CITY OF HAVERHILL
CITY COUNCIL AGENDA - AMENDED
Tuesday, August 10, 2021 at 7:00 PM
Theodore A. Pelosi, Jr. Council Chambers, 4 Summer st, Room 202
In-Person/Remote Meeting

This meeting/hearing of Haverhill City Council will be held in-person at the location provided on this notice. Members of the public are welcome to attend this in-person meeting. Please note that while an option for remote attendance and/or participation is being provided as a courtesy to the public, the meeting/hearing will not be suspended or terminated if technological problems interrupt the virtual broadcast, unless otherwise required by law. Members of the public with particular interest in any specific item on this agenda should make plans for in-person vs. virtual attendance accordingly.

1. **OPENING PRAYER**
2. **PLEDGE OF ALLEGIANCE**
3. **APPROVAL OF MINUTES OF PRIOR MEETING**
4. **ASSIGNMENT OF THE MINUTES REVIEW FOR THE NEXT MEETING**
5. **COMMUNICATIONS FROM THE MAYOR:**
    - 5.1. Mayor Fiorentini requests to give an update on Haverhill's efforts regarding the Coronavirus COVID-19 crisis
    - 5.2. Mayor Fiorentini requests to address Council regarding SiFi Networks Technical Proposal and also will have Frederic Feit, Telecommunications Consultant here from Tilson Technologies to answer any questions
    - 5.3. Mayor Fiorentini submits 2 new orders to put proposed Ballot Question Regarding Ward City Councillors and School Committee Members on the ballot in November 2021 as binding referendums
        - 5.3.1. Order – Home Rule Petition – An Act Providing for the Election of at Large and Ward Councillors in the City of Haverhill
        - 5.3.2. Order – Home Rule Petition – An Act Providing for the Election of at Large and Ward School Committee Members in the City of Haverhill
    - 5.4. Mayor Fiorentini requests to address Council regarding housing & rents in the City and submits non-confirming appointments to newly established *Housing Task Force*:
        - 5.4.1. William Pillsbury, Chairman, Economic Development & Planning Director
          Matthew Hennigan, CDBG Housing Manager
          Andrew Herlihy, CDBG Block Grant Office, Director
          Kerry Perry, Community Action Commission
          Manny Matias, Haverhill Latino Coalition
          Robert Driscoll, Chairperson, Haverhill Housing Authority

6. **COMMUNICATIONS FROM COUNCILLORS TO INTRODUCE AN INDIVIDUAL(S) TO ADDRESS THE COUNCIL:**
    - 6.1. Communication from Councillor Joseph Bevilacqua requesting to introduce Marlene Stasinos of Chris's Farm Stand and to recognize the 50th Anniversary of the Farm Stand located at 436 Salem st
7. **PUBLIC PARTICIPATION- REQUESTS UNDER COUNCIL RULE 28**

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8. COMMUNICATIONS AND REPORTS FROM CITY OFFICERS AND EMPLOYEES:

8.1. Communication from CDBG Director Andrew Herlihy, on behalf of the Economic Development Department, submitting key documents related to redevelopment occurring at 86 Essex st and asks for approval of the Resolution authorizing Mayor regarding HDIP Program and TIF

8.1.1. Resolution - authorizing Mayor to approve and execute a TIF (Tax Increment Financing) agreement between City of Haverhill on the basis of the development of the 86 Essex st parcel number map 302, block 56, lot 1

8.2. Communication from William D Cox, Jr submitting Order authorizing Mayor to enter into a Memorandum of Agreement by & between City of Haverhill & Essex County Greenbelt Association Inc

8.2.1. Order – Authorize Mayor execute Memorandum of Agreement by & between City of Haverhill & Essex County Green Belt Association to purchase, hold & manage a 13.3 acre unique parcel of land which is a portion of 97 Corliss Hill rd

8.3. Communication from John Pettis III, City Engineer submitting request to install monitoring wells within City Right of Way (on sidewalks) adjacent to the subject parcel at 58 Kenoza av *Request from NEET included*

9. UTILITY HEARING(S) AND RELATED ORDER(S):

9.1. Mass Electric Co d/b/a National Grid requests permission for Pole location on Research Drive, Plan 30346085 Hearing Sept 21, 2021

9.2. Mass Electric Co d/b/a National Grid requests permission for underground electric conduits for 21-27 Washington st, Plan 29456312 Hearing Sept 21, 2021

10. HEARINGS AND RELATED ORDERS:

10.1. Document 70; Application for Special Permit, CCSP -21-10 from Beals & Thomas, Inc. (B&T) for client BWC Camp Brook, LLC for installation of a dual use large-scale ground mounted solar energy facility proposed to be located within the Business Park District (BP) and the Rural Density (RD) district; at 1050 Hilldale av Solar 2

10.2. **APPOINTMENTS:**

10.3. **Confirming Appointments:**

10.4. **Non-Confirming Appointments :**

10.5. **Resignations**

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11. PETITIONS:

11.1. Petition from Andre Colon, True House Cannabis LLC requesting Hearing for a Zoning Amendment for 25 Bond st, an industrial location in the Ward Hill section of City, to include cannabis cultivation, for the production of cannabis not to be sold to the public only to licensed cannabis establishments Refer to Planning Board & Council Hearing Oct 19 2021

11.1.1. Ordinance re: Zoning – Licensed Marijuana Establishments Overlay Zone (LMEOZ) Amend Code to include 25 Bond st to permit Licensed Marijuana Establishments – No Retail Sales File 10 days

11.2. **Applications Handicap Parking Sign**

11.3. **Amusement/Event Applications:**

11.4. **Tag Day**

11.5. **One Day Liquor License:**

11.6. **Annual License Renewals:**

11.6.1. **Hawker Peddlers License 2021 - Fixed location**

11.6.2. **Coin-Op License Renewals 2021**

11.6.3. **Drainlayer License for 2021 - with City Engineer approval**

11.6.4. **Christmas Tree Vendor**

11.6.5. **Taxi Driver Licenses for 2021**

11.6.6. **Taxi License/ Limo/Livery**

11.6.7. **Junk Dealer License:**

11.6.8. **Pool Tables**

11.6.9. **Sunday Pool**

11.6.10. **Bowling**

11.6.11. **Sunday Bowling**

11.6.12. **Buy & Sell Second Hand Articles**

11.6.13. **Buy & Sell Second Hand Clothing**

11.6.14. **Pawnbroker license**

11.6.15. **Fortune Teller**

11.6.16. **Buy & Sell Old Gold**

11.6.17. **Roller Skating Rink**

11.6.18. **Sunday Skating**

11.6.19. **Exterior Vending Machines – 2021 renewals**

11.6.20. **Limousine/Livery License/Chair Cars**

12. MOTIONS AND ORDERS:

12.1. Order – transfer $12,000 from Salary Reserve to Library Salaries to fund position upgrades

12.2. Order – transfer $177,024 from Whittier Asbestos Removal capital account into the Hunking Middle School capital account to close out the Hunking School project and cover all final costs, per MSBA

12.3. Order- transfer $55,000 from the Capital Budget to the Capital account: Fire Vehicle Replacement Plan

12.4. Order – authorize payment of bills of previous/current year department appropriations as listed:

Vendor	Amount	Account
North Mechanical Services	$ 712.40	Public Property
North Mechanical Services	$ 190.00	Police Department
Telelanguage Inc.	$ 80.11	Police Department
Aramark	$ 82.75	Police Department
Nardone Electrical Corp.	$ 275.00	Police Department
Priority Dispatch	$ 365.00	Police Department
Common Wealth Resource Mgmt.	$ 2,640.00	Refuse & Recycling
Covanta Energy	$82,995.60	Refuse & Recycling
TOTAL	**$ 87,340.86**	

13. COMMUNICATIONS FROM COUNCILLORS:

13.1. Council President Barrett and Councillors LePage and Michitson request a discussion to change the current at-large electoral voting system for City Council and School Committee to include ward based representation along with the creation of a Charter Commission for a full Charter review

13.2. Councillors Jordan & Michitson request to propose a Housing Forum to address affordable housing crisis, preservation of open space and data-driven impact of proposed residential developments on City's infrastructure and services

14. UNFINISHED BUSINESS OF PRECEDING MEETING

14.1. Document 5-X; Mayor Fiorentini submits Loan Order regarding MSBA Funding for HHS Gym Roof replacement project
Related communication from John McCarthy, Executive Director of Massachusetts School Building Authority

14.2. Document 26-D; Loan Order – appropriate $1,343,283.00 to pay costs of roof replacement at the HHS Gymnasium, 137 Monument Street filed July 28 2021

15. RESOLUTIONS AND PROCLAMATIONS

15.1. Proclamation – Recognize the City of Haverhill as a *"Purple heart City in the State of Massachusetts"*

16. COUNCIL COMMITTEE REPORTS AND ANNOUNCEMENTS

17. DOCUMENTS REFERRED TO COMMITTEE STUDY

18. LONG TERM MATTERS STUDY LIST

19. ADJOURN

5.1

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
HAVERHILL, MA 01830
PHONE 978-374-2300
FAX 978-373-7544
MAYOR@CITYOFHAVERHILL.COM
WWW.CI.HAVERHILL.MA.US

August 5, 2021

City Council President Melinda Barrett and Members of the Haverhill City Council

RE: Communication from the Mayor regarding Coronavirus

Dear Madame President and Members of the Haverhill City Council:

I am requesting to address the City Council at their meeting on Tuesday, August 10th, to give an update on Haverhill's efforts regarding the Coronavirus (COVID-19) crisis.

Very truly yours,

James J. Fiorentini
Mayor

JJF/lyf

5.2

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
HAVERHILL, MA 01830
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MAYOR@CITYOFHAVERHILL.COM
WWW.CI.HAVERHILL.MA.US

August 5, 2021

City Council President Melinda Barrett and Members of the Haverhill City Council

RE: Communication from the Mayor regarding SiFi Networks Technical Proposal

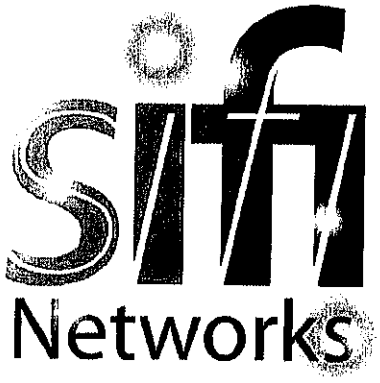
Dear Madame President and Members of the Haverhill City Council:

I am requesting to address the City Council at their meeting on Tuesday, August 10th, regarding SiFi Networks Technical Proposal. Joining me will be Frederic Feit, Telecommunications Consultant from Tilson Technologies, who can answer any questions you may have.

Very truly yours,

James J. Fiorentini
Mayor

JJF/lyf



'TECHNICAL PROPOSAL'

City of Haverhill, Massachusetts

Response to Request for Proposal
RFP:007.21

Fiber to the Premises (FTTP) Network

Proposals Due By: February 26, 2021 10:00am

City of Haverhill Purchasing Office
Steven Bucuzzo
Purchasing Director
City Hall, Room 105
4 Summer Street
Haverhill, MA 01830

Telephone: (978) 420-3606
purchasing@cityofhaverhill.com

Notification

Any and all references in this document or any related attachments to the term "team", "partner", "partnership" or any derivative thereof including, but not limited to, "framework partners", "public-private-partnership", "project partner", "deployment partners", "open partner ecosystem" and "preferred partner", do not refer to the legal creation or formation of a partnership, but instead refer to the joint or combined effort of the various contributors to the project.

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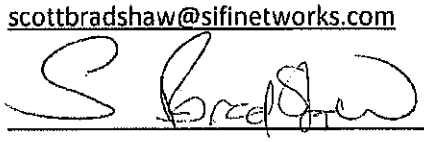
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NON-PRICE PROPOSAL

1. Cover Letter

REQUEST FOR PROPOSALS
007.21
Fiber to the Premise (FTTP) Network
COVER SHEET

Proposer:	SiFi Networks Haverhill LLC (a SiFi Networks company)
Street Address:	55 Madison Avenue, Morristown, NJ, 07960
Contact Name:	Scott Bradshaw
Email Address:	scottbradshaw@sifinetworks.com
Authorized Signature:	
Name:	Scott Bradshaw
Title:	President
Date:	February 23, 2021

EXECUTIVE SUMMARY

City of Haverhill
Steven Bucuzzo
Purchasing Director
City Hall, Room 105
4 Summer Street
Haverhill, MA 01830

Dear Mr. Bucuzzo,

SiFi Networks would like to thank the City of Haverhill (City) for your consideration of a SiFi Networks FiberCity® investment in response to this RFP 007.21.

A FiberCity® investment is an unprecedented opportunity where SiFi Networks (SiFi) 100% privately 'fund, design, build, operate and maintain a citywide fiber to the Premise (FttP) and 'Smart City' fiber optic infrastructure.

As a citywide project, a FiberCity® infrastructure removes the 'digital divide' while enabling multiple Service Providers to provide competitively priced services to every premise within the City boundary over its Open Access platform. Furthermore, SiFi, via the FiberCity® brand, work with City staff to identify areas of the community that would qualify to receive a high-speed, low-cost broadband service, to support social inclusion, equality, and municipal initiatives (Digital Inclusion).

The basis of a FiberCity® is its Smart City design, which incorporates fiber to the home and fiber to the business. As the citywide network will be built from scratch, it not only accommodates next generation technologies available today but will be ready to support IoT technologies that the fiber industry anticipates emerging in the coming years.

SiFi has laid out our RFP response in a way that enables the City staff to gain a detailed understanding of the following:

- Who is SiFi and our RFP partners.
- Our approach to independent/neutral network operation to deliver innovation and attract competition.
- Why flexibility in construction techniques achieves project efficiencies.
- Our advanced technology offering for the City and the community.
- Flexible partnership that mitigates City risk in the partnership.

