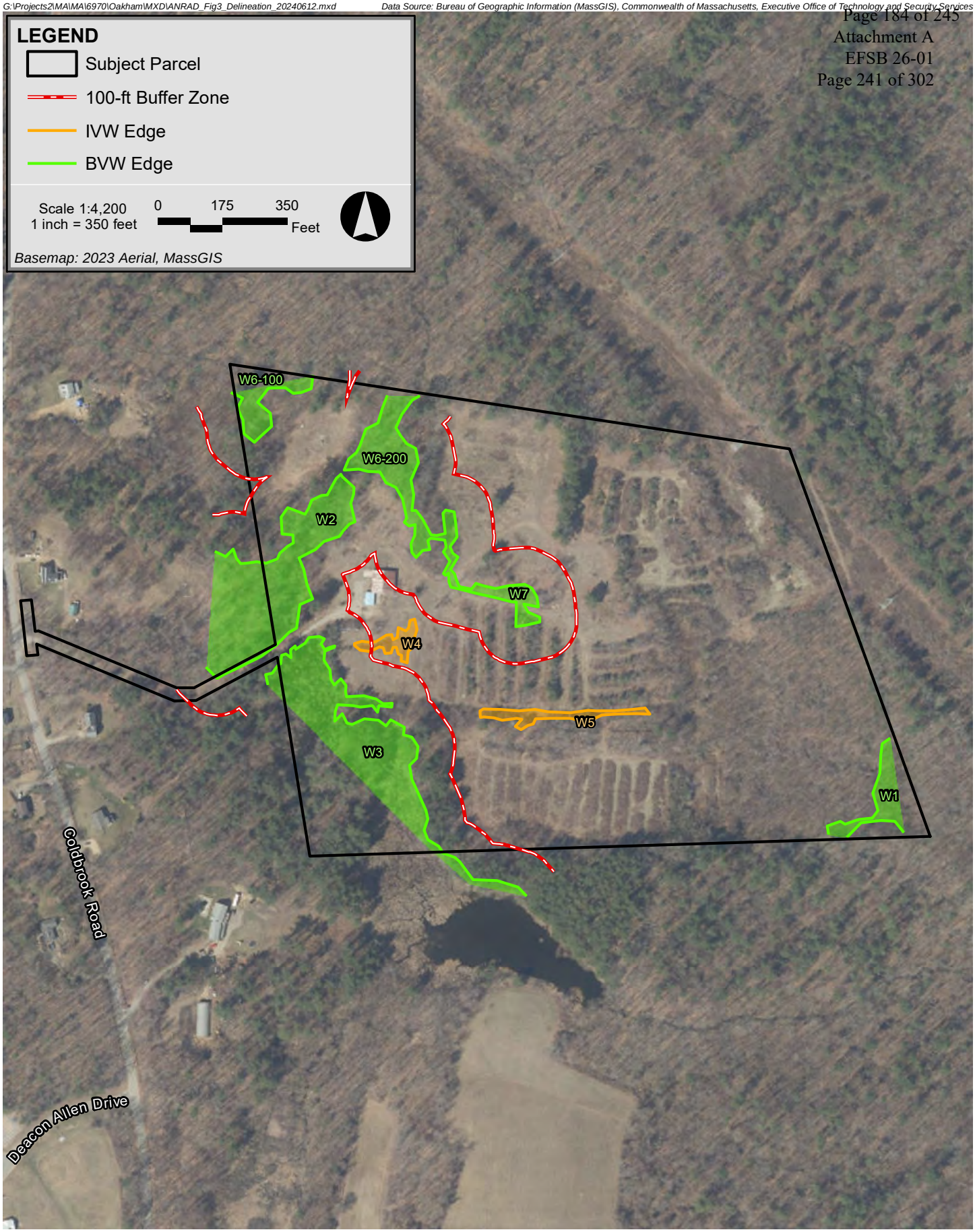
Epsilon Associates Inc.

Figure 2

Aerial Locus Map

G:\Projects2\MA\MA\6970\Oakham\MXD\ANRAD_Fig3_Delineation_20240612.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



358 Coldbrook Road Oakham, Massachusetts

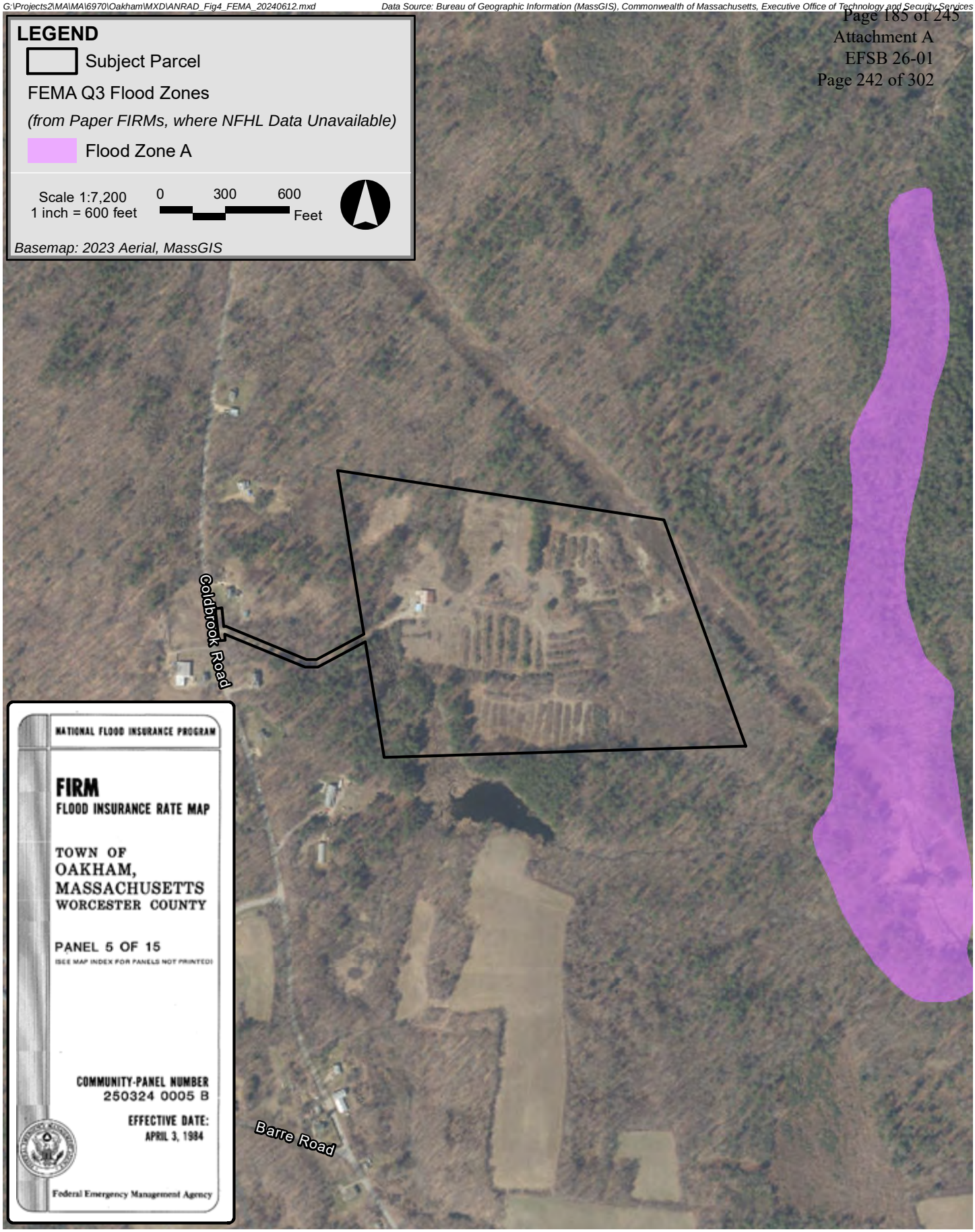
Epsilon Associates Inc.

Figure 3

Field Delineation and Resource Areas

G:\Projects2\MA\MA\6970\Oakham\MXD\ANRAD_Fig4_FEMA_20240612.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



358 Coldbrook Road Oakham, Massachusetts

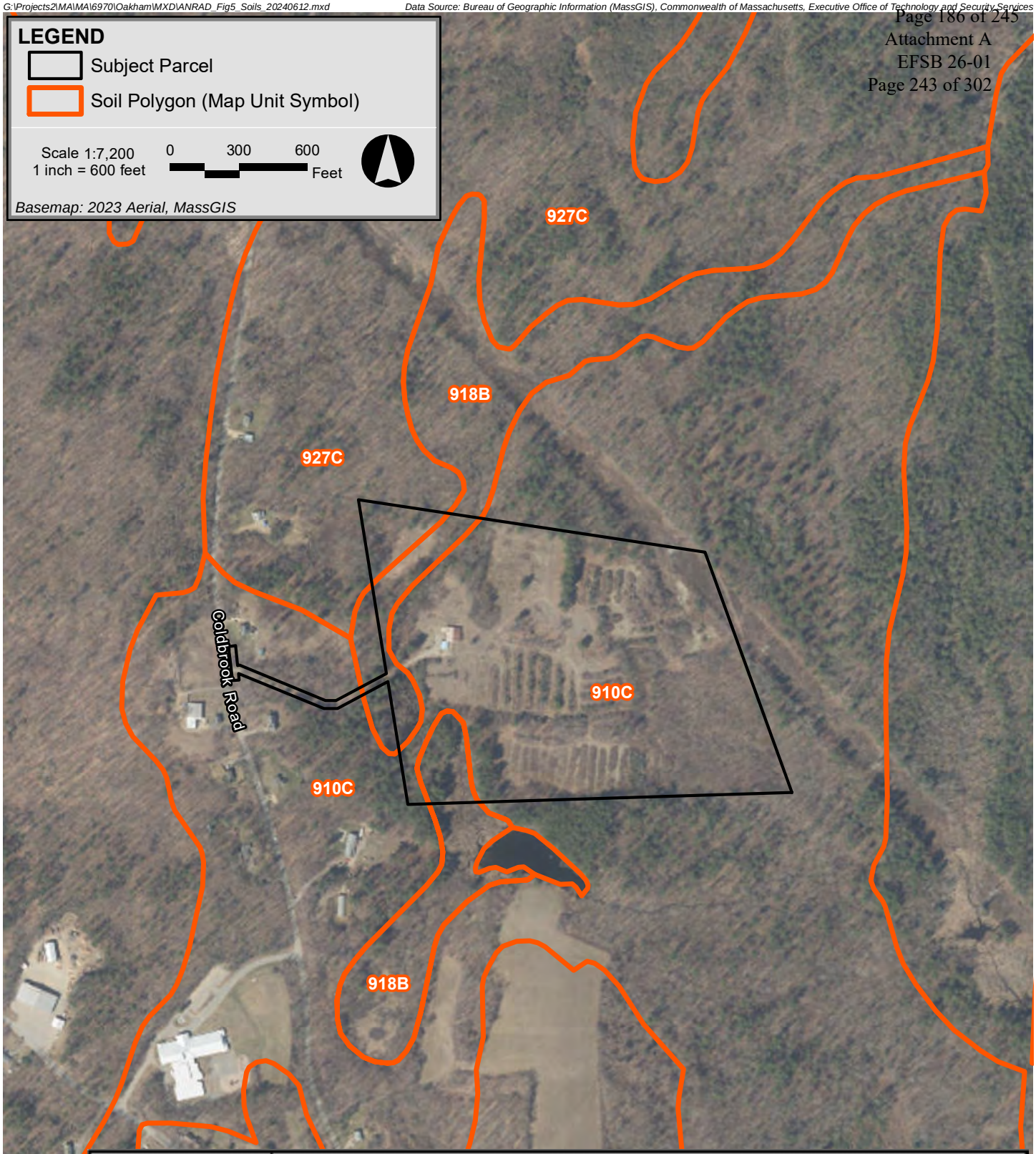
Epsilon ASSOCIATES INC.

Figure 4

FEMA Flood Zones
(FIRM Panel 250324 0005 B - April 3, 1984)

G:\Projects2\MA\MA\6970\Oakham\MXD\ANRAD_Fig5_Soils_20240612.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



Map Unit Symbol	Map Unit Name
910C	Woodbridge-Paxton association, 3 to 15 percent slopes, extremely stony
918B	Ridgebury-Whitman association, 0 to 8 percent slopes, extremely stony
927C	Montauk-Scituate-Canton association, 3 to 15 percent slopes, extremely stony

358 Coldbrook Road Oakham, Massachusetts

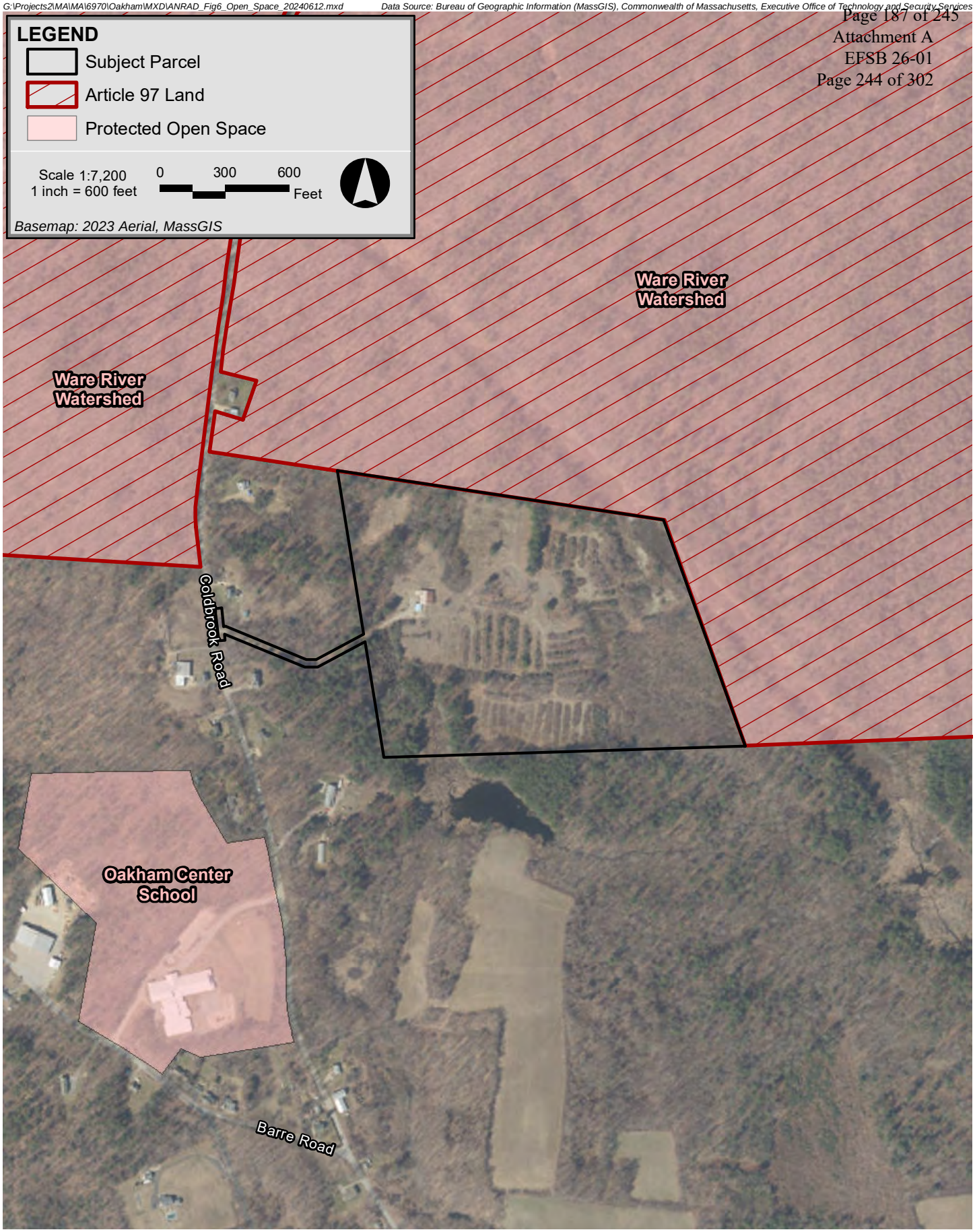
Epsilon Associates Inc.

Figure 5

NRCS SSURGO-Certified Soils

G:\Projects2\MA\MA\6970\Oakham\MXD\ANRAD_Fig6_Open_Space_20240612.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



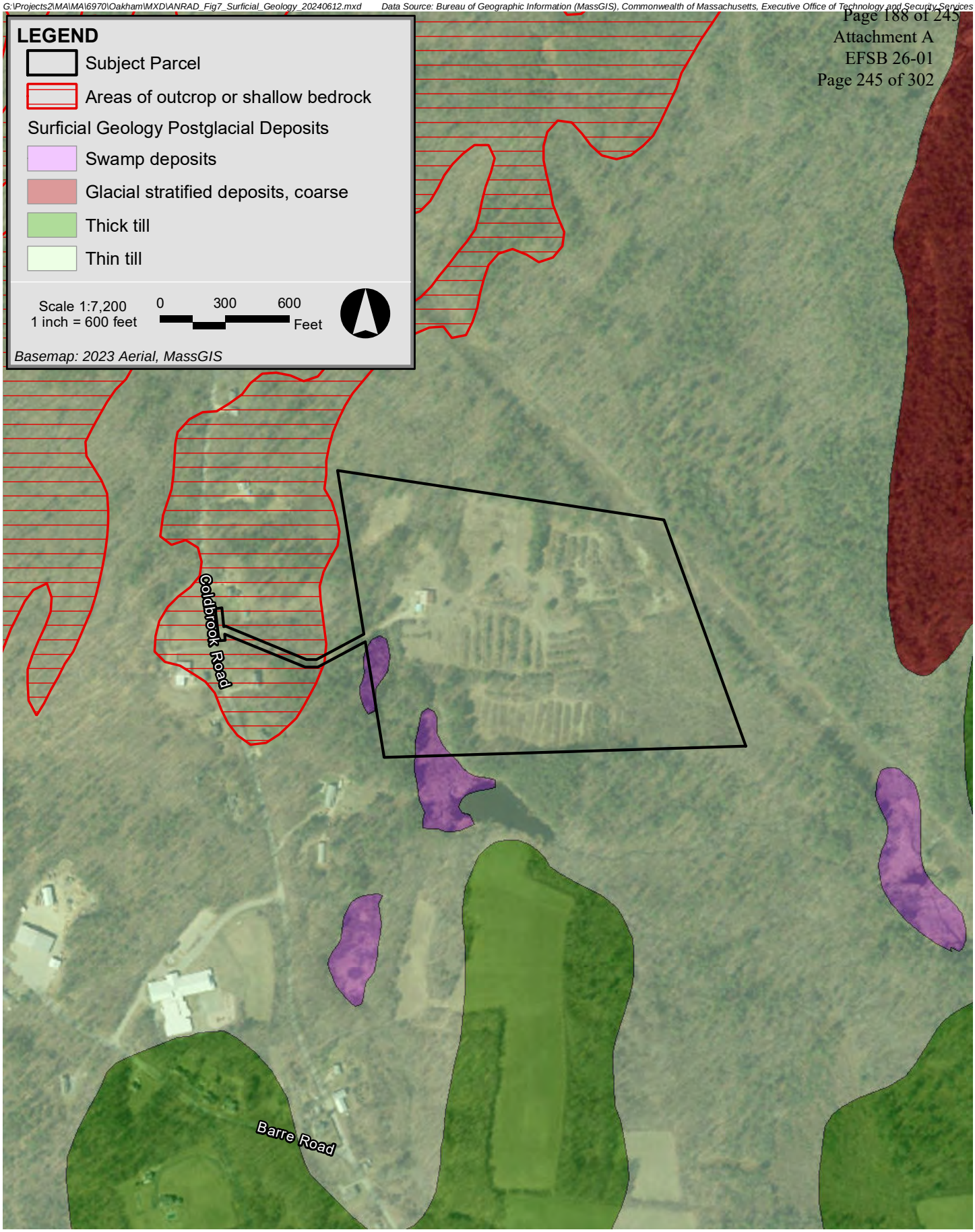
358 Coldbrook Road Oakham, Massachusetts

Epsilon Associates Inc.

Figure 6

Protected Open Space and Article 97 Lands

G:\Projects2\MA\MA\6970\Oakham\MXD\ANRAD_Fig7_Surficial_Geology_20240612.mxd Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



358 Coldbrook Road Oakham, Massachusetts

Epsilon Associates Inc.

Figure 7
Surficial Geology

Attachment C

Abutter Information

Notification to Abutters

In accordance with the second paragraph of the Massachusetts Wetlands Protection Act, and 310 CMR 10.05(4)(a) of the Wetlands Regulations, you are hereby notified that:

A. An Abbreviated Notice of Resource Delineation (ANRAD) was filed with the Oakham Conservation Commission and the Department of Environmental Protection on October 2, 2024 seeking confirmation of the following wetland resources under the Massachusetts Wetlands Protection Act (M.G.L. c. 131 §40):

Bordering Vegetated Wetland (BVW)

B. The name of the applicant is: **Moraga Storage LLC**

C. The address of the land where the activity is proposed is: **358 Coldbrook Road, Oakham (Assessors Map 406, Lot 106.3).**

D. Copies of the ANRAD may be examined or obtained at the office of the Oakham Conservation Commission, located at 2 Coldbrook Rd., Unit 7, Oakham, MA 01068. The Commission may be reached at (508) 882-5549.

E. Copies of the ANRAD application may be obtained from the applicant or their representative by calling Marc Bergeron, representative, at (978) 897-7100 between 9 am and 4 pm.

F. Information regarding the date, time, and location of the public hearing regarding the Abbreviated Notice of Resource Area Delineation may be obtained from the Oakham Conservation Commission. The Commission may be reached at (508) 882-5549.

100-foot Abutters List

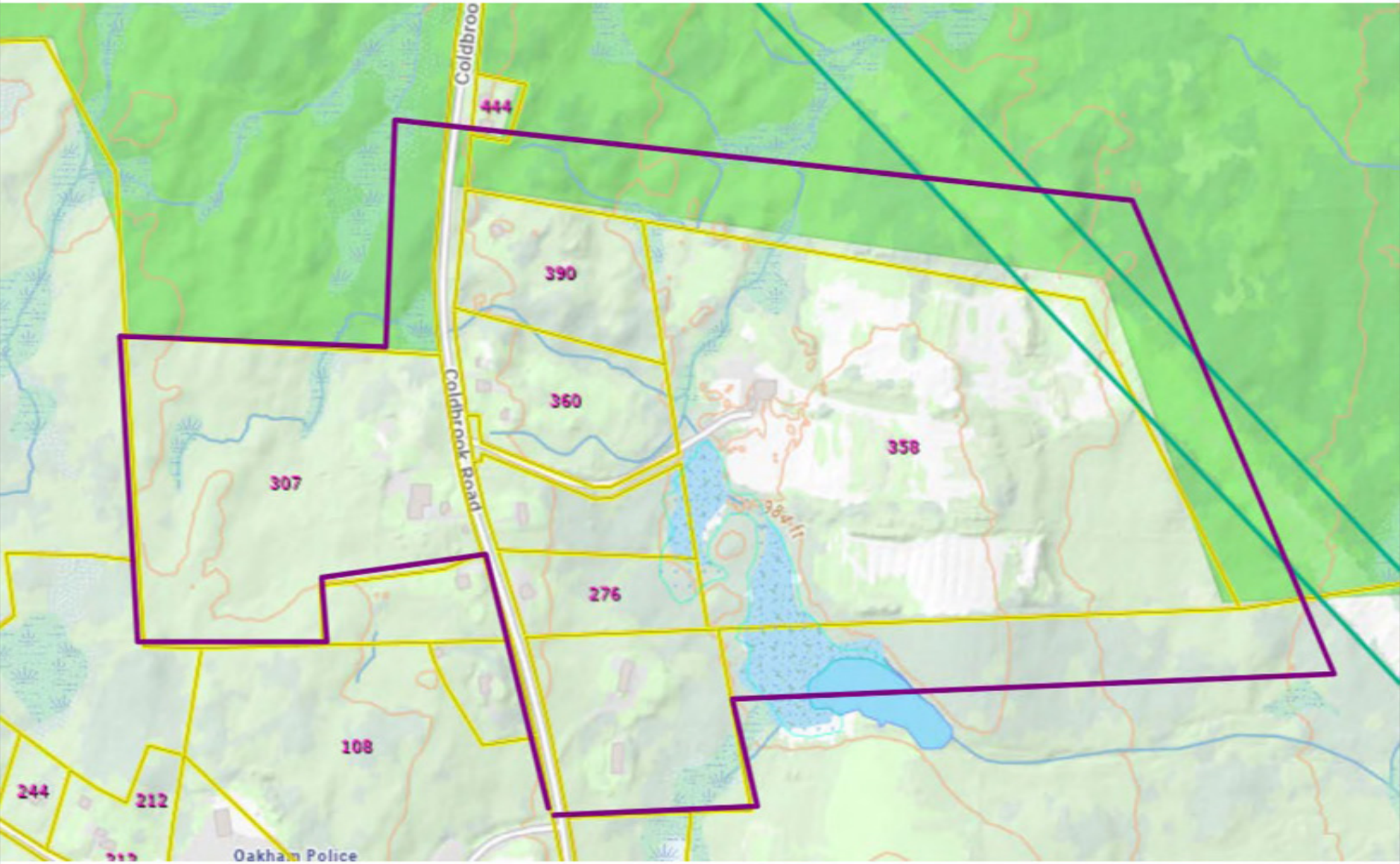
Oakham, MA

Subject Parcel:

Parcel Map/Lot: Property Address:	406 / 106.3 358 Coldbrook Road	Mailing Address:	ZOVL Properties, LLC 5555 Anglers Ave Fort Lauderdale, FL 33312

Abutters:

Parcel Map/Lot: Property Address:	406 / 104 0 Old Turnpike Road	Mailing Address:	Massachusetts, Commonwealth of 20 Somerset Street (Water Division) Boston, MA 02108
Parcel Map/Lot: Property Address:	406 / 108 0 Coldbrook Road	Mailing Address:	Black, Harold 236 Coldbrook Road Oakham, MA 01068
Parcel Map/Lot: Property Address:	406 / 108.1 236 Coldbrook Road	Mailing Address:	Black, Harold 236 Coldbrook Road Oakham, MA 01068
Parcel Map/Lot: Property Address:	406 / 106.4 276 Coldbrook Road	Mailing Address:	Corey, Scott H. 276 Coldbrook Road Oakham, MA 01068
Parcel Map/Lot: Property Address:	406 / 106.2 300 Coldbrook Road	Mailing Address:	Haapakoski, Donald A & Nancy E. PO Box 243 Oakham, MA 01068
Parcel Map/Lot: Property Address:	406 / 102 307 Coldbrook Road	Mailing Address:	Huard, Brian G. 307 Coldbrook Road Oakham, MA 01068
Parcel Map/Lot: Property Address:	406 / 106.1 360 Coldbrook Road	Mailing Address:	Stevens, James R. 360 Coldbrook Road Oakham, MA 01068
Parcel Map/Lot: Property Address:	406 / 106 390 Coldbrook Road	Mailing Address:	Wisnewski, Matthew PO Box 131 Oakham, MA 01068


Coldbroo
444
390
360
358
307
Coldbrook Road
384 ft
276
108
244
212
Oakham Police

Attachment D

Filing Fee Information

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

ANRAD Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A. Applicant Information

1. Location of Project:

358 Coldbrook Road	Oakham
a. Street Address	b. City/Town
$2,000	
c. Fee amount	d. Check number

2. Applicant:

Gus	Hadidi	Moraga Storage LLC
a. First Name	b. Last Name	c. Company

750 Lexington Avenue, 9th Floor
d. Mailing Address

New York	NY	22902
e. City/Town	f. State	g. Zip Code

(401) 215-4000
h. Phone Number

3. Property Owner (if different):

		ZOVL Properties, LLC
a. First Name	b. Last Name	c. Company

5555 Anglers Avenue
d. Mailing Address

Fort Lauderdale	FL	33312
e. City/Town	f. State	g. Zip Code

h. Phone Number

B. Fees

The fee is calculated as follows for each Resource Area Delineation included in the ANRAD (check applicable project type). The maximum fee for each ANRAD, regardless of the number of Resource Area Delineations, is $200 activities associated with a single-family house and $2,000 for any other activity.

☐ **Online users:** check box if fee exempt.

Bordering Vegetated Wetland Delineation Fee:

1. ☐	single family house project	a. feet of BVW	x $2.00 =	b. Fee for BVW
2. ☒	all other projects	6,600 a. feet of BVW	x $2.00 =	$2,000 b. Fee for BVW

Other Resource Area (e.g., bank, riverfront area, etc.):

3. ☐	single family house project	a. linear feet	x $2.00 =	b. Fee
4. ☐	all other projects	a. linear feet	x $2.00 =	b. Fee

Total Fee for all Resource Areas:	$2,000 Fee
State share of filing fee:	$987.50 5. 1/2 of total fee **less** $12.50
City/Town share of filing fee:	$1,012.50 6. 1/2 of total fee **plus** $12.50

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

ANRAD Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

C. Submittal Requirements

a.) Send a copy of this form, with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Abbreviated Notice of Resource Area Delineation; a **copy** of this form; and the city/town fee payment.

c.) **To DEP Regional Office**: Send one copy of the Abbreviated Notice of Resource Area Delineation (and any additional documentation required as part of a Simplified Review Buffer Zone Project); a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

WARNING • THIS CHECK IS PROTECTED BY SPECIAL SECURITY FEATURES

Epsilon ASSOCIATES INC.