For the purposes of this proposal, all questions regarding the content of this RFP response should be directed to Scott Bradshaw, who is appointed primary contact.

Scott Bradshaw | President | SiFi Networks
55 Madison Avenue, Morristown, NJ 07960
T: 973.437.6709 | scottbradshaw@sifinetworks.com

2. Company Information and Project Team

SiFi is an ***infrastructure Developer*** that designs and architects long term sustainable FiberCity® projects. SiFi manages all facets of a fiber project's implementation and subsequent business operations, is dedicated to fiber network development, and has a team of engineers, network architects, financial analysts and developers that have decades of experience in the industry. SiFi is influencing significant improvements in economically efficient solutions such as micro trenching, blown fiber deployment, network architecture and innovative financing structures that all center around creating long-term sustainable fiber networks.

The two founders of SiFi, Roland Pickstock and Michael Harris, who both have extensive experience in the formation of public-private-partnerships (P3), recognized municipalities are becoming increasingly aware that next generation fiber optic infrastructure is a necessary utility, like water, sewer and electricity, yet municipalities have very little, if any, in-house expertise to deliver and operate such a fiber optic infrastructure. Furthermore, the financial burden in bonding the capital needed to deliver such a project is a path most municipalities often do not wish to pursue, if at all. Therefore, they created SiFi; an organization formed to create best-in-class partnerships with some on the leading companies within the fiber optic industry to help support municipalities deliver upon their connected community vision and aspirations.

SiFi recognizes that no one company has all the experience and resource needed to deliver Citywide FttP projects; therefore, SiFi has entered in partnership's with multiple leading-edge U.S. firms who are already engineering and constructing fiber projects daily. Each partner comes together as part of a collaboration to fulfil a specific function in the project, all of which is lead and managed by SiFi. SiFi takes the lead, acts as the single point of contact and ensures all stakeholder requirements are addressed and delivered upon. Most importantly, SiFi, as the Infrastructure Developer, takes the business risk to generate a return on capital and is not just selling a service or product - long term project sustainability is the highest priority.

SiFi Founders

Roland Pickstock

Roland Pickstock is an entrepreneur who began his career at an early age, when he was just 19, Roland formed his first construction company, a company which is still operating today (Pickstock Construction) and forms part of The Pickstock Group www.thepickstockgroup.com of companies.

The Pickstock Group is an international group of companies specializing in construction, manufacturing, property development. The group has delivered a wide spectrum of projects within numerous sectors, for both the private and public sector since its inception in the early 1980s, including the delivery of one of Europe's tallest modular buildings

Roland's track record and reputation precedes him and is renowned for his commitment to projects through tremendous challenges, none more so than the founding of what has now become one of the UK's leading modular manufacturing company, Elements Europe www.elements-europe.com.

Mike Harris

Mike Harris is a serial communications channel entrepreneur, who has successfully built several multimillion-dollar companies including Total Network Solutions, which was acquired by British Telecom in 2005. Mike started his career at British Telecom in 1979 and worked in local telephone exchanges before moving into datacenters, becoming one of the country's first specialist voice and data engineers. He gained a unique level of experience in exchange construction, telephone route planning, datacenter layout, point-to-point links and Ethernet connectivity.

In 1988, he founded Total Network Solutions (TNS) which quickly became a leading provider of communication solutions and services and was acknowledged by Dun & Bradstreet as being the 59th fastest growing company in the UK. As well as accolades, such as the Cisco "Reseller of the Year" award, TNS was one of the first UK-based companies to achieve BS7799-2 security standard accreditation for its network management services.

TNS employed over 150 people and provided managed communication solutions and services to organizations operating in many different market sectors including British Airways, Abbey National Offshore and the London Internet Exchange along with many parts of the public sector. The company also installed and maintained core technology for many of the leading internet service providers as well as more than 27 of the UK's leading universities.

KEY PROJECT MEMBERS

As SiFi's Partners cannot confirm who, from their breadth of skilled worker force, will be available to work on the project until such time that a construction schedule is in place, SiFi has provided an overview of which members of our team will have continuous interaction with the City throughout the project.

CHIEF EXECUTIVE OFFICER

As CEO of SiFi Networks, Ben Bawtree-Jobson was instrumental in the founding of the company and continues to direct all aspects of its offering in the fiber to the premise sector. Ben's prior experience lies within the structuring and financing of fiber infrastructure projects and the strategic formation of strong framework partner alliances. Ben has been at the forefront of developing FTTP models in the USA and built a unique business and a world leading team that has enable privately financed, large scale open access FTTP for the first time in the USA. His landmark deal was successfully raising $450m for SiFi Networks FiberCity® projects and his expertise in the sector often sees him invited to speak at conferences across Europe and the USA.

Ben's expertise stretches through every facet of fiber networks; legal structuring, financial modelling, construction, network design, marketing, community engagement and sales to name but a few. Ben's unique breadth of understanding is what ties complex deals into simple solutions that work for all stakeholders in a project, a fundamental requirement for fiber optic network developer.

PRESIDENT

Scott Bradshaw leads the development of public-private-partnerships relationships and agreements with municipalities based upon the fiber to the premise market strategy he developed during to the company's formation.

Prior to joining SiFi Networks, Scott held several Country Manager and senior management positions in early-stage start-up companies and joint venture partnerships based out of New York, Europe and the UAE. Within these roles, Scott was responsible for the creation and delivery of return of investment models, national channel partner framework structures and IP licensing expansion strategies within emerging markets.

Scott's successful delivery of the FiberCity® strategy has enabled SiFi to partner with cities across multiple U.S. States and create a platform on which the SiFi CEO was able to raise $450m for the deliver FiberCity® projects.

CHIEF OPERATING OFFICER

As SiFi Networks Chief Operating Officer, leading all aspects of the business's design and build operating procedures, strategic assessment of resource utilization for successful delivery of FiberCity® projects. Holding key relationships with all partners to ensure SiFi Networks standards are being adhered to during the projects, and each party are delivering within timescales & budget required.

Rich recently implemented quality management system recognized by achieving ISO 9001, and currently defining environmental, and health and safety policies to achieve certification by international recognized standards organization.

Prior to joining SiFi, Rich spent 21 years working for Total Network Solutions, who were sold to British Telecom in 2005, were he continued to progress his career, and within his last role he was Head of Technical Design & Delivery for the United Kingdom managing over 150 design & delivery technical consultants.

At the age of 17 Rich joined the Royal Navy where he spent 8 ½ years and trained as a Weapons Engineer, gaining knowledge on a multitude of different weapon and telecommunication systems, whilst experiencing active duty in the Balkans war, and visiting many different countries within the Persian Gulf, Malaysia & Europe.

MARKETING AND COMMUNICATIONS DIRECTOR

In 2013 Sara Pickstock and her team began to work with SiFi Networks to develop a new brand for the American Market. A brand awareness campaign was created using both off-line and on-line marketing methods. Once a project progresses, Sara works closely with the city to engage with the community, informing them of the project as well as liaising with local press. Sara manages and implements multiple online and offline campaigns simultaneously enabling SiFi Networks to sync well with all of their project's key stakeholders.

Sara began working for The Pickstock Group in 2009 as part of the Marketing and Communications Department and in 2011 became the Marketing and Communications Director. Sara leads a team responsible for re-branding The Pickstock Group and the companies within it, as well as developing marketing strategies to create brand awareness through creative design, web marketing, social media, PR, and events. Managing in house and external resource she has successfully run campaigns across both business-to-business marketing as well as consumer/retail marketing.

NETWORK OPERATION'S DIRECTOR

David Thomas has over 33 years' experience in the telecommunications sector and brings a unique level of expertise in the development and implementation of workflows for large service centers that specialize in the delivery of high-quality customer service.

Prior to SiFi Networks, David worked at the world-renowned BT Central Operations Unit for 16 years, where he managed the central network operation for all voice and data networks, focusing on optimization of availability, quality of service, route and bandwidth. The capacity of this network, and therefore David's remit covered all of the UK's 652 local exchanges, 64 regional switching centers and all BT transatlantic submarine cable and satellite networks.

David was accountable for the service development, procurement, engineering and build of the networks and managing customer operations centers for Europe's largest Telecoms and IP backbone, Carrier1 London, operating in 13 countries with over 160 major ISP customers.

PROJECT TEAM

adcomm

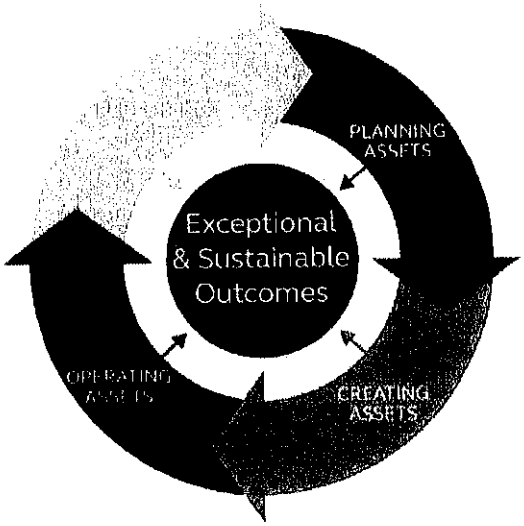
Recognized by Inc. 5000 as one of the fastest-growing privately held U.S. companies, Adcomm is unique in its industry experience and proven track record for high rates of customer satisfaction. Their strong growth history is driven by vision, foresight, innovation and commitment.

Launched in 2005, Adcomm was a pioneer in the market for on-site installation of Satellite TV for dealers. Since 2012, the company has grown dramatically in size, revenues and capacity, taking its place as an industry leader with a large national footprint for residential and commercial fulfillment. Today, Adcomm offers a diverse portfolio of telecommunications management services across the United States.

ARCADIS

Arcadis is the leading global Design & Consultancy firm for natural and built assets. Applying their deep market sector insights and collective design, consultancy, engineering, project and management services they work in partnership with their clients to deliver exceptional and sustainable outcomes throughout the lifecycle of their natural and built assets. They are 27,000 people active in over 70 countries that generate €3.3 billion in revenues.

Arcadis can design and deliver complex solutions by combining their technical, consulting and management skills to provide exceptional and sustainable outcomes for their clients across all phases of asset investments; from planning, through to creation, operation and possible redefinition.



Jacobs

Jacobs is a total solutions provider and leads the global professional services sector delivering solutions for a more connected, sustainable world. Jacobs provide a full spectrum of services including scientific, technical, professional and construction and program-management for business, industrial, commercial, government and infrastructure sectors.

Deeply committed to helping their clients build a more connected, sustainable world, Jacobs has invested significant time and resources in developing and delivering digital solutions to bring operational efficiency in client services. These digital solution offerings include—harnessing the power of digital technologies and IoT to help clients in every industry we serve to make more intelligent decisions, be safer, more secure and sustainable, and simply better. Their technology solutions include network and communications, cyber security, digital twins, predictive analytics, AR/VR visualization, software and cloud solutions, IoT programs, and many more.

Jacobs are an award-winning systems integrator, with expertise linking regional, City, enterprise, and facility-wide assets using real-time data collection, predictive analytics, and visualization—including geospatial analytics, end-to-end cybersecurity, telecommunications services, cloud technologies, and automation—to transform their clients' operations. Importantly, their approach to vendor neutrality allows them to evaluate technology solutions based on merit rather than personal financial benefits.

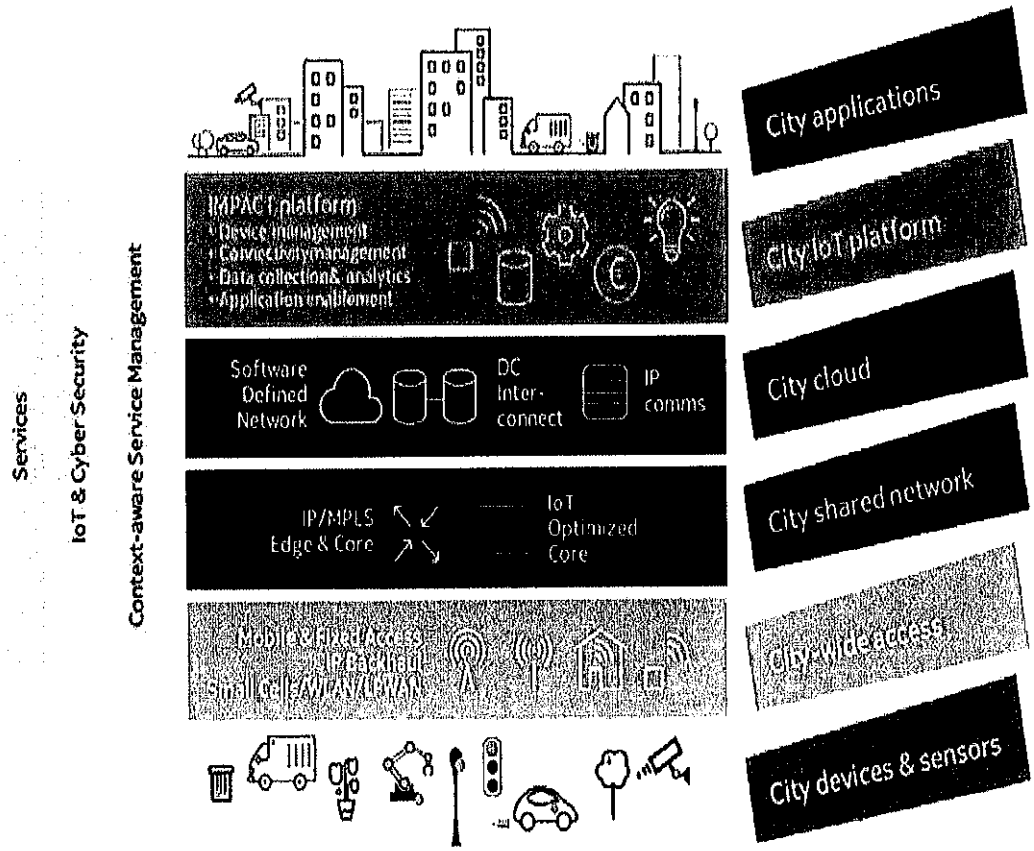


NOKIA

Nokia is uniquely positioned to assist government, communications service providers and large enterprises deliver on the promise of Smart Cities. Nokia's solutions are designed to provide shared, secure and scalable platform that ensures the best use of urban resources and data to enable the human possibilities of smart, safe and sustainable cities.