Epsilon Associates, Inc
3 Mil & Main; Suite 250
MAYNARD, MA 01754
(978) 897-7100

MIDDLESEX SAVING BANK
CONCORD, MA 01742

53-7122 / 2113

56262

Nine Hundred Eighty Seven and 50/100

DATE		AMOUNT
09/30/24	56262	$987.50

PAY TO THE ORDER OF **COMMONWEALTH OF MASSACHUSETTS**

Robert D. O'Neal

SECURITY FEATURES INCLUDE FOIL HOLOGRAM • HEAT SENSITIVE ICON • MICROPRINT • MULTI-COLOR BACKGROUND

[redacted]

WARNING • THIS CHECK IS PROTECTED BY SPECIAL SECURITY FEATURES

Epsilon ASSOCIATES INC.

Epsilon Associates, Inc
3 Mil & Main; Suite 250
MAYNARD, MA 01754
(978) 897-7100

MIDDLESEX SAVING BANK
CONCORD, MA 01742

53-7122 / 2113

56263

One Thousand Twelve and 50/100

DATE		AMOUNT
09/30/24	56263	$1,012.50

PAY TO THE ORDER OF **TOWN OF OAKHAM**

Robert D. O'Neal

SECURITY FEATURES INCLUDE FOIL HOLOGRAM • HEAT SENSITIVE ICON • MICROPRINT • MULTI-COLOR BACKGROUND

[redacted]

Attachment E

Wetland Determination Data Forms

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: 358 Coldbrook Road City/Town: Oakham Sampling Date: 3/26/2024

Applicant/Owner: ZOVL Properties LLC Sampling Point or Zone: W2-113 Upland

Investigator(s): Anna Smith & Greg Hochmuth, PWS, CWS Latitude / Longitude: 42.36291 / -72.04391

Soil Map Unit Name: 927C, Montauk-Scituate-Canton association NWI or DEP Classification: NA

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____ , or Hydrology ____ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ____, Soil ____ , or Hydrology ____ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ____ No ✓	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** ✓
Hydric Soils criterion met?	Yes ____ No ✓		
Wetlands hydrology present?	Yes ____ No ✓		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ____	No ✓	Depth (inches) ____
Water Table Present?	Yes ✓	No ____	Depth (inches) 14.00
Saturation Present (including capillary fringe)?	Yes ✓	No ____	Depth (inches) 14.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
____ Water-stained leaves	____ Hydrological records	____ Direct observation of inundation
____ Evidence of aquatic fauna	____ Free water in a soil test hole	____ Drainage patterns
____ Iron deposits	____ Saturated soil	____ Drift lines
____ Algal mats or crusts	____ Water marks	____ Scoured areas
____ Oxidized rhizospheres/pore linings	____ Moss trim lines	____ Sediment deposits
____ Thin muck surfaces	____ Presence of reduced iron	____ Surface soil cracks
____ Plants with air-filled tissue (aerenchyma)	____ Woody plants with adventitious roots	____ Sparsely vegetated concave surface
____ Plants with polymorphic leaves	____ Trees with shallow root systems	____ Microtopographic relief
____ Plants with floating leaves	____ Woody plants with enlarged lenticels	____ Geographic position (depression, toe of slope, fringing lowland
____ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

Sampling Point W2-113 Upland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,500 +/-

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. White Pine	Pinus strobus	FACU	39.0	Yes	No
2. Black Birch	Betula lenta	FACU	39.0	Yes	No
3. Yellow Birch	Betula alleghaniensis	FAC	21.0	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

99.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,500 +/-

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Witch Hazel	Hamamelis virginiana	FACU	67.0	Yes	No
2. Hazelnut	Corylus cornuta	FACU	21.0	Yes	No
3. Highbush Blueberry	Vaccinium corymbosum	FACW	11.0	No	
4.					
5.					
6.					
7.					
8.					
9.					

99.0 = Total Cover

Herb Stratum Plot size 1,500 +/-

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Evergreen Woodfern	Dryopteris intermedia	FACU	30.0	Yes	No
2. Partridgeberry	Mitchella repens	FACU	30.0	Yes	No
3. Teaberry	Gaultheria procumbens	FACU	8.0	No	
4. Princess Pine	Lycopodium obscurum	FACU	30.0	Yes	No
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

98.0 = Total Cover

Sampling Point W2-113 Upland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,500 +/-				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
		0.0 = Total Cover			

Rapid Test:	Do all dominant species have an indicator status of OBL or FACW?			Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species? Yes ☐ No ☑
	8	1		
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
	Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?	**Yes** ☐ **No** ☑			

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W2-113 Upland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Location[2]	Texture	Remarks
0-8	10YR3/2	100.00					FSL	
8-18	7.5YR5/6	100.00					FSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
____Histosol (A1)	____ Polyvalue Below Surface (S8)	____2 cm Muck (A10)
____Histic Epipedon (A2)	____ Thin Dark Surface (S9)	____ 5 cm Mucky Peat or Peat (S3)
____Black Histic (A3)	____ Loamy Gleyed Matrix (F2)	____ Iron-Manganese Masses (F12)
____Hydrogen Sulfide (A4)	____ Depleted Matrix (F3)	____ Mesic Spodic (A17)
____Stratified Layers (A5)	____ Redox Dark Surface (F6)	____ Red Parent Material (F21)
____Depleted Below Dark Surface (A11)	____ Depleted Dark Surface (F7)	____ Very Shallow Dark Surface (F22)
____Thick Dark Surface (A12)	____ Redox Depressions (F8)	
____Sandy Mucky Mineral (S1)		
____Sandy Gleyed Matrix (S4)		
____Sandy Redox (S5)		____ Other (Include Explanation in Remarks)
____Stripped Matrix (S6)		
____Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ____ **No** ✓

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: 358 Coldbrook Road City/Town: Oakham Sampling Date: 3/26/2024

Applicant/Owner: ZOVL Properties LLC Sampling Point or Zone: W2-113 Wetland

Investigator(s): Anna Smith & Greg Hochmuth, PWS, CWS Latitude / Longitude: 42.36291 / -72.04391

Soil Map Unit Name: 918B, Ridgebury-Whitman association NWI or DEP Classification: PFO

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____ , or Hydrology ____ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ____, Soil ____ , or Hydrology ____ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?**	**Yes** ✓ **No** ____
Hydric Soils criterion met?	Yes ✓ No ____		
Wetlands hydrology present?	Yes ✓ No ____		

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ____	No ✓	Depth (inches) ____
Water Table Present?	Yes ✓	No ____	Depth (inches) 8.00
Saturation Present (including capillary fringe)?	Yes ✓	No ____	Depth (inches) 6.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
✓ Water-stained leaves	____ Hydrological records	____ Direct observation of inundation
____ Evidence of aquatic fauna	✓ Free water in a soil test hole	____ Drainage patterns
____ Iron deposits	✓ Saturated soil	____ Drift lines
____ Algal mats or crusts	____ Water marks	____ Scoured areas
____ Oxidized rhizospheres/pore linings	____ Moss trim lines	____ Sediment deposits
____ Thin muck surfaces	____ Presence of reduced iron	____ Surface soil cracks
____ Plants with air-filled tissue (aerenchyma)	____ Woody plants with adventitious roots	____ Sparsely vegetated concave surface
____ Plants with polymorphic leaves	✓ Trees with shallow root systems	____ Microtopographic relief
____ Plants with floating leaves	____ Woody plants with enlarged lenticels	____ Geographic position (depression, toe of slope, fringing lowland
____ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

Sampling Point W2-113 Wetland

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 1,500 +/-

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. White Pine	Pinus strobus	FACU	21.0	Yes	No
2. Red Maple	Acer rubrum	FACU	39.0	Yes	Yes
3. Yellow Birch	Betula alleghaniensis	FAC	39.0	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

99.0 = Total Cover

Shrub/Sapling Stratum Plot size 1,500 +/-

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Winterberry	Ilex verticillata	FACW	65.0	Yes	Yes
2. Highbush Blueberry	Vaccinium corymbosum	FACW	35.0	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

100.0 = Total Cover

Herb Stratum Plot size 1,500 +/-

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Sensitive Fern	Onoclea sensibilis	FACW	25.0	Yes	Yes
2. Cinnamon Fern	Osmunda cinnamomea	FACW	49.0	Yes	Yes
3. Skunk Cabbage	Symplocarpus foetidus	OBL	25.0	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

99.0 = Total Cover

Sampling Point W2-113 Wetland

VEGETATION – continued.

Woody Vine Stratum	Plot size 1,500 +/-				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
		0.0 = Total Cover			

Rapid Test:	Do all dominant species have an indicator status of OBL or FACW?			Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species? Yes ☑ No ☐
	8	7		
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
	Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?	**Yes** ☑ **No** ☐			

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point W2-113 Wetland

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Location[2]	Texture	Remarks
2-0							Organic	
0-6	2.5Y2.5/1	100.00					FSL	
6-18	5Y5/2	80.00	10YR5/8	20.00	C	M	SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
___ Histosol (A1)	___ Polyvalue Below Surface (S8)	___ 2 cm Muck (A10)
___ Histic Epipedon (A2)	___ Thin Dark Surface (S9)	___ 5 cm Mucky Peat or Peat (S3)
___ Black Histic (A3)	___ Loamy Gleyed Matrix (F2)	___ Iron-Manganese Masses (F12)
___ Hydrogen Sulfide (A4)	___ Depleted Matrix (F3)	___ Mesic Spodic (A17)
___ Stratified Layers (A5)	___ Redox Dark Surface (F6)	___ Red Parent Material (F21)
✓ Depleted Below Dark Surface (A11)	___ Depleted Dark Surface (F7)	___ Very Shallow Dark Surface (F22)
___ Thick Dark Surface (A12)	___ Redox Depressions (F8)	
___ Sandy Mucky Mineral (S1)		
___ Sandy Gleyed Matrix (S4)		
___ Sandy Redox (S5)		___ Other (Include Explanation in Remarks)
___ Stripped Matrix (S6)		
___ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ✓ **No** ___

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: 358 Coldbrook Road City/Town: Oakham Sampling Date: 7/21/23

Applicant/Owner: Rhynland/ZOVL Properties, LLC Sampling Point or Zone: UPL @ Flag W1-102

Investigator(s): David Cameron & Dan White, Epsilon Latitude / Longitude: _____

Soil Map Unit Name: Woodbridge-Paxton Association, 3-15% slopes, extremely stony NWI or DEP Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ____ No ✔ (If no, explain in Remarks)

Are Vegetation ____, Soil ____ , or Hydrology ____ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ____, Soil ____ , or Hydrology ____ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ____ No ✔	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** ✔
Hydric Soils criterion met?	Yes ____ No ✔		
Wetlands hydrology present?	Yes ____ No ____		

Remarks, Photo Details, Flagging, etc.:
The month of July, 2023 has been characterized by multiple, extreme precipitation events, including in the region encompassing the Study Area

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ____	No ✔	Depth (inches) ____
Water Table Present?	Yes ____	No ✔	Depth (inches) ____
Saturation Present (including capillary fringe)?	Yes ____	No ✔	Depth (inches) ____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
____ Water-stained leaves	____ Hydrological records	____ Direct observation of inundation
____ Evidence of aquatic fauna	____ Free water in a soil test hole	____ Drainage patterns
____ Iron deposits	____ Saturated soil	____ Drift lines
____ Algal mats or crusts	____ Water marks	____ Scoured areas
____ Oxidized rhizospheres/pore linings	____ Moss trim lines	____ Sediment deposits
____ Thin muck surfaces	____ Presence of reduced iron	____ Surface soil cracks
____ Plants with air-filled tissue (aerenchyma)	____ Woody plants with adventitious roots	____ Sparsely vegetated concave surface
____ Plants with polymorphic leaves	____ Trees with shallow root systems	____ Microtopographic relief
____ Plants with floating leaves	____ Woody plants with enlarged lenticels	____ Geographic position (depression, toe of slope, fringing lowland
____ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

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Form Revised July 2023

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30' radius

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. yellow birch	Betula allaghaniensis	FAC	30.0	Yes	Yes
2. gray birch	Betula populifolia	FAC	7.0	No	
3. black cherry	Prunus serotina	FACU	7.0	No	
4. northern red oak	Quercus rubra	FACU	7.0	No	
5.					
6.					
7.					
8.					
9.					

51.0 = Total Cover

Shrub/Sapling Stratum Plot size 15' radius

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. witch-hazel	Hammamelis virginiana	FACU	25.0	Yes	No
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

25.0 = Total Cover

Herb Stratum Plot size 5' radius

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Canada mayflower	Maianthemum canadense	FACU	11.0	Yes	No
2. false solomon's seal	Maianthemum racemosum	UPL	3.0	Yes	No
3. starflower	Lysimachia borealis	FAC	1.0	No	
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

15.0 = Total Cover

VEGETATION – continued.