Working with an open partner ecosystem including diverse organizations - technology vendors, application developers, service providers, system integrators, utility companies, research institutions and others - Nokia continuously explores new systems, applications, content, devices and services.

NOKIA, has deployed multiple FttP projects throughout the USA. Highlights include EPB of Chattanooga, Lafayette Utility Systems, Bristol, VA., Bristol, TN, Dalton GA., Westfield, MA, and Holyoke, MA. These cashflow positive networks deployed FttP solutions within their communities to enhance economic development and retain businesses who may have otherwise relocated to other communities. Nokia is currently providing Managed Services on behalf of telecommunications companies to over ***3,000,000*** subscribers throughout the USA and ***650,000,000*** worldwide.



WHITEHELM CAPITAL

One of the most experienced infrastructure managers within their industry, who have an outstanding track record spanning over 21 years, €6.1 billion in direct infrastructure debt and equity investments made since inception, and €3.0 billion of funds currently under management.

Whitehelm are a long-term investor, partnering with clients to invest in true infrastructure assets that protect real investment value, while providing predictable cash returns. This is achieved by investing in assets with clear and measurable cash flows and adding value through active asset management.

The Smart City Infrastructure Fund – the first of its kind globally – was established by APG and Whitehelm Capital in November 2018 to provide long-term funding for Smart City infrastructure projects enabling cities and communities to become more inclusive, safe, resilient and sustainable. Smart Cities is an urban development vision to integrate multiple information and communications technologies and sensor-enabled Internet of Things ("IoT") solutions in a secure fashion to manage a City's assets and processes. The roll-out of such developments at scale requires an effective combination of digital and physical components.

apg

APG is the largest pension fund in the Netherlands who manage a total capital of over 500 billion euros ($590 billion US dollars) for their pension funds and their members and beneficiaries.

APG are a pension provider who looks not only at financial returns, but also at doing their bit for society. In areas such as solidarity between generations, sustainability, values, diversity, the climate, and digitalization. Employing over

3. Financials

SiFi was incorporated in 2013 and is the holding company for our U.S. based Special Purpose Vehicle (SPVs) companies, which are set up for each fiber optic network that SiFi and our Partners deploy. This structure provides clarity for lawyers in drafting agreements between the various parties and should limit additional due diligence around provenance of companies formed for the specific project. This structure is typical of real estate, infrastructure, and project finance deals, where longer-term strategic partnerships are entered at a Head Co level, but all project specific business/contracts are conducted at the SPV level.

Use of SPV's allows the group to ring fence profits and liabilities arising from a specific project, ensuring the project is protected from liabilities arising from other projects in the same group. The SPV structure also offers protection to investors of a specific project and protects all parties from litigation that may arise on other projects and does not allow cross collateralization.

A 30-year investment for FiberCity® Haverhill is only an approximate figure at this stage, however, high-level due diligence indicates this figure would range between $80 million – $90 million of private investment.

SiFi will provide validated evidence of its financial condition or a letter of good standing once selected as the City's preferred RFP partner.

4. FiberCity® Technical

REFERENCES:

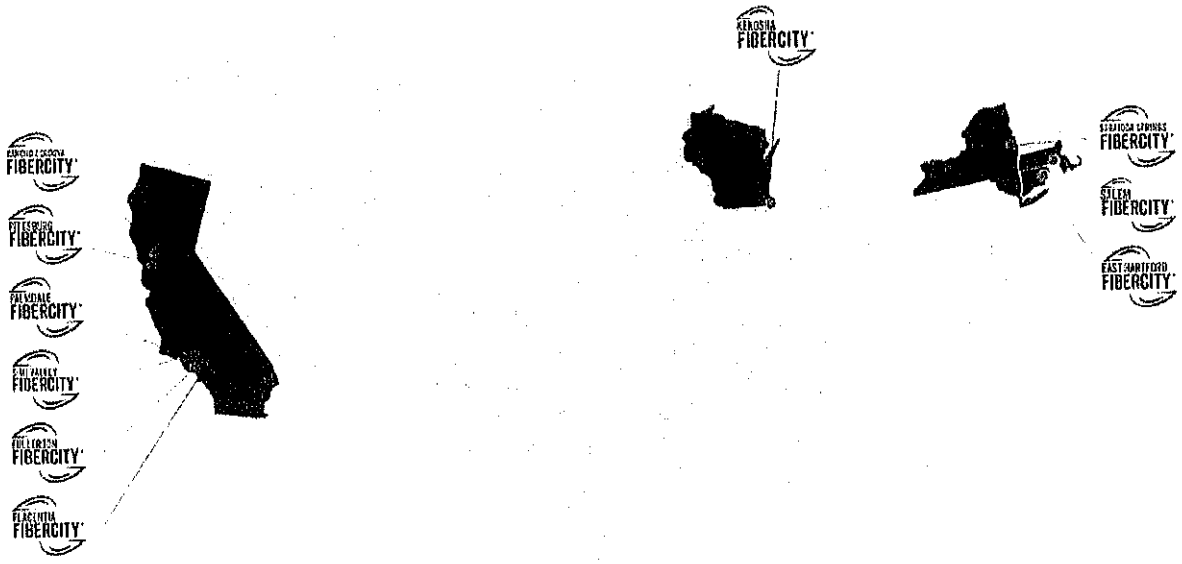
Active FiberCity® Network Construction	
Company Name	City of Salem, MA
Contact Name	Dave Knowlton
Contact Title	Director of Public Services
Contact email	DKnowlton@Salem.com
Description of Project	FiberCity® Network

Recently Signed FiberCity® Agreement	
Company Name	City of Palmdale, CA
Contact Name	Benjamin Lucha
Contact Title	Environmental & Technology Manager
Contact email	blucha@cityofpalmdale.org
Description of Project	FiberCity® Network

FiberCity® Construction Scheduled for Coming Months	
Company Name	City of Saratoga Springs, NY
Contact Name	Michele Madigan
Contact Title	Commissioner of Finance
Contact email	michele.madigan@saratoga-springs.org
Description of Project	FiberCity® Network

Active FiberCity® Network Construction	
Company Name	City of Fullerton, CA
Contact Name	Meg McWade
Contact Title	Director of Public Works
Contact email	mmcwade@cityoffullerton.com
Description of Project	FiberCity® Network

FIBERCITY® PARTNERSHIPS



5. FiberCity® Wholesale/Retail/Other

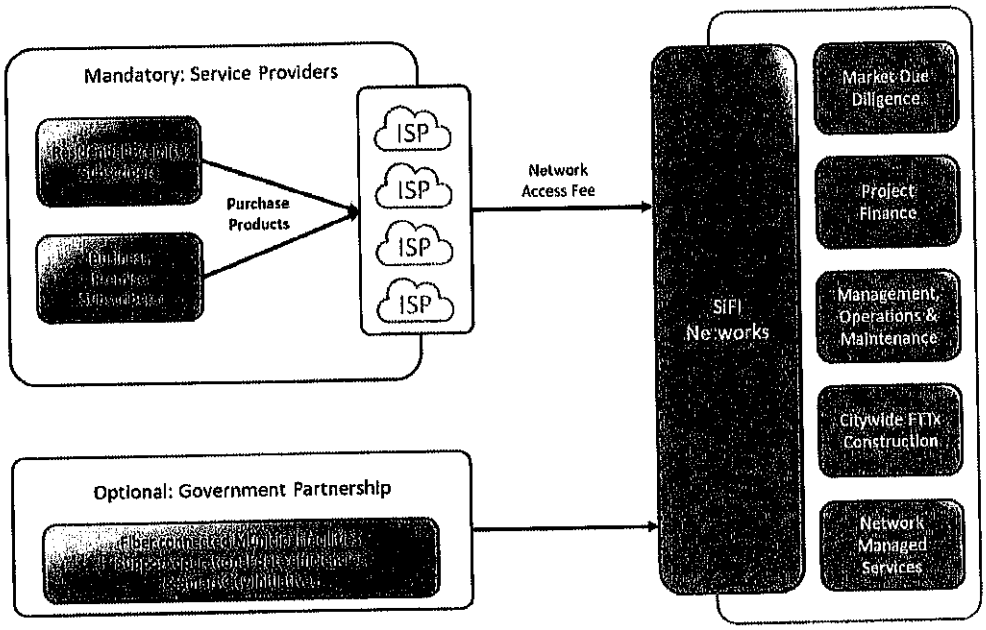
SiFi is not a retail Service Provider, we are a Developer who fund, design, build, operate, and maintain neutral FttP networks via our FiberCity® brand, which enables any retail Service Provider to deliver one or many services over to end-user subscribers. SiFi creates a 3-layer model, which we explain in detail within Section 6: **System Design.**

It is often noted within the municipal sector that smaller Service Providers are known for better pricing, products and customer service and are preferred to larger corporate Service Providers. SiFi's structure is an enabler to attract these smaller Services Providers to your City.

SiFi is currently engaged with multiple Service Providers that have an interested in Haverhill, however, this interest will fluctuate based upon the timing on any contract award to SiFi from the City and the date when construction commences.

The FiberCity® business model is built upon long term sustainable structures that ensures SiFi can create a citywide infrastructure that is 100% funded through private investment, with progressive ramping take rates that are factored below U.S. industry standard.

The FiberCity® business model, in its simplest form, is one where SiFi charges Service Providers a wholesale Fee for access to the FiberCity® network so that such Service Providers can confidently enter the City to compete on the network against other Service Providers for end user subscriber business. This structure removes the significant capital cost to market entry for smaller Services Providers who do not have access to the required funds to build ubiquitous FttP networks themselves.



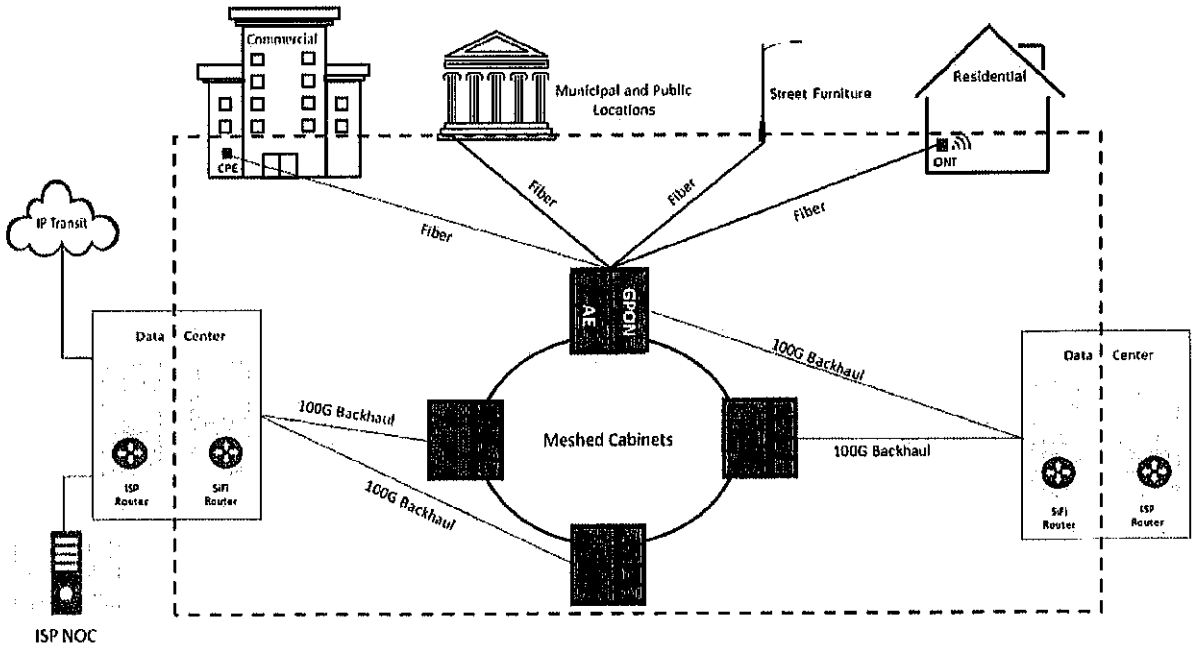
6. FiberCity® System Design

Built on a dual, diverse, carrier grade topology, a FiberCity® network uses Optical Transport Networking (OTN) to provide any municipal Facility with a Layer 2 managed service to connect any IP based device to the fiber network, all of which is backed by a Service Level Agreement (SLA) up to 99.999.

The FiberCity® architecture is the ideal platform for any city as it provides both a physical and logical extension to existing municipal fiber network, connecting any existing and new municipal Facility to the FiberCity® network where the city's switches or similar devices reside.

Gigabyte Passive Optical Network (GPON) and Active Ethernet are used throughout the network and data services, which are managed and monitored by each SiFi and Nokia global network operation centers. Under this the model, SiFi can provide circuits between municipal Facilities from 10MB through 100GB.

The image below illustrates the areas within the red box that are controlled by SiFi within a FiberCity® network to ensure a neutral 3-layer separation.



SiFi structures citywide fiber projects in 4 distinct categories: ***Network Design, Electronics, Construction Efficiencies and Operations***, which are all covered through the 3-layer approach below. The 3-layer approach is paramount in the delivery of a neutral, impartial, and competitive environment, ensuring not one company is favored over any other and innovation of products and services is not hampered by monopolistic environments or socioeconomics constraints.

Layer 1 – The Infrastructure

This represents the physical infrastructure itself, both passive and active components, which are designed and constructed to be future proof, meaning the network can adapt to city growth, changing technologies, and Service Provider models over the next 30+ years. Only through creating a resilient and scalable network which is secure and affordable to maintain, can long term sustainability be achieved.

To ensure the infrastructure is not a digital island within a community, ***dual and diverse backhaul connectivity*** to major carrier hotels of data centers is built, connecting users to Service Providers outside of the network.

Layer 2 – The Operator

Any network infrastructure needs to be fully monitored and maintained on a 24x7x365 basis to deliver any professional services. Operation of a professional network must be ***'independent'*** of any Service Provider to provide comfort and confidence that each Service Provider's data is kept separate, secure and without any prioritization bias.

An operator must also manage the infrastructure for the impartial benefit of all users and ensure the actions of any one user or Service Provider cannot have a detrimental effect on another user or Service Provider. When a Service Provider needs to provide a Service Level Agreement (SLA) to their customer the operator must match or exceed the customer's SLA being provided by the Service Provider.

Layer 3 – The Service Provider

The Service Provider is the company that providers one or many services direct to the end user over the network, whether this be residential, business, government, or anchor institution. As new technologies become available Service Providers will continue to evolve, offering potential services such as home automation, education, tele-health, security, and smart metering.

Not all services offered by the Service Provider are transmitted over the internet i.e. businesses frequently require network services which are used to provide direct connectivity between branch offices or direct connections to cloud service providers. Municipalities are like business users of the network and frequently require connectivity between City hall and municipal buildings, including police departments, fire stations, schools, libraries, and community facilities.

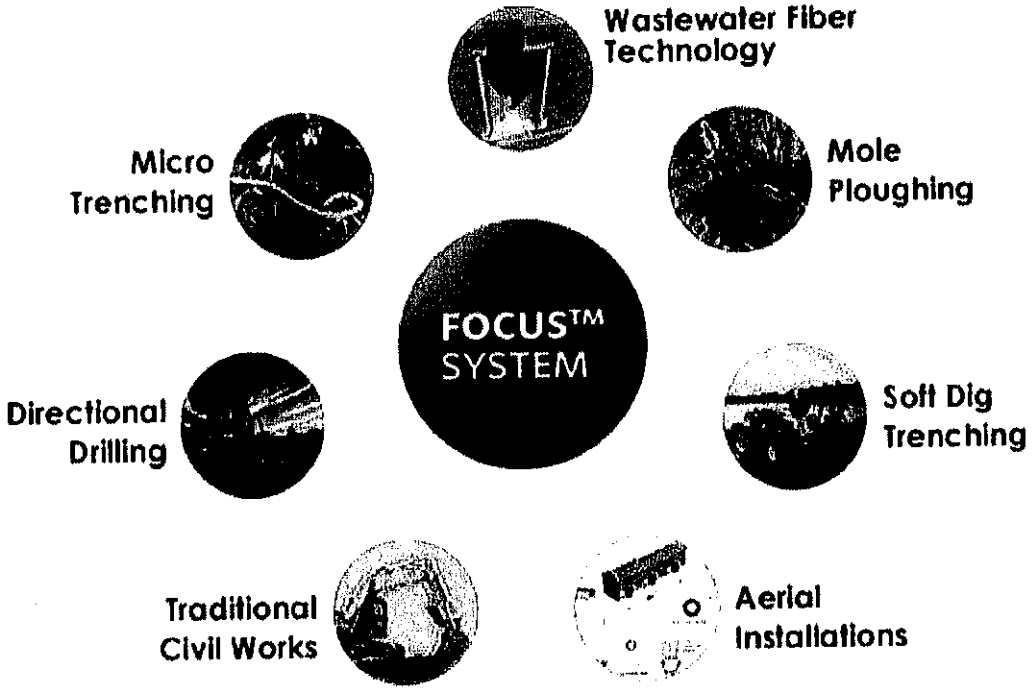
The term Service Provider should therefore be thought of as the total range of services that can now, and in the future, be delivered over the network and open access should be thought of as a network that can provide separate and secure data paths for all services.

THE INFRASTRUCTURE AND ELECTRONICS - LAYER 1 OF 3

The infrastructure is only as good at the construction techniques used to build it and electronics that enable service delivery to end users.

SiFi firmly believes in designing and building any network to be as fault tolerant as possible, delivering high availability of services through multi-ring topology configurations. So, with that in mind, SiFi has created a construction and technology brand named FOCUS™.

FOCUS™ is built around a selection of construction techniques, all of which are being requested to be approved as part of this RFP response. Allowing more techniques ensures the delivery of the most advantageous design, constructed with the least social disruption as possible. Furthermore, advanced techniques such as micro-trenching ensures the fiber infrastructures depth does not typically change your public works maintenance program and is above traditional utilities, thus, resides within a risk mitigated environment.



The network electronics encompasses the NOKIA Optical Line Terminal (OLT), which supports several hundred Gigabits of traffic from two Network Termination cards in the shelf to each of the GPON line cards. This not only guarantees all GPON traffic coming from the subscriber side will have complete non-blocking throughput across the backplane, but it also guarantees the ability to continue using the same shelf should it be decided to migrate in the future. This option strongly differentiates the NOKIA equipment from its competitors, as it allows providers to upgrade to the next available technology without replacing their existing OLT shelves.

THE OPERATOR – LAYER 2 OF 3

The independent Network Operations Center (NOC) assumes all responsibilities for the fiber network, from responding to fiber breaks or faults in the electronics to the provisioning of services to new customers on behalf of Service Providers. The NOC proactively monitors the performance of the network on a 24x7x365, as well as backhaul and Service Provider contract management. Through active surveillance of network alarms and events, the NOC team assess the impact of network incidents using pre-defined procedures to provide a formulated response to such alarms or unplanned events.

Furthermore, the FiberCity® operations center is backed by Nokia's 24x7x365 advanced technology support team, who provide the next level of operations support for incidents requiring a more detailed problem and resolution analysis.

Nokia currently provides Global Managed Services on behalf of telecommunication carriers to over ***650,000,000*** subscribers and are the platform for the FttP poster child build in Chattanooga, TN; a community that currently offers 10 Gigabit internet connectivity to their residents.

The network design provides a true open platform, allowing subscriber 'choice' i.e. over their fiber connection, end users can select multiple services from different providers such as home automation, security, telemedicine, and e-learning. Business symmetrical services can be provisioned with high-level 99.999% SLAs, delivered over fully diverse paths, and Service Providers can cater to specific business needs such as cloud device provision or inter-site connectivity, even when business locations are in different states within the U.S.

SERVICE PROVIDER – LAYER 3 OF 3

When discussing fiber networks, it's important to keep in mind that internet connectivity is only one of the available uses of the network; the fiber infrastructure should be built and operated in a way that ensures true innovation, and entrepreneurial efforts are not limited.

History within the broadband sector has shown that ***closed self-serving monopolistic networks*** do not foster the same levels of innovation or service, as seen in open fiber infrastructure markets. The purpose of a closed network is to offer you typical triple play services such as T.V., Internet and Phone, thus, locking out innovative 3rd party services such as remote healthcare service, or limiting their ability to adequately connect to people due to aging infrastructure. Where such closed networks offer fiber connectivity these are often charged at a premium rate due to lack of competition.

Separating Service Providers from network applications, network operations and asset control is key to ensuring the City achieves their desires from this project: ubiquity, High-Speed, Reliability, Competitive pricing and Excellent Customer Service.



FIBERCITY® SMART CITY OPPORTUNITIES

The foundation of a FiberCity® fiber optic infrastructure is intended to create a ubiquitous network that improves the operations of a city by integrating technology to disseminate information in real time and optimize daily tasks of its end users. As such, traffic operations, public safety, infrastructure, mobility, energy management, government buildings, recreational, educational facilities, stormwater management, weather alerts, connected vehicles, connected homes, streetlights, and other Internet of Things (IoT) and general communication needs will be enhanced as Gigabit data communication speeds will be readily available.

The Objectives of the RFP are in complete alignment of a FiberCity®, as the elements noted within the RFP are the foundation blocks in how the SiFi team engage with every municipality we have selected for a FiberCity® investment, ensuring each municipal department contributes to the RFP objectives to form the deployment of a FiberCity.

During a FiberCity® evaluation process, SiFi work with various heads of City departments to identify and incorporate Smart City initiatives, goals and revenue generating ideas into the FiberCity® design to benefit the city.

A significant upside of a FiberCity® investment into the city would be the city's ability to create revenue generating opportunities via relationships with next generation IoT, 5G, Wireless and other similar technology companies. As a FiberCity® network passes every premise and street furniture on every street throughout the city, all such locations can be connected with fiber; thus, enabling the city to promote the leasing of space on municipal owned facilities to next generation technology companies. The structure of a potential relationship would be as follows:

- A technology company enters into a fiber access agreement with SiFi to connect a municipal facility with fiber, subject to the city's permission.
  The same technology company leases space on a municipal owned facility to locate their next generation equipment, which is connected to the FiberCity® network for high-bandwidth capacity.

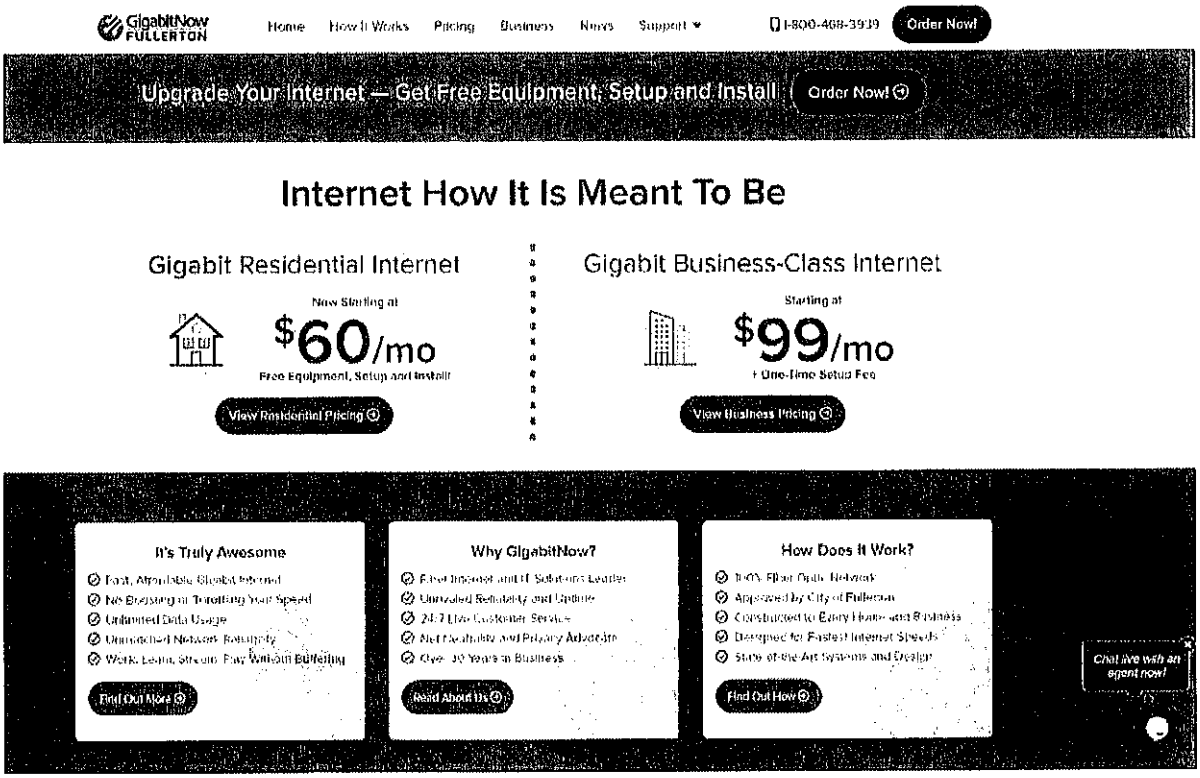
7. Services Offered/Pricing

The proposed FiberCity® network is ultimately 3 active networks combined in to one. For FttH the network is designed to be able to supply services to 100% of residential properties with GPoN connectivity. SiFi Networks provide wholesale services to multiple Service Providers who then provide retail services to residential subscribers.

For business users in addition to business class GPoN services suitable for SoHo and retail businesses, SiFi Networks also delivers a carrier Ethernet platform capable of 100Mbps – 100Gbps symmetrical services. All carrier Ethernet services are available as either un-diverse or fully diverse (dual building entry point service) with 99.999% SLA's. Carrier Ethernet services are delivered with a guaranteed committed data rate throughout the entire network through to the Service Provider. SiFi Networks provide wholesale services to multiple Service Providers who then provide retail services to end-user subscribers.

For Smart City applications, SiFi delivers services direct to the municipality which are drawn from a hybrid of both the GPON and Carrier Ethernet platforms to deliver a separate and complete secure integrated network design in a bespoke nature to meet the present and future needs of the City with services ranging from 10Mbps – 100Gbps.

Within current FiberCity® deployed markets, the following residential and business retail rates below for symmetrical 1 Gigabit internet is being provided by competing Service Providers on the network:



8. Service Territory

FiberCity® Haverhill is a citywide fiber optic network that will resides within the City's boundary.

9. Build-out

The ideal build-out timeframe to pass every premise in the City boundary is 24 months from the day construction commences, though this is contingent of local weather restrictions and delays. Premises will be connected on an ongoing daily basis during and post build-out construction.

Location of where construction commences in the City will be driven by access to the first data center and connection of street cabinets. This is a requirement to enable premises to be 'lit' with service as they are passed and connected by the construction crews, rather than building past premises that cannot receive service from Service Providers until a cabinet is connected to a datacenter.