Woody Vine Stratum	Plot size 30' radius				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
		0.0	= Total Cover		

Rapid Test:	Do all dominant species have an indicator status of OBL or FACW?			Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species? Yes ☐ No ☑
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	0	X 2	= 0.00
	FAC species	38	X 3	=114.00
	FACU species	50	X 4	=200.00
	UPL species	3	X 5	=15.00
	Column Totals	(A) 91		(B)329
	Prevalence Index	B/A = 3.62		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☑
Wetland vegetation criterion met?	**Yes** ☐ **No** ☑			

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-6	10YR 3/3						loamy/clayey	(fine sandy loam)
6-14	10YR 5/6						loamey/clayey	(fine sandy loam)
refusal @ 14"								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
____Histosol (A1)	____ Polyvalue Below Surface (S8)	____2 cm Muck (A10)
____Histic Epipedon (A2)	____ Thin Dark Surface (S9)	____ 5 cm Mucky Peat or Peat (S3)
____Black Histic (A3)	____ Loamy Gleyed Matrix (F2)	____ Iron-Manganese Masses (F12)
____Hydrogen Sulfide (A4)	____ Depleted Matrix (F3)	____ Mesic Spodic (A17)
____Stratified Layers (A5)	____ Redox Dark Surface (F6)	____ Red Parent Material (F21)
____Depleted Below Dark Surface (A11)	____ Depleted Dark Surface (F7)	____ Very Shallow Dark Surface (F22)
____Thick Dark Surface (A12)	____ Redox Depressions (F8)	
____Sandy Mucky Mineral (S1)		
____Sandy Gleyed Matrix (S4)		
____Sandy Redox (S5)		____ Other (Include Explanation in Remarks)
____Stripped Matrix (S6)		
____Dark Surface (S7)		

Restrictive Layer (if observed) Type: stones Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ____ **No** ✔

Form Revised July 2023

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: 358 Coldbrook Road City/Town: Oakham Sampling Date: 7/21/23

Applicant/Owner: Rhynland/ZOVL Properties, LLC Sampling Point or Zone: WET @ Flag W1-102

Investigator(s): David Cameron & Dan White, Epsilon Latitude / Longitude: ____

Soil Map Unit Name: Woodbridge-Paxton Association, 3-15% slopes, extremely stony NWI or DEP Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☐ No ☑ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? (If yes, explain in Remarks)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes ☑ No ☐	**Is the Sampled Area within a Wetland?**	**Yes** ☑ **No** ☐
Hydric Soils criterion met?	Yes ☑ No ☐		
Wetlands hydrology present?	Yes ☑ No ☐		

Remarks, Photo Details, Flagging, etc.:
The month of July, 2023 has been characterized by multiple, extreme precipitation events, including in the region encompassing the Study Area

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes ☑	No ☐	Depth (inches) 12.00
Water Table Present?	Yes ☑	No ☐	Depth (inches) 5.00
Saturation Present (including capillary fringe)?	Yes ☑	No ☐	Depth (inches) 5.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
☑ Water-stained leaves	☐ Hydrological records	☑ Direct observation of inundation
☐ Evidence of aquatic fauna	☑ Free water in a soil test hole	☑ Drainage patterns
☐ Iron deposits	☑ Saturated soil	☐ Drift lines
☐ Algal mats or crusts	☐ Water marks	☐ Scoured areas
☐ Oxidized rhizospheres/pore linings	☐ Moss trim lines	☐ Sediment deposits
☐ Thin muck surfaces	☑ Presence of reduced iron	☐ Surface soil cracks
☐ Plants with air-filled tissue (aerenchyma)	☐ Woody plants with adventitious roots	☑ Sparsely vegetated concave surface
☐ Plants with polymorphic leaves	☑ Trees with shallow root systems	☑ Microtopographic relief
☐ Plants with floating leaves	☐ Woody plants with enlarged lenticels	☑ Geographic position (depression, toe of slope, fringing lowland
☐ Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):
(Data point is immediately adjacent to pool with ~ 12 inches of standing water).

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Form Revised July 2023

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30' radius

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. yellow birch	Betula allaghaniensis	FAC	63.0	Yes	Yes
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

63.0 = Total Cover

Shrub/Sapling Stratum Plot size 15' radius

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. common winterberry	Ilex verticillata	FACW	3.0	Yes	Yes
2. yellow birch	Betula allaghaniensis	FAC	3.0	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

6.0 = Total Cover

Herb Stratum Plot size 5' radius

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Canada mayflower	Maianthemum canadense	FACU	10.5	Yes	No
2. false solomon's seal	Maianthemum racemosum	UPL	3.0	No	
3. starflower	Lysimachia borealis	FAC	3.0	No	
4. jack-in-the-pulpit	Arisaema triphyllum	FAC	3.0	No	
5. sensitive fern	Onoclea sensibilis	FACW	10.5	Yes	Yes
6. Eastern poison ivy	Toxicodendron radicans	FAC	3.0	No	
7.					
8.					
9.					
10.					
11.					
12.					

33.0 = Total Cover

VEGETATION – continued.

Woody Vine Stratum	Plot size 30' radius				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. fox grape	Vitis labrusca	FACU	10.5	Yes	No
2.					
3.					
4.					
		10.5 = Total Cover			

Rapid Test:	Do all dominant species have an indicator status of OBL or FACW?			Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species? Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	=0.00
	FACU species		X 4	=0.00
	UPL species		X 5	=0.00
	Column Totals	(A) 0		(B)0
	Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?	**Yes** ☑ **No** ☐			

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Location[2]	Texture	Remarks
0-6	10YR 3/2						loamy/clayey	(fine sandy loam)
6-12+	10YR 5/2	80.00	10YR 5/4	20.00	C	M	loamey/clayey	(fine sandy loam)

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
____Histosol (A1)	____ Polyvalue Below Surface (S8)	____2 cm Muck (A10)
____Histic Epipedon (A2)	____ Thin Dark Surface (S9)	____ 5 cm Mucky Peat or Peat (S3)
____Black Histic (A3)	____ Loamy Gleyed Matrix (F2)	____ Iron-Manganese Masses (F12)
____Hydrogen Sulfide (A4)	____ Depleted Matrix (F3)	____ Mesic Spodic (A17)
____Stratified Layers (A5)	____ Redox Dark Surface (F6)	____ Red Parent Material (F21)
✔ Depleted Below Dark Surface (A11)	____ Depleted Dark Surface (F7)	____ Very Shallow Dark Surface (F22)
____Thick Dark Surface (A12)	____ Redox Depressions (F8)	
____Sandy Mucky Mineral (S1)		
____Sandy Gleyed Matrix (S4)		
____Sandy Redox (S5)		____ Other (Include Explanation in Remarks)
____Stripped Matrix (S6)		
____Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

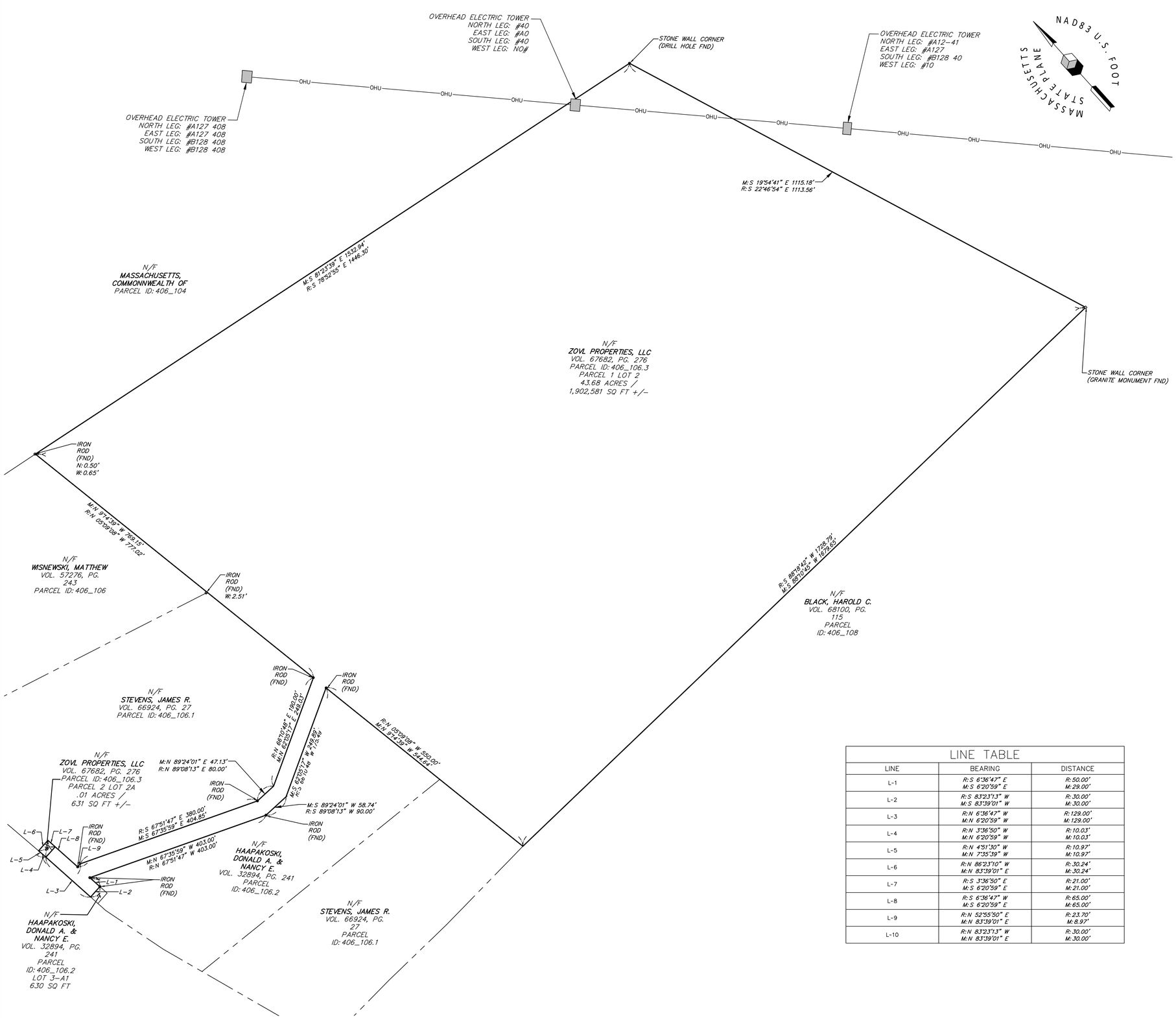
Remarks:

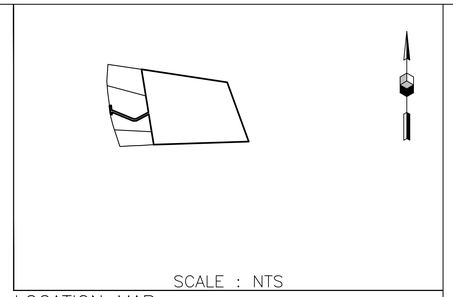
Hydric Soils criterion met? **Yes** ✔ **No** ____

Form Revised July 2023

Attachment F

Site Plans





LOCATION MAP

LEGEND

- PROPERTY LINE
- EXISTING CONDITIONS AREA
- ABUTTER LINE
- MONUMENT FOUND
- DRILL HOLE/IRON ROD FOUND
- STONE WALL
- WETLANDS
- WETLANDS 100' BUFFER ZONE
- TREELINE
- CONTOURS
- SPOT GRADE
- OVERHEAD UTILITY
- WETLAND FLAG
- ELECTRIC TOWER
- WETLANDS

LINE TABLE

LINE	BEARING	DISTANCE
L-1	R: S 6°36'47" E M: S 6°20'59" E	R: 50.00' M: 29.00'
L-2	R: S 83°23'13" W M: S 83°39'01" W	R: 30.00' M: 30.00'
L-3	R: N 6°36'47" W M: N 6°20'59" W	R: 129.00' M: 129.00'
L-4	R: N 3°36'50" W M: N 6°20'59" W	R: 10.03' M: 10.03'
L-5	R: N 4°51'30" W M: N 7°35'39" W	R: 10.97' M: 10.97'
L-6	R: N 86°23'10" W M: N 83°39'01" E	R: 30.24' M: 30.24'
L-7	R: S 3°36'50" E M: S 6°20'59" E	R: 21.00' M: 21.00'
L-8	R: S 6°36'47" W M: S 6°20'59" E	R: 65.00' M: 65.00'
L-9	R: N 52°55'50" E M: N 83°39'01" E	R: 23.70' M: 8.97'
L-10	R: N 83°23'13" W M: N 83°39'01" E	R: 30.00' M: 30.00'

GENERAL NOTES:

1. THIS PLAN IS THE RESULT OF AN ON-THE-GROUND FIELD SURVEY COMPLETED BY CORNERSTONE ENERGY SERVICES, INC. IN MAY 2024.
2. BEARINGS SHOWN HEREON ARE REFERENCED TO GRID NORTH, MASSACHUSETTS STATE PLANE, NAD83. ELEVATIONS ARE IN REFERENCE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) BASED ON DUAL FREQUENCY GPS OBSERVATIONS.
3. PROPERTY MAY BE SUBJECT TO RIGHTS AND EASEMENTS NOT SHOWN THAT MIGHT HAVE BEEN REVEALED BY A COMPLETE AND THOROUGH TITLE SEARCH.
4. UTILITY INFORMATION DEPICTED HEREON IS COMPILED USING PHYSICAL EVIDENCE LOCATED IN THE FIELD AT THE TIME OF THE SURVEY, AND IS A REPRESENTATION OF AVAILABLE SURFACE EVIDENCE ONLY, AND THEREFORE MAY NOT NECESSARILY DEPICT ALL EXISTING UTILITIES. CONTRACTORS AND/OR DESIGNERS NEED TO CONTACT DIG-SAFE SYSTEMS, INC, (1-888-DIG-SAFE) AND FIELD VERIFY EXISTING UTILITIES PRIOR TO ANY EXCAVATION.
5. REFERENCE IS MADE TO THE FOLLOWING DEEDS AND PLANS:
   5.1. DEED BOOK 67682 PAGE 276
   5.2. PLAN BOOK 575, PLAN 122 & PLAN BOOK 739 PLAN 61
6. THE FIGURES SHOWN ON PLAN BOOK 575 PLAN 122 DID NOT MATCH THE PHYSICAL EVIDENCE FOUND IN THE FIELD.

100 50 0 100 200
SCALE: 1" = 100'

REV:	BY:	DATE:	STATUS:
3	DML	09/26/24	VISUAL UPDATES FOR CLARITY
2	JEE	08/26/24	ADDITIONAL TOPOGRAPHIC FEATURES
1	AR	05/23/24	ADDITIONAL TOPOGRAPHIC FEATURES

THIS PLAN SHALL NOT BE MODIFIED WITHOUT WRITTEN PERMISSION. ANY ALTERATIONS, AUTHORIZED OR OTHERWISE, SHALL BE AT THE USER'S SOLE RISK.