Project Schedule

The amount of detail and complexity of our high-level schedule for the proposed City project is too large to be included within this response. Once chosen as the City's preferred RFP partner SiFi can provide such detail and explain each aspect of its structure during workshop sessions, if required.

Public Rights-of-Way Maintenance Plan

SiFi will have a maintenance crew assigned to the project post citywide build-out. One of daily activities of a crew is route protection and route surveillance. This consists of Dig Safe mark out and drive the duct route to assist in preventing contractors who fail to call the Dig Safe System. During these ride outs, they will also watch for failures of trench line. In the event a fault is identified, FiberCity® underground maintenance crew will be called to repair the fault.

Network Outage Approach and Response

A FiberCity® is designed as a distributed core without the need for a central office. Each active street cabinet serves approx. 1,000 units (business or residential) and each cabinet connects in a ring to two other cabinets. Up to 20 cabinets form a ring and multiple rings connect together to provide diverse connections with multiple restoration paths. Diverse business connectivity solutions connect to two active cabinets. This level of fiber diversity in the design guarantees high availability services and ensure no single point of failure.

10. Digital Inclusion Plan

The FiberCity® network will pass every premise within the City boundary; thus, removing the digital divide. A variety of services will be available to every premise from Service Providers on the network, with retail pricing aligned with the outcome of a community outreach campaign/survey that SiFi commissions via an independent broadband research company. This approach ensures Service Providers who utilize the network are providing competitive services based upon community driven data.

SiFi, via the FiberCity® brand, work in partnership with City staff and Service Providers to create low-cost targeted services to those in the community that qualify based on the City staff guidance and direction. This section requires in depth conversations between SiFi and City staff to ensure all areas of the RFP Digital Inclusion goals are being addressed without compromising the sustainability of the project. There could be options where the City financially supports low-income high-speed connectivity service initiatives, though any such contribution is unknown at this stage as it has not been factored into the success of the citywide offering.

11.Net Neutrality

The Net Neutrality debate is based around controls within networks to preference one type of traffic over another or one Service Providers traffic over another. In practice, this is unusually implemented in one of two layers of the network. Layer 3 control s are based around IP addresses or TCP ports in use. As a Wholesale provider of a Layer 2 connectivity solution to Service Providers, SiFi does not read, process, interpret, manipulate, or amend any Layer 3 data. All layer 3 data is passed through the network from the end user subscriber to the Service Provider and back to the end user untouched by the SiFi network. The second area where traffic preferences can occur is in the layer 2 part of the network through a set of controls generally referred to as QoS or quality of service. These controls are primarily designed to manage traffic flows when individual circuits are running at capacity. The SiFi network is designed to ensure there are no bottlenecks or contention points within the core network, as such, SiFi has no requirements for QoS; therefore; SiFi can ensure net neutrality rules are observed in the layer 2 network.

12.Use of City Assets

For each FiberCity®, SiFi takes on all construction and development risk to ensure a long term financially sustainable project; ultimately creating a very high-speed multi-lane highway that many Service Providers can access to provide IP based services to any premise throughout the City, while the government has the option to utilizes fiber for municipal efficiencies and ***Smart City*** capabilities.

As SiFi's FiberCity® proposal is a long-term partnership with the City, SiFi requires City government to grant SiFi access to the City's entire public right-of-way via a SiFi Development Agreement so that the fiber network can pass every premise to remove the digital divide. The FiberCity® network is designed to be 100% underground and constructed using micro-trenching technology, as illustrated in Section 13, given its minimal impact to the public right-of-way.

	Public Rights of Way Access	Project Finance	Smart City Fiber Locations	Network Access Fee	Design & Construction	Operations, Maintenance & Upgrades	Product Marketing	End User Services
SiFi Networks		●			●	●		
Municipality	●		●					
Service Providers				●			●	●

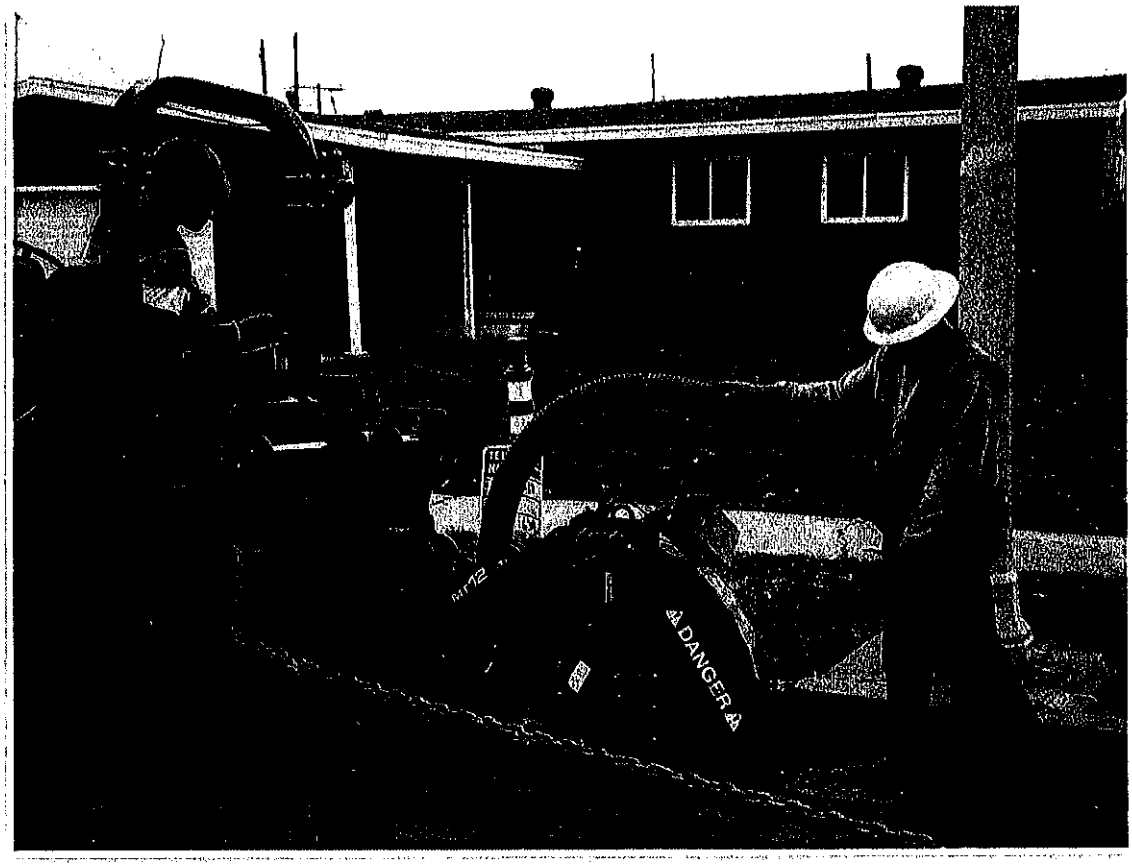
Should SiFi be required to pay the City for access to the public right-of-ways then this will most likely impede the FiberCity® Haverhill investment opportunity. Once Service Providers begin to use the FiberCity® network, each Service Provider will be expected to satisfy any federal, State or local law pertaining to franchise fees and taxes that they are subjected to.

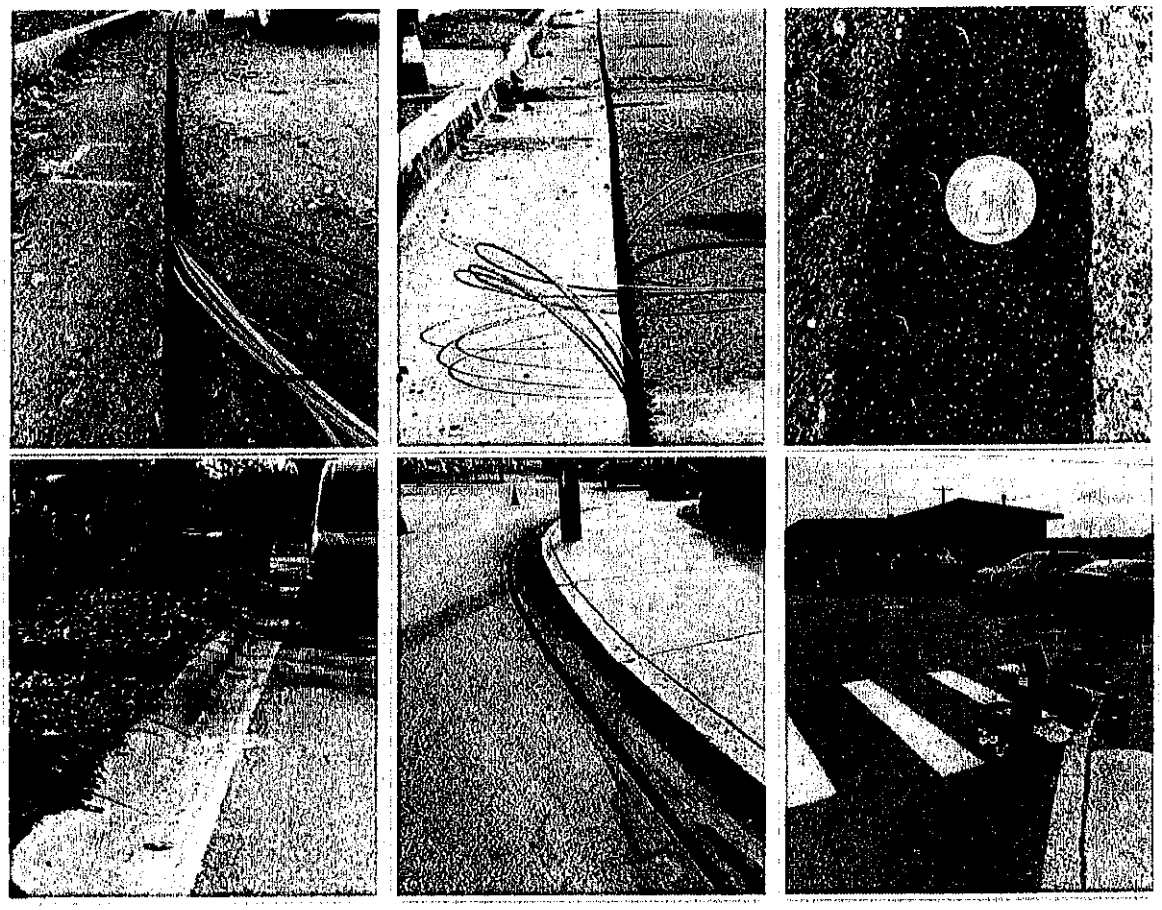
13.System Installation and Maintenance

SiFi use the latest micro-trenching techniques to deploy our FiberCity® networks as it provides benefits such as, but not limited to:

- Minimal to no lane closures.
- Each construction crew machine averages 2500 – 3000 ft per day.
- Each slot cut is closed during the same day.
- Traffic can drive over the slot cut without stopping construction due to its minimal width of 1.25", with such environments being, but not limited to, residential or business driveways and main thoroughfares.
- Multiple installation location options within the public right-of-ways. These locations are agreed with City engineering at the outset and incorporated into the Development Agreement, which construction permits are raise upon.

It is intended that 100% of the FiberCity® Haverhill build will be deployed using micro-trench technology, similar to all other FiberCity® deployments. The images below illustrate the micro-trench work undertaken during FiberCity® projects on both the west and east coast of the U.S.





FiberCity® project scheduling, winter shutdowns and or incremental weather affects, number of allowed crews, construction maintenance and planning are to be agreed via workshops between SiFi and our appointed construction partner and City engineering.

CONCLUSION

This RFP response is based on SiFi providing the City of Haverhill with a flexible and transparent model that delivers a citywide, Gigabit speed, fiber-optic network that removes the digital divide and enables fiber connectivity to every premise, public building, and municipal facility in line with the goals outlined within your RFP.

Like other FiberCity® investments illustrated in the FiberCity® partnership map, FiberCity® Haverhill will be privately funded by the private sector and constructed and monitored by highly reputable firms on behalf of SiFi; such partners who are already constructing and monitoring FttP networks on behalf of U.S. telecommunication providers.

The FiberCity® network will pass every premise within an agreed short timeframe – typically 24 months - connecting premises with fiber when the premise occupier or owner requests connectivity from one of the competitive Service Providers on the network.

An advanced network architecture, which can deliver mission critical and high-demand services that conform to stringent 99.999 SLA agreements is great, but equally important are the Service Providers that deliver the range of services over the network to the end users. It is for this reason that SiFi continues to partner with highly credible Service Providers to deliver advanced services over our FiberCity® networks across the country; some of these Service Providers have expressed an interest in serving the City. Furthermore, SiFi is open to working with any credible Service Provider to support the delivery of a successful fiber project throughout the City, whether they be small or large or local or out-of-state, that the City may suggest.

Digital Inclusion is a key area of focus for FiberCity® Haverhill and one that SiFi is discussing with other FiberCity® communities. SiFi welcomes dialogue with City staff on this topic to ensure all avenues are pursued to accommodate the goals and desires laid out in the RFP.

Only by having an ***independently operated network*** that is ***neutral and separates the infrastructure from the Service Providers*** will the City be able to achieve such a competitive position and build upon the forward thinking steps the City has already taken. Such steps not only ensure the City is one of the elite communities to have a true fiber to the premise Gigabit speed network, but you will also have a fiber rich Smart City infrastructure that places the City ahead of the competition and serves as a platform to drive economic development.

Finally, SiFi ensures all required funds for a citywide build-out are in place prior to commencement of any construction; thus, providing City Council with a high degree of comfort in support of the FiberCity® project.

SIGNED CERTIFICATE OF NON-COLLUSION

REQUEST FOR PROPOSALS
T-08
FTTP NETWORK
CERTIFICATIONS

NON-COLLUSION

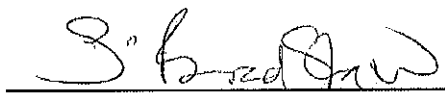
The undersigned certifies under penalties of perjury that this proposal or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee club, or other organization, entity, or group or individuals.

TAX COMPLIANCE

Pursuant to M.G.L. Chapter 62C, Sec. 49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

CERTIFICATE OF CORPORATE AUTHORITY

The undersigned hereby certifies that I am duly authorized to sign and submit this proposal on behalf of my business/corporate entity and its governing body.



(Signature of authorized individual submitting proposal)

Scott Bradshaw
(Printed Name)

SiFi Networks
(Name of Proposer)

February 23, 2021
(Date)



'PRICE PROPOSAL'

City of Haverhill, Massachusetts

Response to Request for Proposal
RFP:007.21

Fiber to the Premises (FTTP) Network

Proposals Due By: February 26, 2021 10:00am

City of Haverhill Purchasing Office
Steven Bucuzzo
Purchasing Director
City Hall, Room 105
4 Summer Street
Haverhill, MA 01830

Telephone: (978) 420-3606
purchasing@cityofhaverhill.com

PRICE PROPOSAL

FIBERCITY® PRICE PROPOSAL

SiFi Networks will 100% privately fund, build, operate, and maintain the proposed FiberCity® network without the use of any taxpayer subsidy towards its construction. There is no ($0) financial investment required from the City towards construction of the FiberCity® network.

Within the Development Agreement the language will outline all costs associated with the project such as, but not limited to, permits, plan check and inspections fees that SiFi will pay the City in the delivery of the FiberCity® Haverhill network.

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
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August 6, 2021

City Council President Melinda E. Barrett and Members of the Haverhill City Council

RE: Proposed Ballot Question Regarding Ward City Councilors

Dear Madame President and Members of the Haverhill City Council:

Enclosed please find my letter dated March 17, 2020 regarding District City Councilors and School Committee members. I recommended at that time that these orders be placed on the November 2020 ballot. Unfortunately, that did not happen. As you recall, the City Council sent this matter to committee but it was never acted upon.

I am now enclosing 2 new orders to put these items on the ballot in November 2021 as binding referendums.

I continue to believe that this city is best served if every neighborhood has a neighborhood City Councilor to best address their needs as well as 4 At-Large City Councilors.

The COVID-19 situation has also convinced me that we need neighborhood representation on the School Committee. The 2 orders are before you and I recommend approval.

Respectfully submitted,

James J. Fiorentini
Mayor

JJF/lyf

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
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March 17, 2020

City Council President Melinda E. Barrett and Members of the Haverhill City Council

RE: Proposed Ballot Question Regarding Ward City Councilors

Dear Madame President and Members of the Haverhill City Council:

Enclosed please find a proposed ballot question to be placed on the ballot for the Tuesday, November 3, 2020 State Election.

This ballot question asked whether or not we should petition the legislature to allow us to change our charter to elect seven Councilors by ward and four Councilors at large. I know the Council is quite familiar with this issue so I need not explain it further.

While there is nothing that would prevent the City Council from voting on this Tuesday night, it is my recommendation that we keep this on file for two weeks in order to allow more public discussion. I recommend that this matter be tabled until the March 31 City Council meeting and be scheduled for a vote at that time.

I know there is also been some discussion about other matters such as ward School Committee members before the public. While I am certainly open to discussing this with the City Council and to having public discussion about this, it is my feeling that if we decide to go with other ballot initiatives that they should be on the municipal ballot next year. These matters are more complex and require planning and discussion. If the Council would prefer to have that discussion this year and if there is a Council desire to put that on the ballot this year I am certainly open to discussing and working with the Council on that.

Respectfully submitted,

James J. Fiorentini
Mayor

JJF/lyf

DOCUMENT

5.13.1

CITY OF HAVERHILL

In Municipal Council

ORDERED:

Pursuant to the provisions of §C-43 of the Charter of the City of Haverhill the following question shall be submitted to a vote of the registered voters of the city for adoption or rejection at a special city election to be held on Tuesday, November 2, 2021:

"Shall the following Home Rule Petition providing for the election of at large and ward councilors be adopted and forwarded to the General Court for enactment?

_____ Yes

_____ No

HOME RULE PETITION

AN ACT PROVIDING FOR THE ELECTION OF AT LARGE AND WARD COUNCILORS IN THE CITY OF HAVERHILL.

Be it enacted, etc. as follows:

SECTION 1. City Council. Notwithstanding chapter 43 of the General Laws or any other general or special law or rule, regulation or ordinance to the contrary, there shall be in the city of Haverhill a city council of 11 members, which council shall have all the rights, powers and duties of the city except as otherwise provided by the general laws, this act, the city charter, or any amendments thereto. Each councilor shall be elected for a term of 2 years: 4 councilors shall be elected at large by the voters of the entire city and 1 councilor shall be elected from each district of the city of Haverhill, which district shall be one ward, or otherwise, as defined in the ordinances of the city.

SECTION 2. Nomination. (a) Councilor at large. An individual seeking to be elected as councilor at large shall be a resident and registered voter of the city on the date they take out nomination papers for the office and at all times thereafter. Nomination papers for councilor at large shall be signed by no less than 50 registered voters of the city. (b) District Councilor. An individual seeking election as a district councilor shall be a resident and registered voter of the city and that district, on the date they take out nomination papers for the office and at all times thereafter, except as provided for in Section 3 below. Nomination papers for district councilor shall be signed by no less than 25 registered voters of the district from which the individual seeks to be elected.

(5.3.1)

SECTION 3. Removal from City or Ward. A councilor at large or district councilor that removes from the city during their elected term shall be deemed by the city clerk to have vacated their office. A district councilor that moves from one ward to another during the first 18 months of the elected term shall be deemed to have vacated their seat, however, a district councilor who removes from the district from which they were elected during the last six months of the elected term may complete their term as district councilor.

SECTION 4. Effective Date. This act shall take effect upon passage, and the offices of four councilors at large and seven ward councilors shall appear on the ballot at the 2023 biennial city election. Nomination papers shall differentiate between councilor at large and district councilor, and shall be furnished by the city clerk to individuals requesting the same. All incumbent elected councilors who submit nomination papers for election to any position on the city council at such 2023 biennial city election shall be entitled to have the words "candidate for re-nomination" or "candidate for re-election" appear next to their name on the ballot."

At Large + Ward Councillors

DOCUMENT

5.3.2

CITY OF HAVERHILL

In Municipal Council

ORDERED:

Pursuant to the provisions of §C-43 of the Charter of the City of Haverhill the following question shall be submitted to a vote of the registered voters of the city for adoption or rejection at a regular city election to be held on Tuesday, November 2, 2021:

"Shall the following Home Rule Petition providing for the election of at large and ward school committee members be adopted and forwarded to the General Court for enactment?

_____ Yes

_____ No

HOME RULE PETITION

AN ACT PROVIDING FOR THE ELECTION OF AT LARGE AND WARD SCHOOL COMMITTEE MEMBERS IN THE CITY OF HAVERHILL.

Be it enacted, etc. as follows:

SECTION 1. School Committee. Notwithstanding chapter 43 of the General Laws or any other general or special law or rule, regulation or ordinance to the contrary, there shall be in the city of Haverhill a school committee of 9 members, which committee shall have all the rights, powers and duties of a school committee as provided by the general laws, this act, the city charter, or any amendments thereto. The mayor shall serve, in an ex officio capacity, as chairperson of the school committee, with a voice and a vote. Each other member shall be elected for a term of 2 years: 3 school committee member shall be elected at large by the voters of the city and 5 school committee member shall be elected from each district of the city, which district shall be defined in the ordinances of the city.

SECTION 2. Nomination. (a) School Committee Member At Large. An individual seeking to be elected as school committee member at large shall be a resident and registered voter of the city on the date they take out nomination papers for the office and at all times thereafter. Nomination papers for school committee member at large shall be signed by no less than 50 registered voters of the city. (b) District School Committee Member. An individual seeking election as a district school committee member shall be a resident and registered voter of the city, and that district, on the date they take out nomination papers for the office and at all times thereafter, except as

5.13.2

provided for in Section 3 below. Nomination papers for district school committee member shall be signed by no less than 25 registered voters of the district from which the individual seeks to be elected.

SECTION 3. Removal from City or District. A school committee member at large or district school committee member that removes from the city during their elected term shall be deemed by the city clerk to have vacated their office. A district school committee member that moves from one district to another during the first 18 months of the elected term shall be deemed to have vacated their seat, however, a district school committee member who removes from the district from which they were elected during the last six months of the elected term may complete their term as district school committee member.

SECTION 4. Effective Date. This act shall take effect upon passage, and the offices of eight school committee members, 7 district school committee members, and 1 school committee member at large shall appear on the ballot at the 2023 biennial city election. Nomination papers shall differentiate between school committee member at large and district school committee member, and shall be furnished by the city clerk to individuals requesting the same. All incumbent elected school committee members holding office as of the effective date of this act who submit nomination papers for election to any position on the school committee at such 2023 biennial city election shall be entitled to have the words "candidate for re-nomination" or "candidate for re-election" appear next to their name on the ballot."

At Large + Ward School Committee

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
HAVERHILL, MA 01830
PHONE 978-374-2300
FAX 978-373-7544
MAYOR@CITYOFHAVERHILL.COM
WWW.CI.HAVERHILL.MA.US

5-4

August 5, 2021

City Council President Melinda E. Barrett and Members of the Haverhill City Council

RE: Establishment of the Housing Task Force to Address Housing Affordability in Haverhill

Dear Madame President and Members of the Haverhill City Council:

Several weeks ago, on June 25, I introduced an ordinance to require that 10% of the housing units that are built in Haverhill be affordable. That ordinance is going to be deliberated on by the Planning Board at its August 11th meeting and is scheduled to come before the city council in September.

I filed this ordinance because I am concerned about the high cost of housing and rents in the city. While we certainly welcome people to Haverhill that have the means to buy or rent market rate housing, we must always be cautious that the average Haverhill resident is not priced out of living here. Current Haverhill residents need to be able to share in the housing opportunities that are being approved. We need to keep our city affordable so that the average Haverhill resident and our children and grandchildren can afford to live here..

I filed this ordinance as a first step to make certain that our city remains affordable. However, I believe that this ordinance is just a first step. More needs to be done and we need a more comprehensive ordinance and policy.

Several cities have developed more comprehensive inclusionary zoning ordinances to achieve the goal we are seeking: to keep Haverhill affordable. The City of Malden commissioned a comprehensive report called the "Inclusionary Zoning Feasibility Study." Ordinances have also been developed in several other cities.

I would like to address the City Council on this critical issue which is facing our city. I will be establishing a Housing Task Force to advise me and advise the city on the best ways of providing housing that includes providing affordable units in these developments. I would also like to suggest that the City Council consider sending this policy initiative to one of their subcommittees so that we can work together on this critical issue.

Respectfully submitted,

James J. Fiorentini
Mayor

JJF/lyf

5.4.1

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
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HAVERHILL, MA 01830
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MAYOR@CITYOFHAVERHILL.COM
WWW.CI.HAVERHILL.MA.US

August 5, 2021

City Council President Melinda E. Barrett and Members of the Haverhill City Council

RE: Housing Task Force Establishment and Appointments

Dear Madame President and Members of the Haverhill City Council:

I hereby establish a Housing Task Force to advise the Mayor, the City Council and the city on the best means of establishing Inclusionary Housing for the City of Haverhill.

I will shortly be adding public members to this task force. My initial appointments to the Housing Task Force are:

- William Pillsbury, Chairman, Haverhill Economic Development & Planning Director
- Matthew Hennigan, Community Development Block Grant Office, Housing Manager
- Andrew Herlihy, Community Development Block Grant Office Director
- Kerry Perry, Community Action Commission
- Manny Matias, Haverhill Latino Coalition
- Robert Driscoll, Chairperson, Haverhill Housing Authority

I will be announcing shortly several other appointments from the private sector.

These non-confirming appointments take effect immediately.

Very truly yours,

James J. Fiorentini
Mayor

JJF/lyf

CITY COUNCIL

MELINDA E. BARRETT
PRESIDENT
COLIN F. LEPAGE
VICE PRESIDENT
JOSEPH J. BEVILACQUA
JOHN A. MICHITSON
THOMAS J. SULLIVAN
TIMOTHY J. JORDAN
MICHAEL S. MCGONAGLE
MARY ELLEN DALY O'BRIEN
WILLIAM J. MACEK

6.1

CITY OF HAVERHILL
HAVERHILL, MASSACHUSETTS 01830-5843

CITY HALL, ROOM 204
4 SUMMER STREET
TELEPHONE: 978 374-2328
FACSIMILE: 978 374-2329
www.cityofhaverhill.com
citycncl@cityofhaverhill.com

August 2, 2021

TO: President and Members of the City Council:

Councillor Bevilacqua requests to introduce Marlene Stasinos of Chris' Farm Stand and recognize the 50th Anniversary of Chris' Farm Stand, 436 Salem Street.

Joseph Bevilacqua /lac

City Councillor Joseph Bevilacqua

8.1

WILLIAM PILLSBURY, JR.,
DIRECTOR
TELEPHONE: 978-374-2344 V/TDD
FAX: 978-374-2332

CITY OF HAVERHILL
COMMUNITY DEVELOPMENT

CITY HALL, ROOM 309
FOUR SUMMER STREET
HAVERHILL, MA 01830-5843

August 5, 2021

TO: City Council President Melinda Barrett and Members of the City Council

FROM: Andrew S. Herlihy, Community Development Division Director

RE: 86 Essex Street – HDIP TIF Resolution

On behalf of the Economic Development Department, I am pleased to ask for your approval to submit key documents related to the exciting redevelopment occurring at 86 Essex Street. As you recall, the City Council previously granted approval for this project.