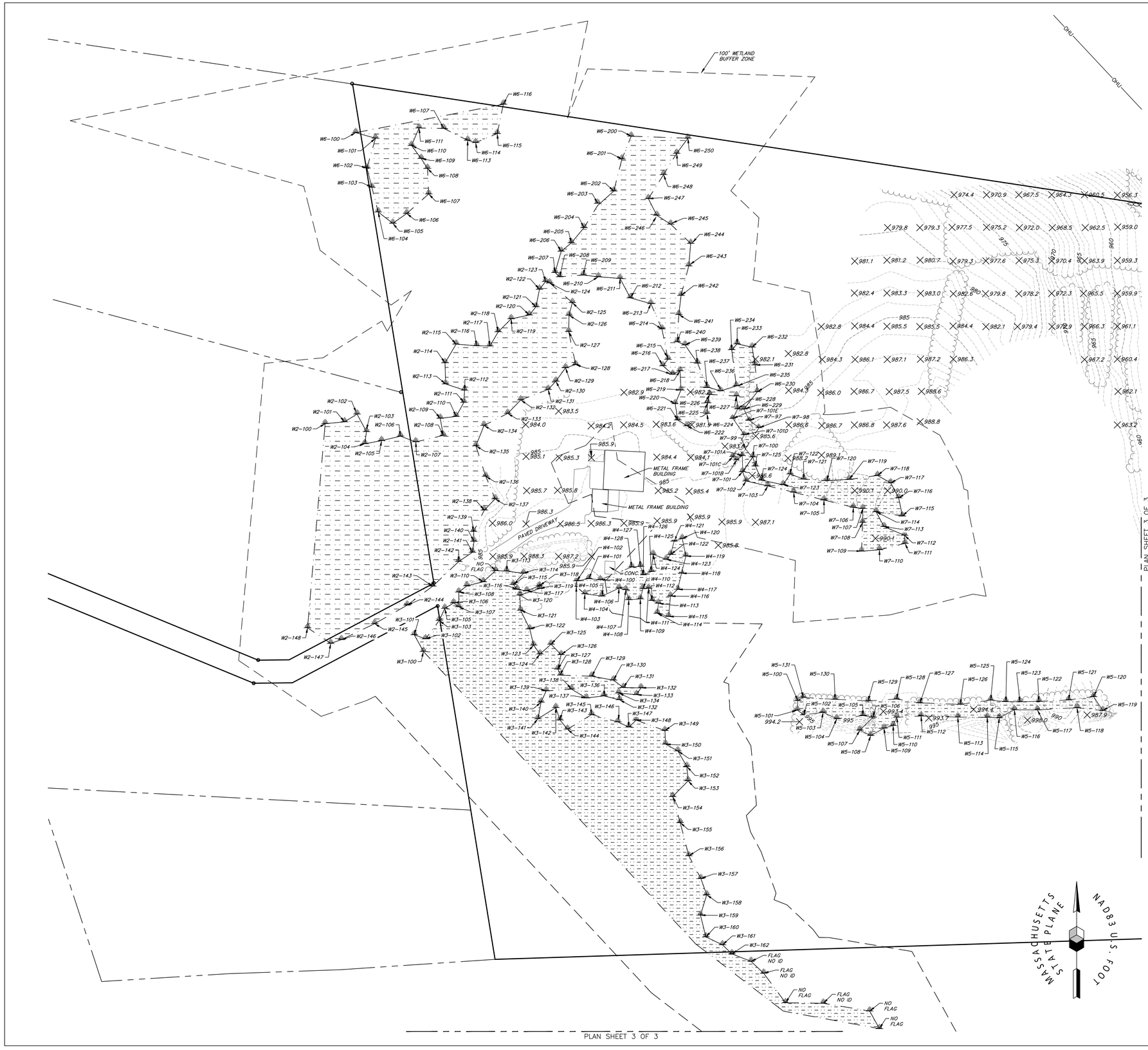
Cornerstone
111 CHINQUAPIN ROUND ROAD
SUITE 210
ANNAPOLIS, MD 21401
207-735-7343
FAX: 207-735-7343

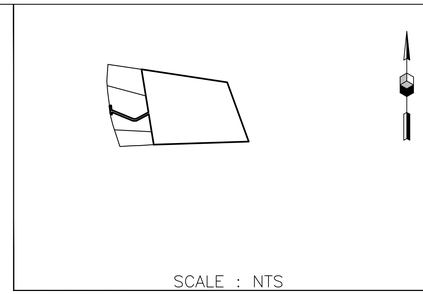
EXISTING CONDITIONS SURVEY
OF:
ZOVL PARCEL
358 Caldbrook Road
Oakham, MA 01068
FOR:
Rhynland Energy

RECORD OWNER:
ZOVL Properties, LLC

DRAWN	CHECKED
MA	DL
PROJECT NO.	DATE
23230.1	08/29/2023
SHEET SIZE	SCALE
24" x 36"	1" = 100'

SHEET 1 OF 3





LOCATION MAP

LEGEND

- PROPERTY LINE
- EXISTING CONDITIONS AREA
- ABUTTER LINE
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- STONE WALL
- WETLANDS
- WETLANDS 100' BUFFER ZONE
- TREELINE
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- SPOT GRADE
- OVERHEAD UTILITY
- WETLAND FLAG
- ELECTRIC TOWER
- WETLANDS

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6. THE FIGURES SHOWN ON PLAN BOOK 575 PLAN 122 DID NOT MATCH THE PHYSICAL EVIDENCE FOUND IN THE FIELD.

70 35.5 0 70 140
SCALE: 1" = 70'

REV:	BY:	DATE:	STATUS:
3	DML	09/26/24	VISUAL UPDATES FOR CLARITY
2	JEE	06/26/24	ADDITIONAL TOPOGRAPHIC FEATURES
1	JR	05/23/24	ADDITIONAL TOPOGRAPHIC FEATURES

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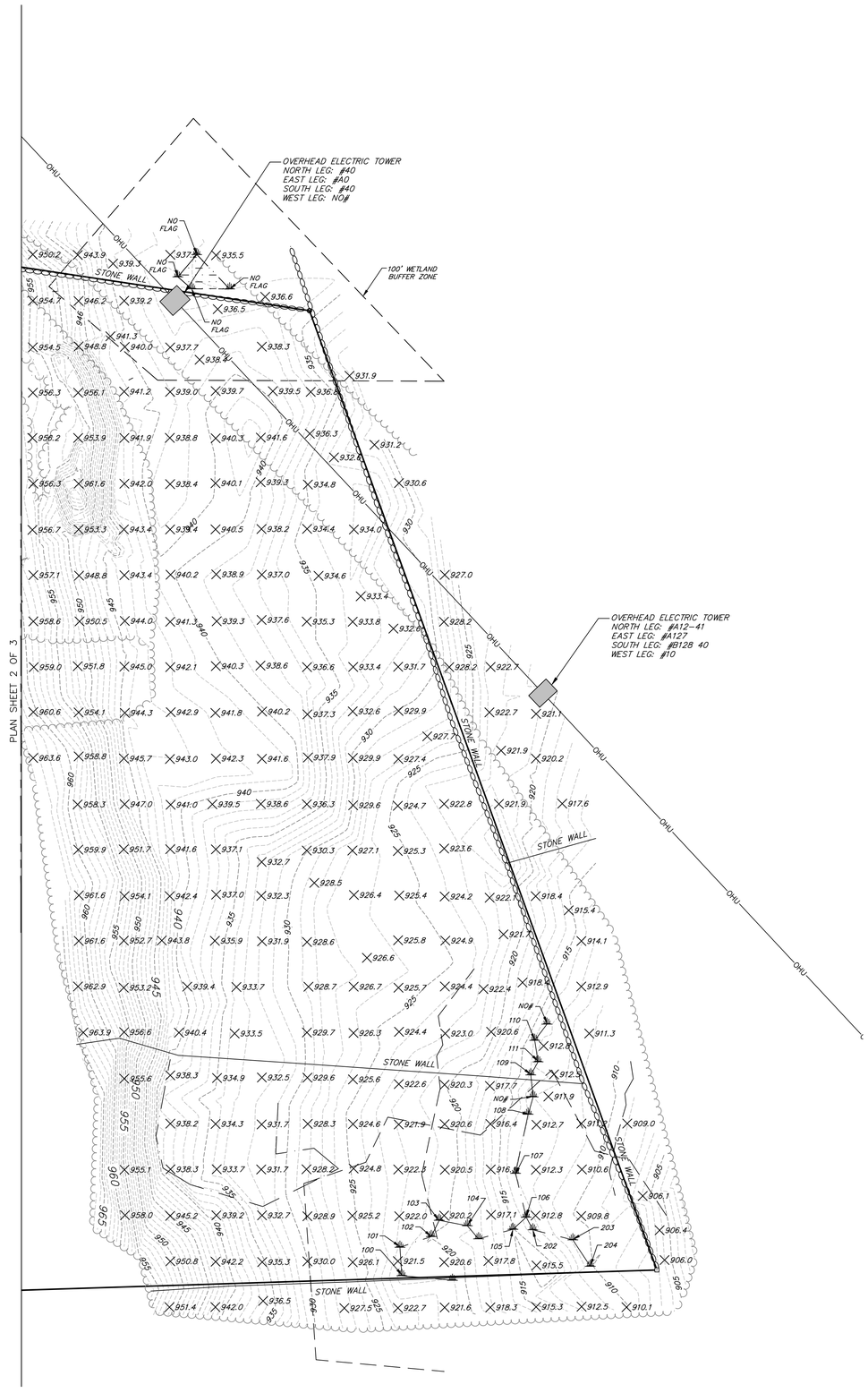
Cornerstone Energy Services
111 CHINQUAPIN ROUND ROAD
ANNAPOLIS, MD 21401
207-326-7340
FAX: 207-326-7343

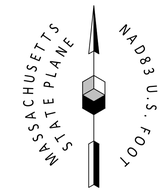
EXISTING CONDITIONS SURVEY
OF:
ZOVL PARCEL
358 Coldbrook Road
Oakham, MA 01068
FOR:
Rhynland Energy

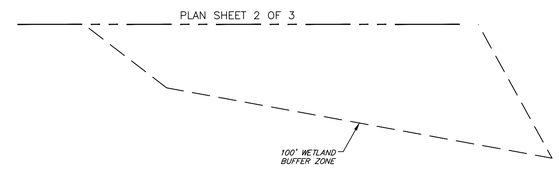
RECORD OWNER:
ZOVL Properties, LLC

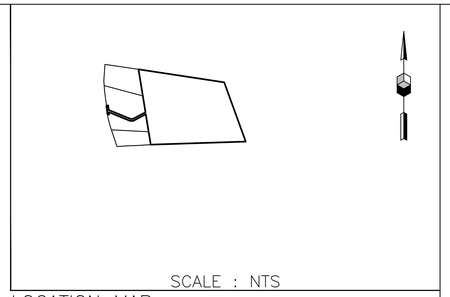
DRAWN	CHECKED
MA	DL
PROJECT NO.	DATE
23230.1	08/29/2023
SHEET SIZE	SCALE
24" x 36"	1" = 60'

SHEET 2 OF 3









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- SPOT GRADE
- OVERHEAD UTILITY
- WETLAND FLAG
- ELECTRIC TOWER
- WETLANDS

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70 35.5 0 70 140
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Cornerstone Energy Services
111 CHINQUAPIN ROUND ROAD
ANNAPOLIS, MD 21401
207-730-7340
FAX: 207-730-7343

RECORD OWNER:
ZOVL Properties, LLC

EXISTING CONDITIONS SURVEY
OF:
ZOVL PARCEL
358 Coldbrook Road
Oakham, MA 01068
FOR:
Rhynland Energy

DRAWN	CHECKED
MA	DL
PROJECT NO.	DATE
23230.1	08/29/2023
SHEET SIZE	SCALE
24" x 36"	1" = 60'

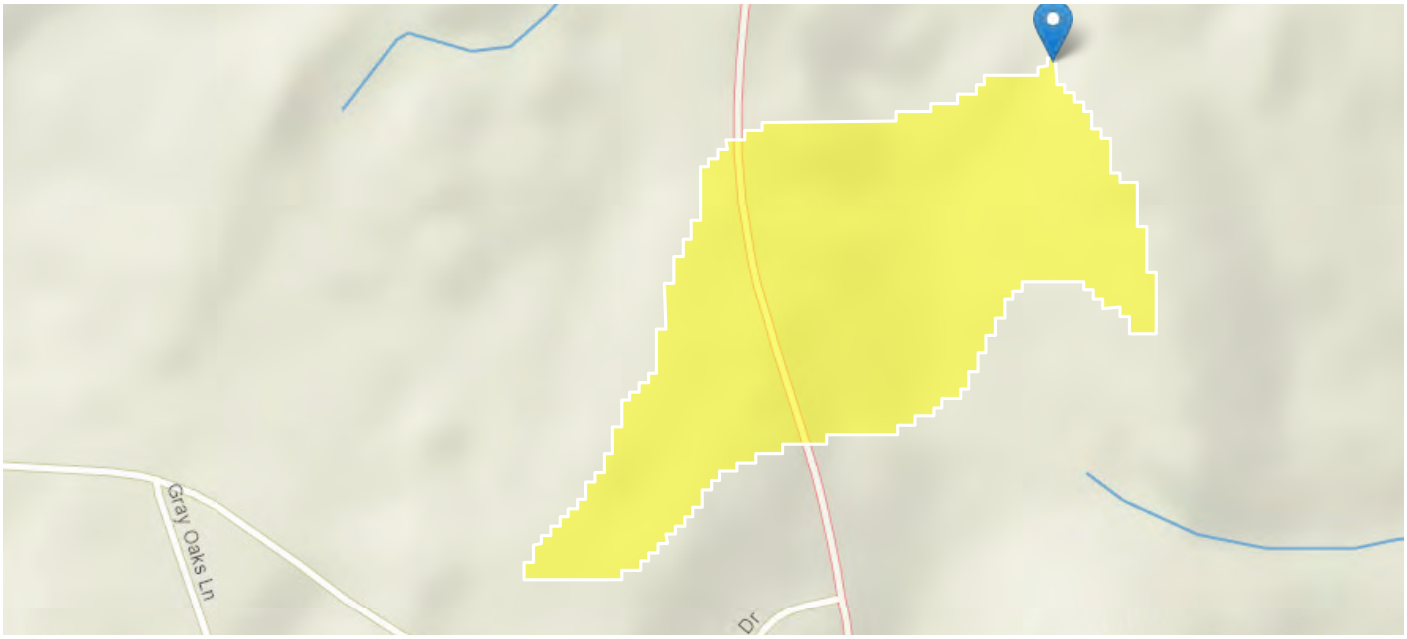
SHEET 3 OF 3

Attachment G

U.S.G.S. StreamStats Report

StreamStats Report: Coldbrook Road, Oakham, MA

Region ID: MA
Workspace ID: MA20240410173344565000
Clicked Point (Latitude, Longitude): 42.36402, -72.04245
Time: 2024-04-10 13:34:07 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
ACRSDFT	Area underlain by stratified drift	0	square miles
BSLDEM10M	Mean basin slope computed from 10 m DEM	6.363	percent
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.098	percent
CAT1ROADS	Length of interstates lmtd access highways and ramps for lmtd access highways, includes cloverleaf interchanges (USGS Ntl Transp Dataset)	0	miles
CAT2ROADS	Length of sec hwy or maj connecting roads; main arteries & hwys not lmtd access, usually in the US Hwy or State Hwy systems (USGS Ntl Transp Dataset)	0	miles
CAT3ROADS	Length of local connecting roads; roads that collect traffic from local roads & connect towns, subdivisions & neighborhoods (USGS Nat Transp Dataset)	0	miles
CAT4ROADS	Length of local roads; generally paved street, road, or byway that usually have single lane of traffic in each direction (USGS Ntnl Transp Dataset)	0.41	miles
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	155089.4	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	901388.2	meters

Parameter Code	Parameter Description	Value	Unit
CROSCOUNT1	Number of intersections between streams and roads, where the roads are interstate, limited access highway, or ramp (CAT1ROADS)	0	dimensionless
CROSCOUNT2	Number of intersections between streams and roads, where the roads are secondary highway or major connecting road (CAT2ROADS)	0	dimensionless
CROSCOUNT3	Number of intersections between streams and roads, where roads are local conecting roads (CAT3ROADS)	0	dimensionless
CROSCOUNT4	Number of intersections between streams and roads, where roads are local roads (CAT4ROADS)	0	dimensionless
CRSDFT	Percentage of area of coarse-grained stratified drift	0	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	252	feet per mi
DRFTPERSTR	Area of stratified drift per unit of stream length	-100000	square mile per mile
DRNAREA	Area that drains to a point on a stream	0.0705	square miles
ELEV	Mean Basin Elevation	1020	feet
FOREST	Percentage of area covered by forest	65.66	percent
LAKEAREA	Percentage of Lakes and Ponds	0	percent
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	22.1	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	9.6	percent
LFPLENGTH	Length of longest flow path	0.62	miles
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	1	dimensionless
MAXTEMPC	Mean annual maximum air temperature over basin area, in degrees Centigrade	13.2	degrees C
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	155315	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	901645	feet
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	0	percent
PRECPRIS00	Basin average mean annual precipitation for 1971 to 2000 from PRISM	47.7	inches
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	0	miles
WETLAND	Percentage of Wetlands	5.2	percent

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.19.4
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Attachment H

Isolated Land Subject to Flooding Memorandum

ARUP

Memorandum

To	Marc Bergeron, Epsilon Associates, Inc.
Date	June 22, 2024
Copies	Anna Beheshti, Arup Justin Roy, Arup Jonathan O'Hara, Rhynland Energy, LLC Gus Hadidi, Rhynland Energy, LLC
From	Derek Anderson, Arup
Subject	Isolated Land Subject to Flooding Determination ZOVL Site (Oakham, MA)

In support of the Abbreviated Notice of Resource Area Delineation (ANRAD) filing for 358 Coldbrook Road in Oakham, MA, Arup USA, Inc. (Arup) performed calculations to determine if three (3) topographic depressions within the property bounds qualify as Isolated Land Subject to Flooding (ILSF). Arup's analysis was conducted in accordance with the Massachusetts Wetlands Protection Act Regulations at 310 CMR 10.57 (2)(b). This memorandum summarizes our findings.