I am asking the City Council to approve the attached resolution authorizing the Mayor to submit certain Documents related to the Commonwealth's Housing Development Incentive Program (HDIP) and the program's required Tax Increment Financing (TIF) agreement, and any related documents required for this project to become a reality. This TIF agreement mirrors other similar TIF agreements previously approved for HDIP projects by the City Council.

8.1.1

DOCUMENT

CITY OF HAVERHILL

In Municipal Council

~~ORDERED:~~

CITY OF HAVERHILL

RESOLUTION

BE IT RESOLVED THAT THE City Council of the City of Haverhill:

(a) authorizes the Mayor to approve and execute a TIF agreement, pursuant to Massachusetts General Laws HDIP Program between Haverhill 86 LLC and the City of Haverhill on the basis of the development of the 86 Essex Street parcel number map 302 block 56 lot 1; and

(b) Authorizes the Mayor or his designee to take such other and further actions as may be necessary or appropriate to carry out the purposes of this resolution, or take any other action relative thereto.

8.2

CITY OF HAVERHILL

MASSACHUSETTS
CITY SOLICITOR'S OFFICE
145 South Main Street
Bradford, MA 01835
(978) 373-2360
FAX: 978/372-0688
EMAIL: billcoxlaw@aol.com

WILLIAM D. COX, JR.
CITY SOLICITOR

August 5, 2021

TO: Melinda Barrett, President, and Members of the Haverhill City Council

FROM: William D. Cox, Jr., Esq., City Solicitor

RE: 97 Corliss Hill Road

An Order has been prepared for your consideration which would authorize the Mayor to enter into a Memorandum of Agreement By and Between the City of Haverhill and Essex County Greenbelt Association, Inc. for the assignment of the City's MGL c. 61A rights regarding the option to purchase the property at 97 Corliss Hill Road, and, to provide for the subsequent purchase by the City's Water Department of a portion of the parcel, all as described in the documents submitted.

Both Vanessa Johnson-Hall, Assistant Director of Land Conservation for Essex County Greenbelt Association, and I look forward to joining you on Tuesday evening to further discuss the details of the proposed Agreement. In the mean time, if you have any questions or concerns about this matter, kindly contact me in advance so that I can respond timely to your questions or concerns.

cc: James J. Fiorentini, Mayor

8.2.1

DOCUMENT

CITY OF HAVERHILL

In Municipal Council

ORDERED:

That the Mayor is hereby authorized to execute a certain *Memorandum of Agreement By and Between the City of Haverhill and Essex County Greenbelt Association, Inc.* ("Greenbelt"), ("Agreement") a copy of which is attached hereto and incorporated herein, regarding agricultural/horticultural land at 97 Corliss Hill Road and the City's option to purchase pursuant to M.G.L. Chapter 61A, which shall be assigned to Greenbelt. Following Greenbelt's acquisition of the property, Greenbelt will divide the parcel and sell to the City's Water Department a 13.3 +/- acre portion of the premises, all as described in said Agreement.

That the City of Haverhill Water Department being and is hereby authorized on behalf of the City of Haverhill, as authorized under M.G.L. c.40, §39A, to purchase, hold and manage a 13.3 +/- acre unique parcel of land which is a portion of 97 Corliss Hill Road, Haverhill, MA* (Assessor's Map 462, Block 204, Lot 71B) and more specifically shown as as Lot 71B on that certain plan entitled "Proposed Site Plan of Land at 117 Corliss Hill Road, Haverhill, Massachusetts, Owner/Applicant: Leslie Salach and Michael W. Byra", prepared by R.A.M. Engineering, dated September 2008, and recorded in the Essex Southern District Registry of Deeds in Plan Book 418 as Plan 86, for the sum of $150,000, for the purposes of water supply protection and land conservation under M.G.L c. 40, § 38, 398, 41 and 158, and Article 97 of the Amendments to the Massachusetts Constitution.

The City of Haverhill Water Department, City Council, and the Mayor being and are hereby authorized to execute any and all other documents as required to complete the terms of said Agreement, the purchase and to comply with all of the terms of sale. Also, that the City of Haverhill Water Department being and is hereby authorized to utilize funds as appropriated by City Council in the FY 2022 Water Fund as the means to fund the acquisition of the parcel.

Also, that the City of Haverhill Water Department, the City Council and the Mayor being and are hereby authorized to seek and accept funding under the Commonwealth of Massachusetts Executive Office of Energy & Environmental Affairs, Drinking Water Supply Protection grant program, Chapter 312 of the Acts of 2008, § 2A, 2200-7017, and enter into any contracts for the acquisition of the parcel.

That the Mayor and City Council hereby approve Conservation Restrictions to and from the Essex County Greenbelt Association, Inc., as cited in the Agreement and further incorporated herein, for the preservation of the above natural resources of the City and being in the public interest pursuant to Massachusetts General Laws Chapter 184, Section 32.

*Exhibit B of the above cited Agreement provides the portion to be purchased by the Water Department.

MEMORANDUM OF AGREEMENT BY AND BETWEEN
THE CITY OF HAVERHILL
AND
ESSEX COUNTY GREENBELT ASSOCIATION, INC.

PARTIES

THIS MEMORANDUM OF AGREEMENT (the "Agreement") is entered into by and among the City of Haverhill, acting by and through its Mayor and/or its City Council (the "City"), the City of Haverhill, acting by and through its Water Division (the "Water Division"), and Essex County Greenbelt Association, Inc. ("Greenbelt").

PURPOSES

WHEREAS, Daniel S. Byra and Mark A. Byra (together with their respective heirs and personal representatives, the "Current Owners") are the owners of that certain parcel of land located in Haverhill, Essex County, Massachusetts, shown as Lot 71B on that certain plan entitled "Proposed Site Plan of Land at 117 Corliss Hill Road, Haverhill, Massachusetts, Owner/Applicant: Leslie Salach and Michael W. Byra," prepared by R.A.M. Engineering, dated September 2008, and recorded in the Essex Southern District Registry of Deeds in Plan Book 418 as Plan 86 (a copy of which is attached hereto as **Exhibit A** and incorporated herein), and which parcel of land is commonly identified as 97 Corliss Hill Road and Assessor's Parcel 462-204-71B (collectively, the "Property"); and

WHEREAS, the Property is enrolled in a preferential tax classification as agricultural/horticultural land pursuant to M.G.L. Chapter 61A, which statute grants to the City an option to purchase the Property in the event that the Current Owners intend to sell the Property for residential, commercial or industrial use (the "Purchase Option"); and

WHEREAS, the Current Owners have entered into a purchase and sale agreement with M. Ryan Norman for one or more such uses, and the Current Owners have delivered the statutorily required Notice of Intent to the City; and

WHEREAS, the City wishes to assign the Purchase Option to Greenbelt, and Greenbelt wishes to accept such assignment and purchase the Property, subject to the terms and conditions set forth herein; and

WHEREAS, following Greenbelt's acquisition of the Property, Greenbelt intends to divide the Property into two parcels as generally depicted upon the sketch plan attached hereto as **Exhibit B** and incorporated herein (the "Property Division Sketch Plan"); and

WHEREAS, following such division, the parties wish to engage in additional transactions with respect to the Property, such as (i) the taking of the 13+/- acre parcel shown on the Property Division Plan (collectively, the "City Land") by the Water Division (the "Taking"), (ii) the granting of a perpetual conservation restriction by the Water Division to Greenbelt on, over and

across the City Land, which conservation restriction shall be substantially similar to the draft document attached hereto as **Exhibit C** and incorporated herein (in its final form, the "City CR"), and (iii) the granting of a perpetual conservation restriction by Greenbelt to the Water Division on, over and across the 9.5+/- acre parcel shown on the Property Division Sketch Plan (the "Greenbelt Land"), which conservation restriction shall be substantially similar to the draft document attached hereto as **Exhibit D** and incorporated herein (in its final form, the "Greenbelt CR"), all subject to the terms and conditions set forth herein; and

WHEREAS, the parties have prepared that certain timeline of actions attached hereto as **Exhibit E** and incorporated herein (the "Timeline"), to which the parties agree to adhere to the best of their abilities; and

WHEREAS, the purpose of this Agreement is to set forth the respective rights and obligations of the City, the Water Division and Greenbelt with respect to the Purchase Option and the subsequent transactions with respect to the Property.

AGREEMENT

NOW THEREFORE, in consideration of the mutual covenants contained herein, the sufficiency of which is hereby acknowledged, the City, the Water Division and Greenbelt, agree as follows:

A. **Assignment and Acceptance of Purchase Option**. The City agrees to assign the Purchase Option and Greenbelt agrees to accept the Purchase Option, subject to the terms and conditions set forth herein. Notwithstanding anything to the contrary set forth herein, however, the assignment of the Purchase Option by the City and/or the acceptance of such assignment by Greenbelt is expressly conditioned upon satisfaction of all of the following contingencies:

(i) No later than October 15, 2021, the full and complete negotiation of the City CR and the Greenbelt CR, subject to the final review by the Commonwealth of Massachusetts, and Greenbelt's submission of such instruments to the Commonwealth of Massachusetts for review; and

(ii) No later than October 31, 2021, Greenbelt's and the Water Division's satisfaction with the approval-not-required plan commissioned by Greenbelt at Greenbelt's sole expense dividing the Property into the City Land and the Greenbelt Land (the "ANR Plan"), which plan shall be based upon the Property Division Sketch Plan. Greenbelt shall deliver a draft of such plan to the Water Division no later than October 15, 2021;

(iii) No later than November 15, 2021, Greenbelt's and the Water Division's satisfaction with its due diligence investigations of the Property, with Greenbelt agreeing to share with the Water Division copies of any and all title reports, environmental inspections and/or appraisals of the Property commissioned by Greenbelt at Greenbelt's sole expense (though the Water Division agrees and acknowledges that Greenbelt is not making any representations or warranties with respect to the completeness or accuracy of such materials) and with the Water

Division agreeing to confirm to Greenbelt in writing its satisfaction with the condition of title to and the physical condition (including, but not limited to, the environmental condition) of the Property; and

(iv) No later than November 30, 2021, a public hearing(s) has been held by the City with respect to the assignment of the Purchase Option, the Taking, the granting of the City CR and the acceptance of the Greenbelt CR; and

(v) No later than November 30, 2021, the full and complete negotiation of the consensual order of taking (the "Order of Taking"); and

(vi) No later than December 15, 2021, Greenbelt's receipt of the unqualified approval of its Board of Directors with respect to the assignment of the Purchase Option, the exercise of the Purchase Option, the acquisition of the Property, the acceptance of the City CR and the granting of the Greenbelt CR; and

(vii) No later than December 15, 2021, the affirmative vote of the Mayor and the City Council with respect to the assignment of the Purchase Option; and

(viii) No later than December 15, 2021, Greenbelt and the City have executed and exchanged original counterparts to the assignment and assumption agreement attached hereto as **Exhibit F** and incorporated herein (the "Assignment of First Refusal Option"); and

(ix) No later than December 15, 2021, Greenbelt has received from the City an original executed and acknowledged notice in the form attached hereto as **Exhibit G** and incorporated herein (the "Notice of Assignment of First Refusal Option"); and

(x) No later than December 15, 2021, Greenbelt has been provided with sufficient evidence that the City has successfully appropriated no less than $150,000 as consideration for the Taking (collectively, the "Water Division Funds") and that such funds will be delivered in escrow in advance of the Closing by means of a wire transfer of immediately available funds.

In the event that one of more of these contingencies remains unsatisfied as of 5:00 p.m. Eastern Time on the applicable date, any party hereto may terminate this Agreement upon written notice to the other parties, in which case no party shall have any further obligations hereunder.

If, however, all of these contingencies are satisfied by the applicable deadline, Greenbelt, at its expense, shall record the Notice of Assignment of First Refusal Option in the Southern Essex District Registry of Deeds no later than December 17, 2021, and Greenbelt shall deliver a copy of such recorded notice to the Current Owners by means of certified mail.

B. **Exercise of Purchase Option**. Unless this Agreement is earlier terminated in accordance with its terms, no later than January 5, 2022, Greenbelt agrees to exercise the Purchase Option, record a notice of exercise in the Southern Essex District Registry of Deeds, and deliver a copy of said recorded notice to the Current Owners, together with a proposed purchase and sale agreement, by means of certified mail.

C. **Acquisition of Property by Greenbelt; Closing Date**. Unless this Agreement is earlier terminated in accordance with its terms, Greenbelt shall acquire the Property pursuant to the terms and conditions of a purchase and sale agreement by and between the Current Owners, as seller, and Greenbelt, as buyer (the "Acquisition P&S"), on March 31, 2022 (as such date may be modified and/or extended by the Current Owners and Greenbelt, the "Closing Date"). Notwithstanding anything to the contrary set forth herein, however, Greenbelt's acquisition of the Property is expressly conditioned upon satisfaction of all of the following contingencies:

(i) No later than February 28, 2022, the execution of the City CR and the Greenbelt CR (each in their final form as approved by the Commonwealth of Massachusetts) by the City, the Water Division and Greenbelt, with all original and acknowledged counterparts being delivered to Greenbelt; and

(ii) No later than March 15, 2022, the execution of the Acquisition P&S by the Current Owners and Greenbelt; and

(iii) No later than March 22, 2022, Greenbelt's receipt of the Commonwealth of Massachusetts' original and acknowledged signatures on the City CR and the Greenbelt CR; and

(iv) No later than March 22, 2022, the Water Division's delivery of the Water Division Deliveries to (as defined in Section E herein) to the Closing Agent (as defined in Section D herein).