To determine whether an isolated depression qualifies ILSF, one must follow a three-step process. First, it must be determined that the depression is isolated from waterbodies without any discernible inlets or outlets. Next, verify that the depression experiences flooding up to a volume of 0.25 acre-foot with a minimum depth of 6-inches. Finally, if the depression meets those requirements – one must determine the ILSF elevation based on the extent of lateral flooding resulting from a 7-inch, 24-hour storm event.

The three (3) topographic depressions in question were delineated by Epsilon Associates, Inc. on 7/21/2023 and are noted with wetland flag series W7-100 through W7-123, W4-100 through W4-127, and W5-100 through W5-131. The topographic depression delineated by wetland flags W4-100 through W4-127 has a total storage volume of 0.097 acre-feet. The topographic depression delineated by wetland flags W5-100 through W5-131 has a total storage volume of 0.041 acre-feet. The topographic depression delineated by wetland flags W7-100 through W7-123 does not have a maximum depth of at least 6-inches.

Based on the outcomes noted above, Arup has determined that none of the three (3) topographic depressions qualify as ILSF. Supporting calculations and sketches are provided as attachments to this memorandum.

ZOVL
Coldbrook Road
Oakham, MA
Arup Job Number: 296229
June 22, 2024

ILSF Determination

Wetland Flag Sequence	Is this area isolated?				Can this area confine a volume of water equal to or greater than 0.25 acre-feet and to an average depth of 6 inches?		
	Inlets	Outlets	Connection to 100-yr Floodplain	Outcome	Volume >= 0.25 acre-ft	Depth >= 6 inches	Outcome
W4-100 - W4-128	No	No	No	Yes	No	-	No
W5-100 - W5-131	No	No	No	Yes	No	-	No
W7-100 - W7-125	No	No	No	Yes	-	No	No

ILSF Sizing Calculations

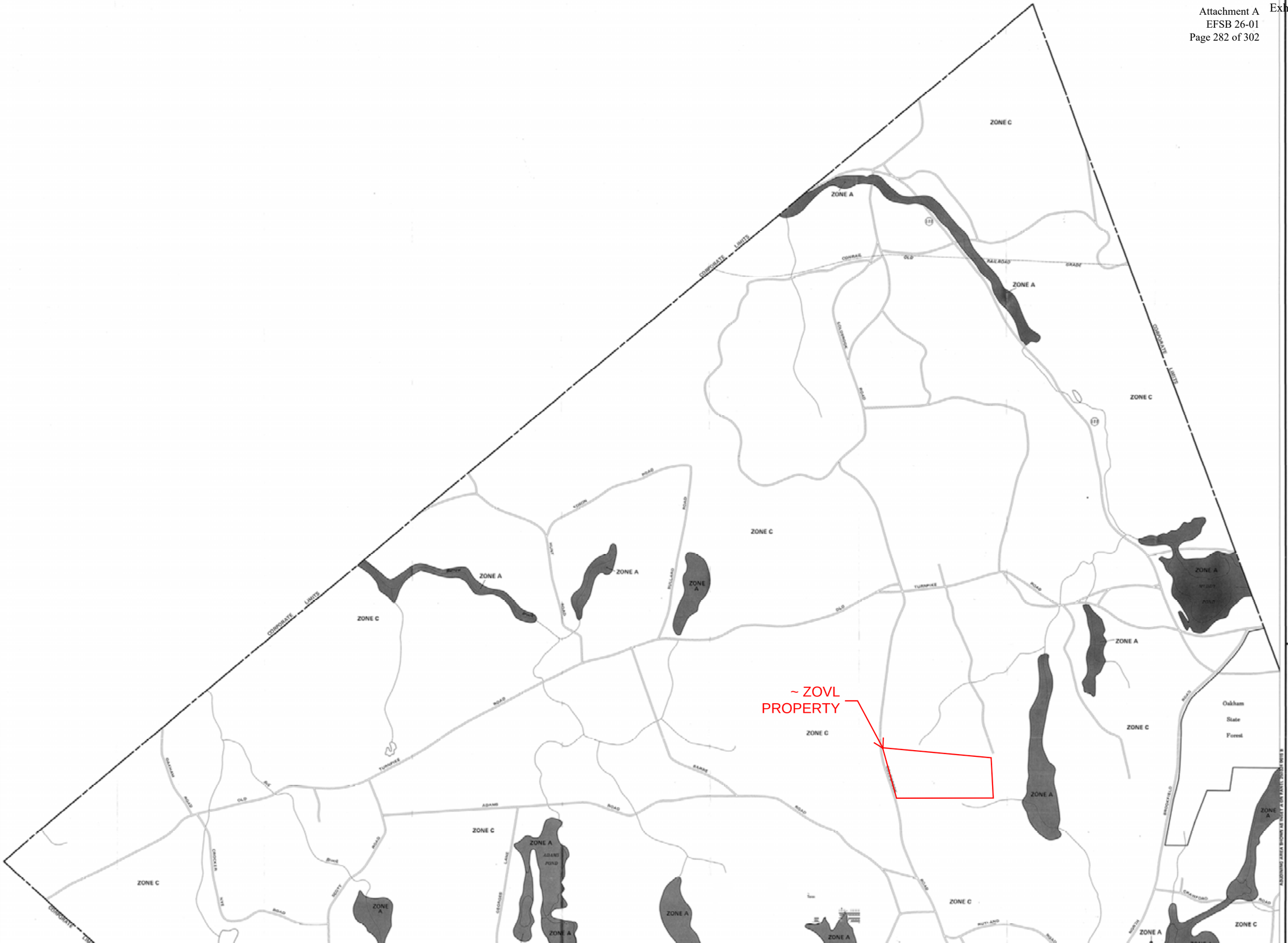
Wetland Flags W4-100 - W4-128

Elevation	Area at Elevation (sf)	Increment (ft)	Cumulative Volume (cf)	Cumulative Volume (ac-ft)
984.1	0			
		0.9		
985	821		369.45	0.0085
		0.5		
985.5	14533		4207.95	0.0966

Wetland Flags W5-100 - W5-131

Elevation	Area at Elevation (sf)	Increment (ft)	Cumulative Volume (cf)	Cumulative Volume (ac-ft)
983.1	0			
		0.9		
984	3985		1793.25	0.0412

Prepared By:
Arup
60 State Street, 10th Floor
Boston, MA 02109
(617) 864-2987



Zone Designations*

100-Year Flood Boundary

Zone D Boundary

Base Flood Elevation Line With Elevation In Feet**

Base Flood Elevation in Feet Where Uniform Within Zone**

(EL 987)

Elevation Reference Mark

RM7X

River Mile

•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard area (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
AUGUST 2, 1974
FLOOD HAZARD BOUNDARY MAP REVISIONS:
AUGUST 20, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
APRIL 3, 1984
FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE
800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

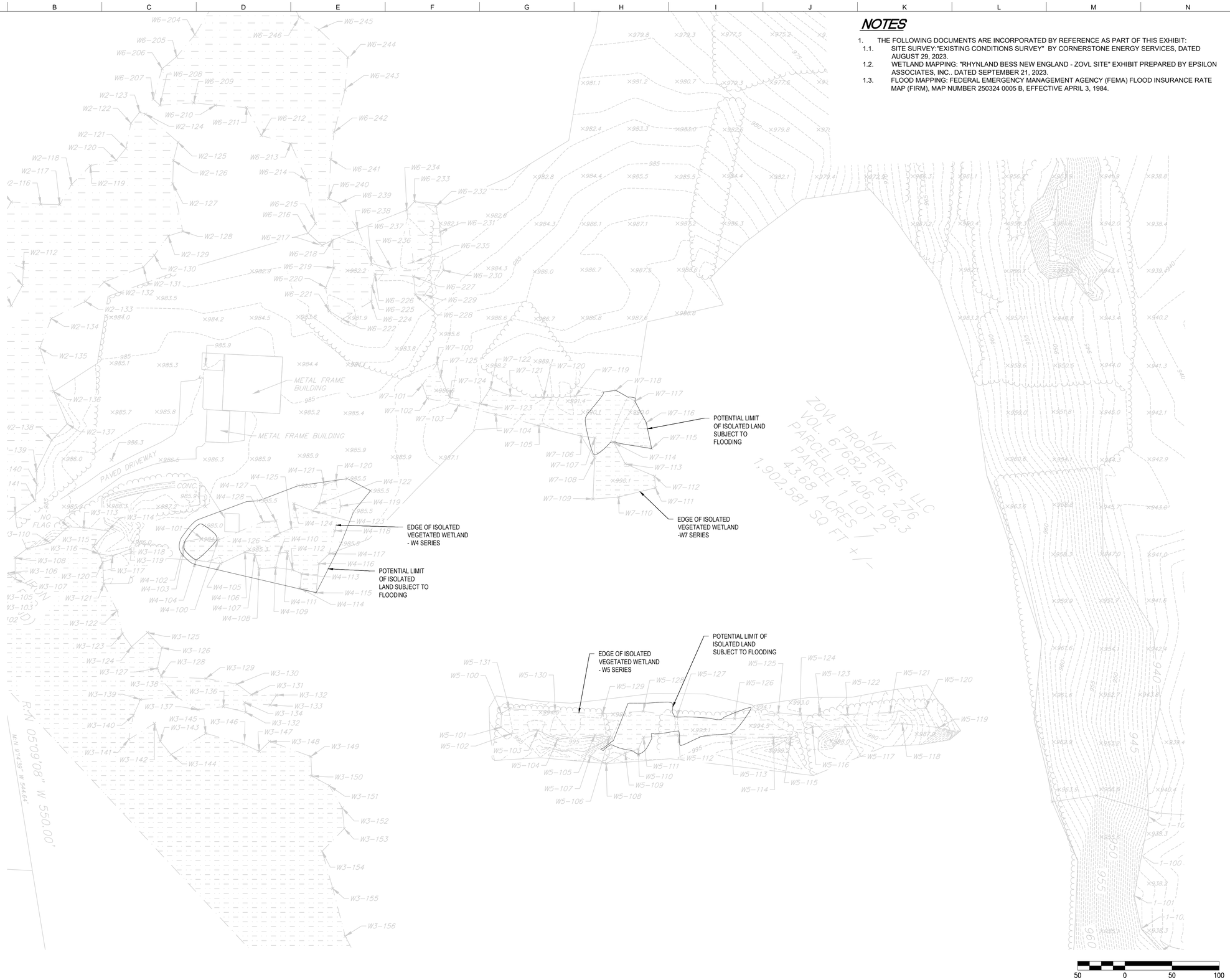
TOWN OF
OAKHAM,
MASSACHUSETTS
WORCESTER COUNTY

PANEL 5 OF 15
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
250324 0005 B

EFFECTIVE DATE:
APRIL 3, 1984

PLOT BY: Anna Behesht PLOT TIME: 6/20/2024 1:00 PM



NOTES

1. THE FOLLOWING DOCUMENTS ARE INCORPORATED BY REFERENCE AS PART OF THIS EXHIBIT:
   - 1.1. SITE SURVEY:"EXISTING CONDITIONS SURVEY" BY CORNERSTONE ENERGY SERVICES, DATED AUGUST 29, 2023.
   - 1.2. WETLAND MAPPING: "RHYNLAND BESS NEW ENGLAND - ZOVL SITE" EXHIBIT PREPARED BY EPSILON ASSOCIATES, INC.. DATED SEPTEMBER 21, 2023.
   - 1.3. FLOOD MAPPING: FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBER 250324 0005 B, EFFECTIVE APRIL 3, 1984.

Issue	Date	Revisions

ARUP

60 State St, Boston, MA
02109, United States

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Client
MORAGA STORAGE LLC

Job Title
MORAGA STORAGE
ZOVL - Oakham, MA

Seal

NOT FOR CONSTRUCTION

Drawing Title
ISOLATED LAND SUBJECT TO FLOODING EXHIBIT

Scale 1" = 50'

File Name ZOVL - ILSF.DWG

Drawing Status
NOT FOR CONSTRUCTION

Job No	Drawing No	Issue
289761-00	EX-1	0

Appendix M: Site Development Drawings

PLOT TIME: 3/14/2025 10:18 AM

PLOT BY: Reese Smith

GENERAL NOTES

1. THE FOLLOWING DOCUMENTS ARE INCORPORATED BY REFERENCE AS PART OF THIS SITE PLAN:
   - 1.1. TOPOGRAPHIC SURVEY: "EXISTING CONDITIONS SURVEY" BY CORNERSTONE ENERGY SERVICES, DATED NOVEMBER 6, 2024.
   - 1.2. FLOOD MAPPING: FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBERS 2503240005B, EFFECTIVE APRIL 3, 1984.
   - 1.3. WETLAND DELINEATION: PER FIELD FLAGGING BY EPSILON ON JULY 21, 2023 AND MARCH 26, 2024 AND APPROVED BY THE OAKHAM CONSERVATION COMMISSION THROUGH AN ORDER OF RESOURCE AREA DELINEATION (ORAD) IN DECEMBER 2024.
   - 1.4. GEOTECHNICAL: GEOTECHNICAL INVESTIGATION COMPLETED DEC 23, 2024. ADDITIONAL GEOTECHNICAL INFORMATION MAY BE REQUIRED.
   - 1.5. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST VERIFY THAT THEY HAVE THE LATEST EDITION OF THE DOCUMENTS REFERENCED ABOVE. THIS IS CONTRACTOR'S RESPONSIBILITY.
2. VERTICAL ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1998 (NAVD 88) AND HORIZONTAL LOCATIONS REFER TO THE NORTH AMERICAN DATUM OF 1983 (NAVD 83).
3. ARUP HAS NOT VERIFIED EXISTING CONDITIONS INFORMATION INDICATED HEREON. LOCATIONS OF EXISTING UNDERGROUND UTILITIES/OBSTRUCTIONS/STRUCTURES/SYSTEMS SHOWN HEREON ARE APPROXIMATE ONLY. ADDITIONAL UTILITIES/OBSTRUCTIONS/STRUCTURES/SYSTEMS NOT INDICATED HERON MAY EXIST. EXISTING UTILITY, PROPERTY LINE, AND ENVIRONMENTAL RESOURCE AREA INFORMATION INDICATED ON THIS PLAN SHOULD BE CONSIDERED APPROXIMATE.
4. NO GUARANTEE IS IMPLIED OR INTENDED AS TO THE ACCURACY, LOCATION, OR THAT ALL UTILITIES AND/OR SUBSURFACE STRUCTURES ARE SHOWN. CONTRACTOR SHALL VERIFY SIZE, LOCATION, AND ELEVATIONS OF UTILITIES AND STRUCTURES AS REQUIRED PRIOR TO THE START OF ANY CONSTRUCTION.
5. EXISTING UTILITIES TO REMAIN AND BE PROTECTED DURING CONSTRUCTION UNLESS OTHERWISE NOTED. CONTRACTOR TO NOTIFY ENGINEER IN WRITING ABOUT ANY CONFLICTS.
6. ALL DIMENSIONS SHOWN ON THE PLANS MUST BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR MUST NOTIFY ENGINEER, IN WRITING, IF ANY CONFLICTS, DISCREPANCIES, OR AMBIGUITIES EXIST PRIOR TO PROCEEDING WITH CONSTRUCTION. NO EXTRA COMPENSATION WILL BE PAID TO THE CONTRACTOR FOR WORK WHICH HAS TO BE REDONE OR REPAIRED DUE TO DIMENSIONS OR GRADES SHOWN INCORRECTLY ON THESE PLANS PRIOR TO CONTRACTOR GIVING ENGINEER WRITTEN NOTIFICATION OF SAME AND ENGINEER, THEREAFTER, PROVIDING CONTRACTOR WITH WRITTEN AUTHORIZATION TO PROCEED WITH SUCH ADDITIONAL WORK.
7. THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING WHEN SHORING IS REQUIRED AND FOR INSTALLING ALL SHORING REQUIRED DURING EXCAVATION (TO BE PERFORMED IN ACCORDANCE WITH CURRENT OSHA STANDARDS) AND ANY ADDITIONAL PRECAUTIONS TO BE TAKEN TO ASSURE THE STABILITY OF ADJACENT, NEARBY AND CONTIGUOUS STRUCTURES AND PROPERTIES.
8. THE ENGINEER IS NOT RESPONSIBLE FOR CONSTRUCTION METHODS, MEANS, TECHNIQUES OR PROCEDURES, GENERALLY OR FOR THE CONSTRUCTION MEANS, METHODS, TECHNIQUES OR PROCEDURES FOR COMPLETION OF THE WORK DEPICTED BOTH ON THESE PLANS, AND FOR ANY CONFLICTS/SCOPE REVISIONS WHICH RESULT FROM SAME. CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE METHODS/MEANS FOR COMPLETION OF THE WORK PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
9. SAFETY MEASURES, CONSTRUCTION METHODS AND CONTROL OF WORK SHALL BE RESPONSIBILITY OF CONTRACTOR. THE ENGINEER OF RECORD IS NOT RESPONSIBLE FOR JOB SITE SAFETY. THE ENGINEER OF RECORD HAS NOT BEEN RETAINED TO PERFORM OR BE RESPONSIBLE FOR JOB SITE SAFETY, SAME BEING WHOLLY OUTSIDE OF ENGINEER'S SERVICES AS RELATED TO THE PROJECT. THE ENGINEER OF RECORD IS NOT RESPONSIBLE TO IDENTIFY OR REPORT ANY JOB SITE SAFETY ISSUES, AT ANY TIME.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR AND/OR REPLACEMENT OF ANY EXISTING IMPROVEMENTS DAMAGED DURING DEMOLITION THAT ARE NOT DESIGNATED FOR DEMOLITION AND/OR REMOVAL ON THE CONTRACT DOCUMENTS. DAMAGED IMPROVEMENTS SHALL BE REPAIRED TO THE SATISFACTION OF THEIR RESPECTIVE OWNERS.
11. ALL DISTURBED AREAS SHALL BE RESTORED TO THEIR PRE-CONSTRUCTION CONDITIONS UPON COMPLETION OF DEMOLITION WORK, UNLESS OTHERWISE NOTED ON THE CONTRACT DOCUMENTS.
12. ANY DEMOLITION NECESSITATED BY FIELD CONDITIONS NOT COVERED ON THE CONTRACT DOCUMENTS SHALL BE REVIEWED AND APPROVED BY THE OWNER'S REPRESENTATIVE PRIOR TO IMPLEMENTATION.
13. REFER TO ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
14. GENERAL CONTRACTOR SHALL COORDINATE ALL WORK WITH ALL TRADES.
15. AS CONTAINED IN THESE DRAWINGS AND ASSOCIATED APPLICATION DOCUMENTS PREPARED BY THE SIGNATORY PROFESSIONAL ENGINEER, THE USE OF THE WORDS CERTIFY OR CERTIFICATION CONSTITUTES AN EXPRESSION OF "PROFESSIONAL OPINION" REGARDING THE INFORMATION WHICH IS THE SUBJECT OF THE UNDERSIGNED PROFESSIONAL'S KNOWLEDGE OR BELIEF AND IN ACCORDANCE WITH COMMON ACCEPTED PROCEDURE CONSISTENT WITH THE APPLICABLE STANDARDS OF PRACTICE, AND DOES NOT CONSTITUTE A WARRANTY OR GUARANTEE, EITHER EXPRESSED OR IMPLIED.

REGULATORY NOTES

1. CONTRACTOR SHALL CONTACT DIG-SAFE FOR UNDERGROUND UTILITY MARKING AT 1-800-344-7233 AT LEAST 72 HOURS PRIOR TO COMMENCEMENT OF ANY WORK.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY LOCATING AND COORDINATING ANY ON-SITE ACTIVITY WITH DIG-SAFE AND THE APPROPRIATE UTILITY COMPANY AND MAINTAINING EXISTING UTILITY SYSTEM SERVICE.
   - 2.1. CONTRACTOR SHALL MAKE THEMSELVES AWARE OF AND SHALL COMPLY WITH ALL CONSTRUCTION REQUIREMENTS, CONDITIONS, AND LIMITATIONS IMPOSED REGULATORY REQUIREMENTS, PERMITS, AND APPROVALS OF REGULATORY AUTHORITIES AND UTILITY COMPANIES PRIOR TO COMMENCEMENT OF ANY WORK. CONTRACTOR SHALL COORDINATE AND OBTAIN ALL CONSTRUCTION PERMITS, APPROVALS, INSPECTIONS, AND/OR CERTIFICATIONS REQUIRED BY REGULATORY AUTHORITIES.
3. DISPOSE OF ALL CONSTRUCTION WASTE IN ACCORDANCE WITH ALL APPLICABLE LAWS AND REGULATIONS.
4. ANY DISCHARGE FROM DEWATERING OPERATIONS, SHOULD SUCH OPERATIONS PROVE NECESSARY, SHALL TAKE PLACE OUTSIDE THE 100-FOOT BUFFER ZONE TO WETLAND RESOURCE AREAS AND WITHIN THE LIMIT OF WORK. DISCHARGE FROM SEDIMENTATION BASINS SHALL BE FILTERED THROUGH SILT SACKS.
5. NO MATERIALS, INCLUDING BUT NOT LIMITED TO GRAVEL, TOPSOIL, BOULDERS, BRUSH, LOGS, STUMPS, SLASH, ASPHALT, AND CONSTRUCTION SUPPLIES OR DEBRIS, SHALL BE STORED OR BURIED WITHIN THE 100-FT BORDERING VEGETATED WETLAND BUFFER ZONE, OR THE FEMA 100-YEAR FLOOD AREA. ALL SUCH MATERIALS SHALL BE REMOVED FROM THE SITE PRIOR TO COMPLETION OF THE PROJECT, EXCEPT AS APPROVED BY THE OWNER'S REPRESENTATIVE.
6. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN ACCORDANCE WITH THE MASSACHUSETTS GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.
7. THESE DRAWINGS ARE ISSUED FOR PERMIT-LEVEL REVIEW ONLY. THEY ARE NOT INTENDED FOR CONSTRUCTION PURPOSES. ANY USE OF THESE DRAWINGS FOR CONSTRUCTION IS AT THE USER'S OWN RISK. THE DESIGN IS SUBJECT TO FURTHER DEVELOPMENT, REVIEW, AND APPROVAL BEFORE BEING CONSIDERED FINAL FOR CONSTRUCTION.

SHEET INDEX

C0-00	GENERAL NOTES
C1-01	CIVIL EXISTING CONDITIONS SHEET
C2-01	CIVIL SITE PLAN
C4-01	CIVIL GRADING AND DRAINAGE SHEET
C4-02	CIVIL GRADING AND DRAINAGE SHEET
C6-01	SOIL EROSION AND SEDIMENTATION CONTROL SHEET
C8-01	CIVIL DETAIL SHEET 1
C8-02	CIVIL DETAIL SHEET 2
C8-03	CIVIL DETAIL SHEET 3
C8-04	CIVIL DETAIL SHEET 4
C8-05	CIVIL DETAIL SHEET 5
C8-06	CIVIL DETAIL SHEET 6
C8-07	CIVIL DETAIL SHEET 7
C8-08	CIVIL DETAIL SHEET 8
E500	SUBSTATION EQUIPMENT GENERAL ARRANGEMENT
E501	SUBSTATION EQUIPMENT SECTION A-A VIEW

EXISTING WORKS LEGEND

- PROPERTY LINE
- EXISTING CONDITIONS AREA
- ABUTTER LINE
- MONUMENT FOUND
- DRILL HOLE/IRON ROD FOUND
- STONE WALL
- WETLANDS
- WETLANDS 100' BUFFER ZONE
- TREELINE
- CONTOURS
- SPOT GRADE
- OVERHEAD UTILITY
- WETLAND FLAG
- ELECTRIC TOWER
- EXISTING ACCESS ROAD

PROPOSED WORKS LEGEND

- PROPERTY LINE
- LIMIT OF DISTURBANCE
- FENCE LINE
- MAJOR CONTOUR
- MINOR CONTOUR
- NOISE WALL/RETAINING WALL
- STORM PIPE
- CATCH BASIN
- DOUBLE CATCH BASIN
- DRAIN MANHOLE/WATER QUALITY UNIT
- PROPOSED ASPHALT ROAD
- GRAVEL
- SILT FENCE
- CONSTRUCTION ENTRANCE
- SLOPE STABILIZATION
- INLET PROTECTION

ABBREVIATIONS

APPROX	APPROXIMATE/APPROXIMATELY
LF	LINEAR FEET
CB	CATCH BASIN
MH	MANHOLE
INV	INVERT
HDS	HYDRODYNAMIC SEPARATOR
HDPE	HIGH DENSITY POLYETHYLENE
JFV	JELLYFISH FILTRATION VAULT
B/BASIN	BOTTOM OF BASIN
T/BASIN	TOP OF BASIN
BVW	BORDERING VEGETATED WETLAND

Issue	Date	Revisions
A	9/22/23	DRAFT ISSUED FOR REVIEW
B	9/28/23	CONSTRAINT MAPPING
C	8/21/24	10% DESIGN SUBMISSION
D	9/13/24	30% DESIGN DRAFT
E	11/01/24	ISSUED FOR ISO-NE SIS APPLICATION
F	02/28/2025	30% DESIGN
G	03/18/2025	30% DESIGN REVISION

ARUP

60 State Street , Boston, MA
02109, United States

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Client
MORAGA STORAGE LLC

Job Title
MORAGA STORAGE
ZOVL - Oakham, MA

Seal

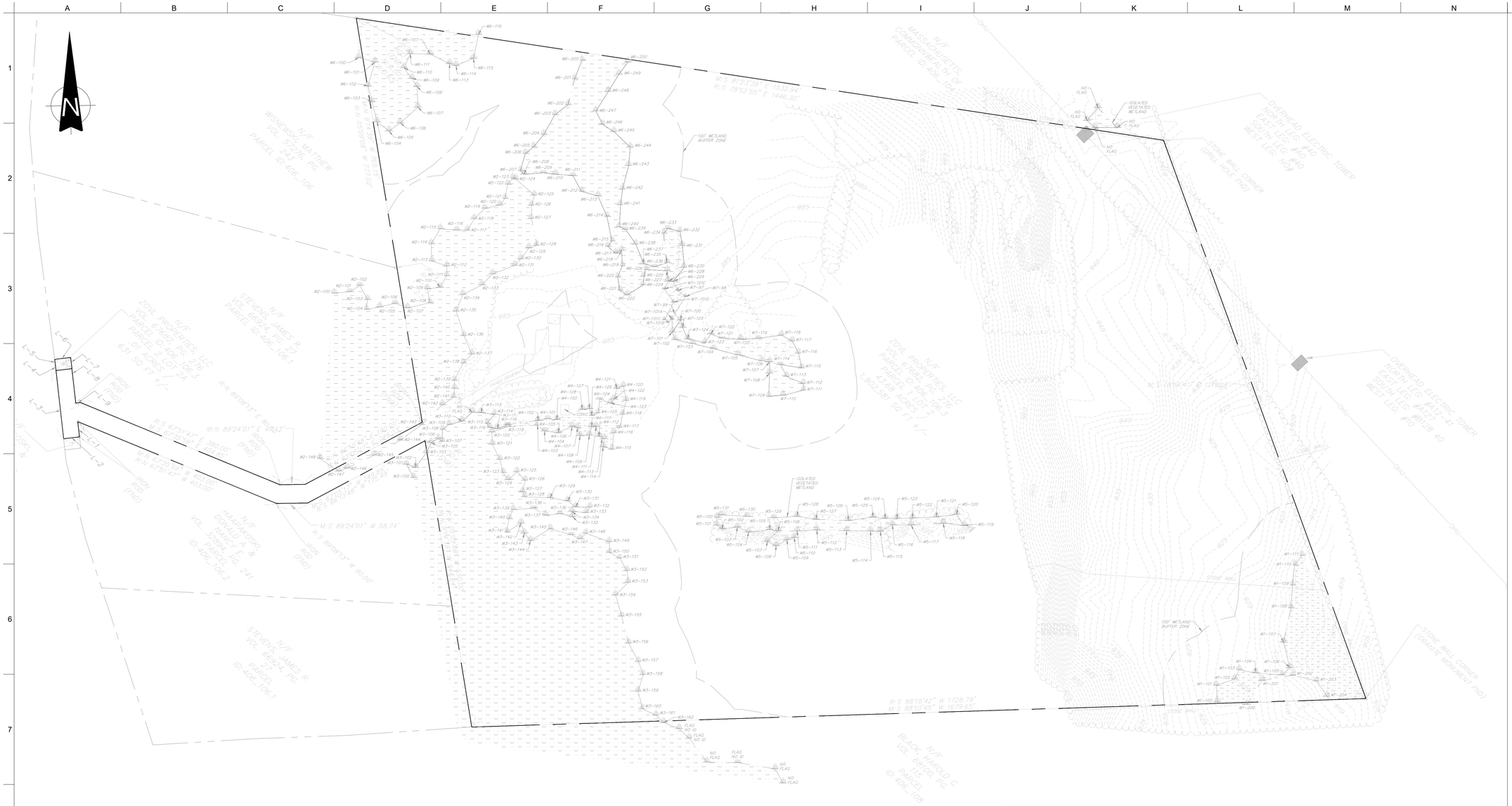
NOT FOR CONSTRUCTION

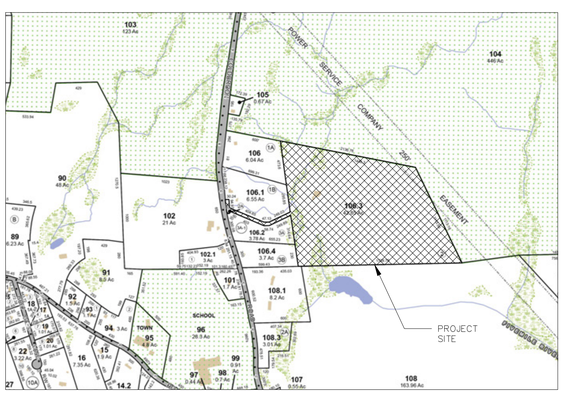
Drawing Title
GENERAL NOTES

Scale: NTS
File Name: C0-01.DWG
Drawing Status: 30% DESIGN DRAWINGS

Job No	Drawing No	Issue
296229-00	C0-00	G

PLOT BY: Reese Smith PLOT TIME: 3/19/2025 1:24 PM





LOCUS MAP

SCALE: 1"=400'

NOTES

1. THE FOLLOWING DOCUMENTS ARE INCORPORATED BY REFERENCE AS PART OF THIS SITE PLAN:
   - 1.1. TOPOGRAPHIC SURVEY:"EXISTING CONDITIONS SURVEY OF ZOVL PARCEL" BY CORNERSTONE ENERGY SERVICES, DATED NOVEMBER 6, 2024.
   - 1.2. FLOOD MAPPING: FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBER 2503240005B, EFFECTIVE APRIL 3, 1984.
   - 1.3. WETLAND DELINEATION: PER FIELD FLAGGING BY EPSILON ON JULY 21, 2023 AND MARCH 26, 2024 AND APPROVED BY THE OAKHAM CONSERVATION COMMISSION THROUGH AN ORDER OF RESOURCE AREA DELINEATION (ORAD) IN DECEMBER 2024.
   - 1.4. GEOTECHNICAL: GEOTECHNICAL INVESTIGATION COMPLETED DEC 23, 2024. ADDITIONAL GEOTECHNICAL INFORMATION MAY BE REQUIRED.
   - 1.5. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST VERIFY THAT THEY HAVE THE LATEST EDITION OF THE DOCUMENTS REFERENCED ABOVE. THIS IS CONTRACTOR'S RESPONSIBILITY.
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4. NO GUARANTEE IS IMPLIED OR INTENDED AS TO THE ACCURACY, LOCATION, OR THAT ALL UTILITIES AND/OR SUBSURFACE STRUCTURES ARE SHOWN. CONTRACTOR SHALL VERIFY SIZE, LOCATION, AND ELEVATIONS OF UTILITIES AND STRUCTURES AS REQUIRED PRIOR TO THE START OF ANY CONSTRUCTION.
5. EXISTING UTILITIES TO REMAIN AND BE PROTECTED DURING CONSTRUCTION UNLESS OTHERWISE NOTED. CONTRACTOR TO NOTIFY ENGINEER IN WRITING ABOUT ANY CONFLICTS.

ADDRESS:	358 COLDBROOK RD, OAKHAM, MA, 01068
EXISTING ZONE:	AGRICULTURAL AND RURAL RESIDENTIAL DISTRICT
PROPOSED ZONE:	AGRICULTURAL AND RURAL RESIDENTIAL DISTRICT
USES:	BATTERY ENERGY STORAGE SITE (BESS)

RELEVANT STANDARDS	PERMITTED/REQUIRED	PROPOSED	NOTES
MINIMUM LOT AREA (SF)	44,000 SF	1,866,546 SF	
MINIMUM LOT FRONTAGE (FT)	150 FT	150 FT	
MAXIMUM UPLAND AREA (%)	65%	25%	UNCLEAR WHETHER THIS MINIMUM APPLIES TO A LOT TO BE USED FOR BUSINESS PURPOSES, BUT FOR THE PURPOSES OF THIS ANALYSIS, THE MINIMUM UPLAND AREA IS 65% OF THE MINIMUM LOT AREA.
MINIMUM FRONT SETBACK (FT)	50 FT	244 FT	REMOVAL OF SOIL BELOW EXISTING GRADE IS PROHIBITED WITHIN 200 FEET OF ANY PUBLIC ROADWAY OR ABUTTING PROPERTY LINE, EXCEPT BY (A) PERMISSION OF AN ABUTTER AND A SUPER-MAJORITY VOTE OF THE PLANNING BOARD, PER SECTION 6.3.3., OR (B) CONSTRUCTING A CONTINUOUS VISUAL BARRIER, AS APPROVED BY THE PLANNING BOARD, IN WHICH CASE REMOVAL OF SOIL MAY OCCUR WITHIN 100 FEET OF THE ABUTTING PROPERTY LINE PER SECTION 6.3.3.1."
MINIMUM SIDE SETBACK (FT)	50 FT	44 FT	
MINIMUM REAR SETBACK (FT)	50 FT	34 FT	
MINIMUM DIMENSION BETWEEN SIDE SETBACKS (FT)	100 FT	950 FT	
MAXIMUM BUILDING HEIGHT (FT)	35 FT	< 35 FT	HEIGHT OF NOISE BARRIER IS NOT SPECIFIED ON PLANS
PROPORTION FACTOR	PF = $(16A/P^2)$ < 40	N/A	SECTION 5.6.5.4 EXEMPTS ALL LOTS OF RECORD AS OF JUNE 17, 2002. THE SUBJECT LOT WAS CREATED BY A PLAN RECORDED IN 1987 (PB 575/122) AS AMENDED BY A PLAN RECORDED ON MARCH 26, 1999 (PB 739/61). THEREFORE, THE LOT IN QUESTION IS EXEMPTED FROM THE REQUIREMENTS OF SECTION 5.6.
LOT DEPTH ALONG FRONTAGE (FT)	50 FT	30 FT	
FENCING	PERMITTED - 8 FT	8 FT	
DRIVEWAYS	MINIMUM 15 FT WIDTH	16 FT	

100 0 100 200

Issue	Date	Revisions
A	9/22/23	DRAFT ISSUED FOR REVIEW
B	9/28/23	CONSTRAINT MAPPING
C	8/21/24	10% DESIGN SUBMISSION
D	9/13/24	30% DESIGN DRAFT
E	11/01/24	ISSUED FOR ISO-NE SIS APPLICATION
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G	03/18/2025	30% DESIGN REVISION

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02109, United States

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Client
MORAGA STORAGE LLC

Job Title
MORAGA STORAGE
ZOVL - Oakham, MA

Seal

NOT FOR CONSTRUCTION

Drawing Title
CIVIL EXISTING CONDITIONS SHEET

Scale
1" = 100'

File Name
C1-01.DWG

Drawing Status
30% DESIGN DRAWINGS

Job No	Drawing No	Issue
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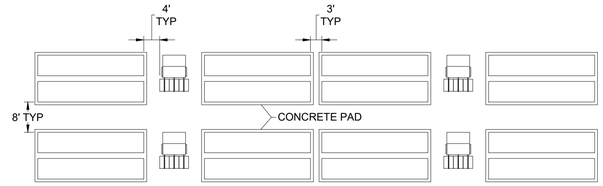
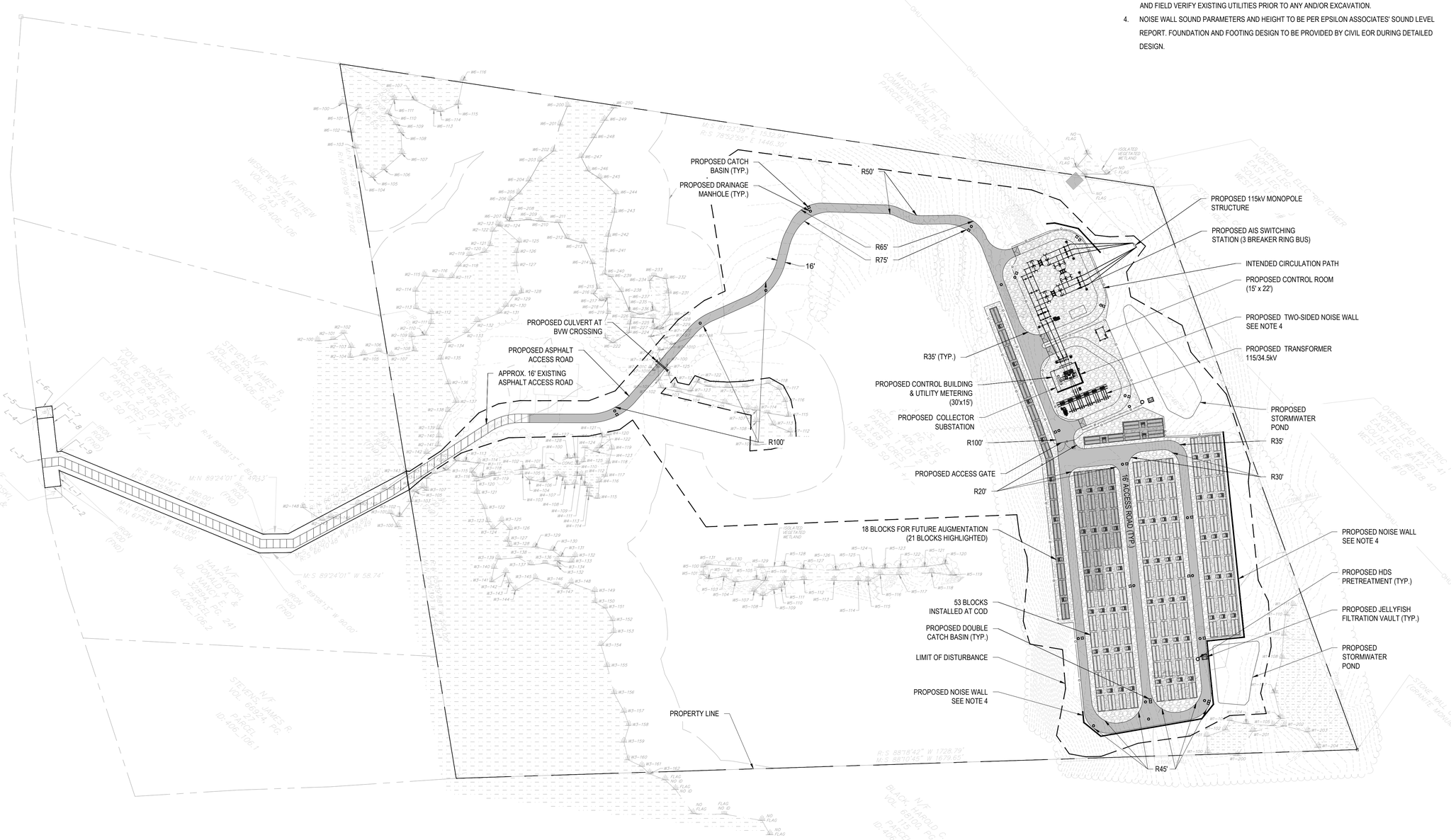


BESS CLEARANCE TYPICAL
SCALE: 1" = 20'

NOTES

1. TOPOGRAPHIC/SITE SURVEY, WETLAND LOCATIONS AND INFORMATION, AND LOCATIONS OF UNDERGROUND UTILITIES SOURCED FROM "EXISTING CONDITIONS SURVEY OF: ZOVL PARCEL" BY CORNERSTONE SURVEY, DATED NOV. 6, 2024.
2. BEARINGS SHOWN HEREON ARE REFERENCED TO GRID NORTH, MASSACHUSETTS STATE PLANE, NAD83. ELEVATIONS ARE IN REFERENCE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) BASED ON DUAL FREQUENCY GPS OBSERVATIONS REFER TO THE NORTH AMERICAN DATUM OF 1983 (NAD 83).
3. UTILITY INFORMATION DEPICTED HEREON IS COMPILED USING PHYSICAL EVIDENCE LOCATED IN THE FIELD AT THE TIME OF THE SURVEY, AND IS A REPRESENTATION OF AVAILABLE SURFACE EVIDENCE ONLY, AND THEREFORE MAY NOT NECESSARILY DEPICT ALL EXISTING UTILITIES. CONTRACTORS AND/OR DESIGNERS NEED TO CONTACT DIG-SAFE SYSTEMS, INC, (1-888-DIG-SAFE) AND FIELD VERIFY EXISTING UTILITIES PRIOR TO ANY AND/OR EXCAVATION.
4. NOISE WALL SOUND PARAMETERS AND HEIGHT TO BE PER EPSILON ASSOCIATES' SOUND LEVEL REPORT. FOUNDATION AND FOOTING DESIGN TO BE PROVIDED BY CIVIL EOR DURING DETAILED DESIGN.



Issue	Date	Revisions
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Client
MORAGA STORAGE LLC

Job Title
MORAGA STORAGE
ZOVL - Oakham, MA

Seal

NOT FOR CONSTRUCTION

Drawing Title
CIVIL SITE PLAN

Scale 1" = 100'
File Name C2-01.DWG
Drawing Status
30% DESIGN DRAWINGS

Job No	Drawing No	Issue
296229-00	C2-01	G

PLOT BY: Reese Smith PLOT TIME: 3/19/2025 1:29 PM