In the event that one of more of these contingencies remains unsatisfied as of 5:00 p.m. Eastern Time on the applicable date, Greenbelt may terminate this Agreement upon written notice to the other parties, in which case no party shall have any further obligations hereunder.

D. **Closing**. Greenbelt's acquisition of the Property, the Taking, the grant of the City CR and the grant of the Greenbelt CR (collectively, the "Closing") shall occur on the Closing Date. The Closing shall be conducted by a Massachusetts-licensed attorney or a representative of a Massachusetts title insurance company (as applicable, the "Closing Agent") selected by Greenbelt, and the cost of Closing Agent's services shall be borne solely by Greenbelt.

The Water Division shall deposit the Water Division Deliveries in escrow with Closing Agent at least three (3) business days in advance of the Closing Date, and Greenbelt shall deposit the Greenbelt Deliveries (as defined in Section E herein) with Closing Agent at least three (3) business days in advance of the Closing Date. On the Closing Date, Closing Agent shall record a municipal lien certificate (if Greenbelt so elects), the quitclaim deed from the Current Owners conveying the Property to Greenbelt (the "Deed"), the ANR Plan, the Order of Taking, the City CR and the Greenbelt CR, strictly in that order, and shall disburse the Water

Division Funds to Greenbelt. It is agreed that Closing Agent shall have no liability to the Water Division or Greenbelt for the performance of its services herein except as a result of Closing Agent's gross negligence or willful misconduct.

Notwithstanding anything to the contrary set forth herein, however, in the event that Greenbelt fails to acquire the Property on the Closing Date for any reason, this Agreement shall terminate automatically and no party shall have any further obligations hereunder (including, but not limited to, any obligation to initiate and/or participate in litigation).

E. **Closing Deliveries**. No later than 12:00 noon on the third (3rd) business day prior to the Closing Date, the Water Division and Greenbelt shall deliver the documents and/or monies described below. All documents shall be originals, executed by an authorized representative(s) of the Water Division and/or Greenbelt, as applicable, and if such closing document is intended to be recorded, each signature will be properly acknowledged.

(i) Water Division Deliveries. No later than the above deadline, the Water Division shall deliver the following items to Closing Agent in escrow (collectively, the "Water Division Deliveries"): (i) the Water Division Funds, (ii) the Order of Taking, and (iii) if applicable, a certified vote authorizing the Taking, the grant of the City CR and/or the acceptance of the Greenbelt CR.

(ii) Greenbelt Deliveries. No later than the above deadline, Greenbelt shall deliver the following items to Closing Agent in escrow (collectively, the "Greenbelt Deliveries"): (i) the remaining funds necessary to acquire the Property as set forth on that certain settlement statement by and between the Current Owners and Greenbelt, (ii) all documents required of Greenbelt by the terms of the Acquisition P&S, (iii) the signed, stamped and recordable mylar of the ANR Plan, (iv) the fully executed City CR, and (v) the fully executed Greenbelt CR.

F. **Closing Expenses and Prorations**. Greenbelt shall pay all recording fees associated with any municipal lien certificates, the Deed, the ANR Plan, the Order of Taking, the City CR, the Greenbelt CR and any other documents required to effectuate the transactions contemplated herein (such as certified votes). The parties acknowledge and agree that no transfer taxes or deed stamps are required with respect to the Order of Taking, the City CR and/or the Greenbelt CR and that real estate taxes on the City Land shall not be prorated at Closing. The City and the Water Division further acknowledge and agree that no conveyance taxes and/or rollback taxes shall be assessed against Greenbelt with respect to the Property at or following the Closing. Each party shall be responsible for its own legal expenses and for the costs associated with its own policies of title insurance, if any.

G. **Condition of Title**. At the time of the recording of the Order of Taking, the City CR and the Greenbelt CR, the Property shall be subject only to the following encumbrances (collectively, the "Permitted Encumbrances"):

(i) the applicable laws and regulations of any governmental authority in effect on the date hereof; and

(ii) the statutory lien for current year real property taxes not yet due and payable; and

(iii) any statutory liens imposed by virtue of the Subject Property's enrollment in a preferential tax classification pursuant to M.G.L. Chapters 61A, to the extent that such liens remain in effect and in force; and

(iv) that certain easement to New England Telephone and Telegraph Company dated September 8, 1941, and recorded in the Southern Essex District Registry of Deeds in Book 3279 at Page 515; and

(v) that certain easement to New England Telephone and Telegraph Company dated September 14, 1953, and recorded in the Southern Essex District Registry of Deeds in Book 4026 at Page 169; and

(vi) those matters shown on the ANR Plan.

H. **As-Is, Where-Is Condition; Delivery of City Land**. The parties, each having been given the opportunity to inspect the Property, agree as follows:

(i) Upon the recording of the Order of Taking, Greenbelt shall deliver to the Water Division full possession of the City Land free and clear of the rights and claims of all other parties, other than as set forth in the Permitted Encumbrances, and the Water Division agrees to accept the City Land in AS-IS, WHERE-IS condition as of the date hereof, reasonable wear and tear excepted. Accordingly, the Water Division hereby waives any and all claims it might otherwise have against Greenbelt, now or in the future, relating to the title to, condition of, siting and/or boundaries of the City Land and/or value of the City Land; and

(ii) The Water Division hereby agrees to accept the Greenbelt CR with the Greenbelt Land in AS-IS, WHERE-IS condition as of the date hereof, reasonable wear and tear excepted. Accordingly, the Water Division hereby waives any and all claims it might otherwise have against Greenbelt, now or in the future, relating to the title to, condition of, siting and/or boundaries of the Greenbelt Land and/or value of the Greenbelt CR, provided, however, that this sentence shall not serve to negate, modify, or amend any warranties of title and/or covenants made by Greenbelt in the Greenbelt CR; and

(iii) Greenbelt hereby agrees to accept the City CR with the City Land in AS-IS, WHERE-IS condition as of the date hereof, reasonable wear and tear excepted. Accordingly, Greenbelt hereby waives any and all claims it might otherwise have against the Water Division, now or in the future, relating to the title to, condition of, siting and/or boundaries of the City Land and/or value of the City CR, provided, however, that this sentence shall not serve to negate, modify, or amend any warranties of title and/or covenants made by the Water Division in the City CR.

I. **Defaults; Remedies**. In the event that any party fails to perform its obligations hereunder, either of the other parties shall have the right, but not the obligation, to terminate this Agreement upon written notice the other parties, in which case no party shall have any further obligations hereunder.

J. **Notices**. All notices pertaining to this Agreement shall be in writing delivered to the parties by hand, by facsimile, by commercial express courier service or by first class United States mail, postage prepaid, addressed to the parties at the addresses set forth below.

City:

James J. Fiorentini, Mayor, 4 Summer Street, Haverhill, MA 01830, Tel: (978) 374-2300, Fax: (978) 373-7544

Water Division:

Robert Ward, Deputy Director, Department of Public Works, 40 South Porter Street, Haverhill, MA 01835, Tel: (978) 374-2382, Fax: (978) 521-4083

Greenbelt:

Essex County Greenbelt Association, Inc.
Attn: Vanessa Johnson-Hall
82 Eastern Ave.
Essex, MA 01929
Tel: (978) 768-7241 ext. 16
Fax: (978) 768-3286

All notices given personally or by facsimile shall be deemed given when received. All notices given by mail or by commercial express courier service shall be deemed given when deposited in the mail, first class postage prepaid, or with such courier, addressed to the party to be notified. The parties may, by notice as provided above, designate a different address to which notice shall be given.

K. **Applicable Law**. This Agreement shall be governed by and construed and enforced in accordance with the laws of the Commonwealth of Massachusetts without regard to conflict of law principles.

L. **Binding on Successors**. This Agreement shall be binding not only upon the parties, but also upon their respective assigns and/or successors in interest.

M. **Time of the Essence; Next Business Day**. Time is of the essence in this Agreement. Notwithstanding anything to the contrary set forth herein, in the event that any date for performance or notice hereunder falls on a Saturday, Sunday, a date on which a state of emergency has been declared in the Commonwealth of Massachusetts, a state, federal or bank holiday, or, with respect to the Closing Date, a date on which the applicable registry of deeds is closed for any reason, the deadline for such performance or notice shall be automatically extended to the next business day.

N. **Entire Agreement; Modification; Waiver**. This Agreement constitutes the entire agreement between the parties pertaining to the subject matter contained in it and supersedes all prior and contemporaneous agreements, representations, and understandings. This Agreement shall be construed without regard to any presumption or other rule requiring construction against the party causing this Agreement to be drafted. No supplement, modification, waiver or amendment of this Agreement shall be binding unless specific and in writing executed by the party against whom such supplement, modification, waiver or amendment is sought to be enforced. No delay, forbearance or neglect in the enforcement of any of the conditions of this Agreement or any rights or remedies hereunder shall constitute or be construed as a waiver thereof. No waiver of any of the provisions of this Agreement shall be deemed or shall constitute a waiver of any other provision, whether or not similar, nor shall any waiver constitute a continuing waiver.

O. **Counterparts**. This Agreement may be executed in two or more counterparts, each of which shall be deemed to be an original, and all of which counterparts together shall constitute but one and the same instrument. Legible facsimile copies, electronically scanned copies and photocopies of documents signed by either party are deemed to be equivalent to originals.

[Remainder of page intentionally left blank]

Executed under seal as of the ____ day of _____, 2021.

CITY:

City of Haverhill acting by and through its Mayor and/or its City Council

By: _____
Name:
Title:

By: _____
Name:
Title:

By: _____
Name:
Title:

Water Division:

City of Haverhill, acting by and through its Water Division

By: _____
Name:
Title:

GREENBELT:

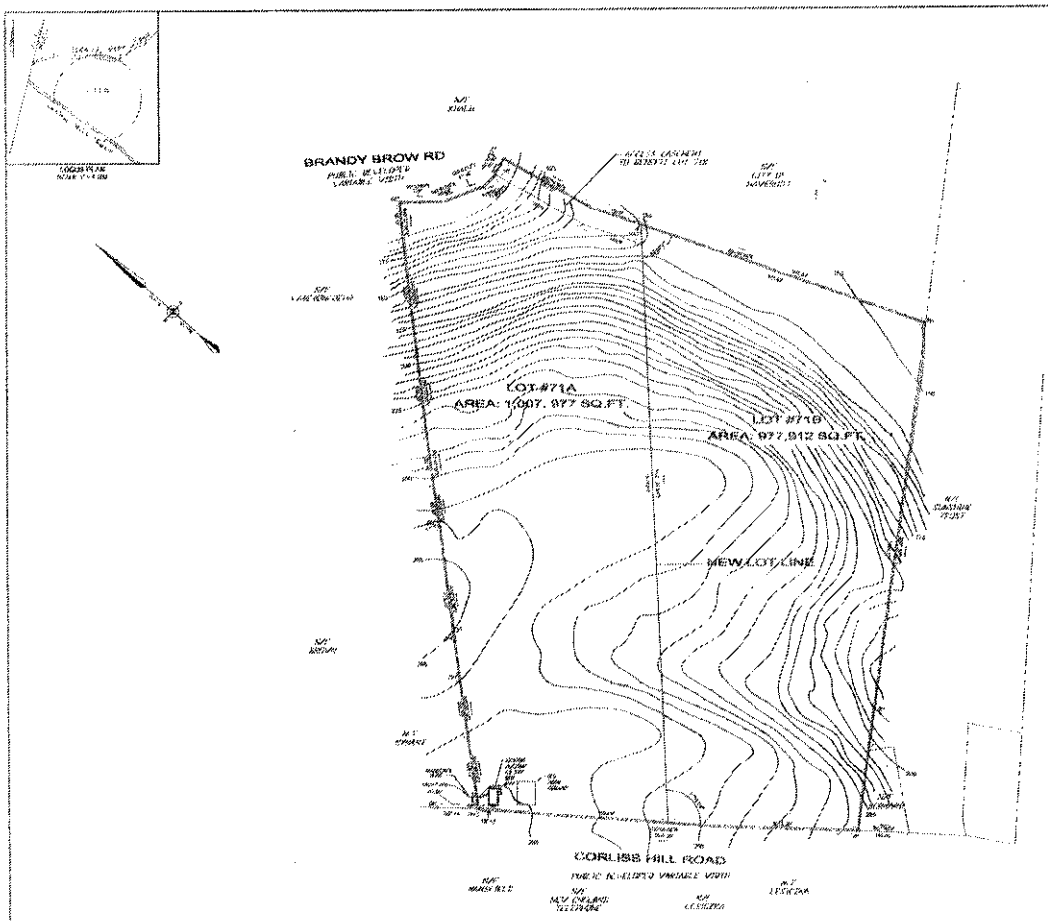
Essex County Greenbelt Association, Inc.

By: _____
Katherine Bowditch
President

EXHIBIT A

Recorded Plan of Property

(see attached)



ASSESSORS PLAN 467
BLOCK 204
LOT 71
DEED BOOK 6946 PAGE 757
ZONE SC

84
418

FOR REGISTRY USE ONLY

PROPOSED SITE PLAN OF LAND AT

117 CORLISS HILL ROAD
HAVERHILL, MASSACHUSETTS

OWNER/APPLICANT:

LESLIE BALACH
117 CORLISS HILL ROAD
HAVERHILL, MA 01830

MICHAEL W. BYRA
117 CORLISS HILL ROAD
HAVERHILL, MA 01830

SEPTEMBER, 2006

PLANNING BOARD APPROVAL
UNDER SUBDIVISION CONTROL
LAW IS NOT REQUIRED

DATE: 9-19-2006

"I CERTIFY THAT THE LAND AND FRONTAGE SHOWN ARE IN COMPLIANCE WITH ZONING GUIDELINES OF THE CITY OF HAVERHILL AND FURTHER, I CERTIFY THAT NO NEW RIGHT OF WAY LINES ARE BEING CREATED BY THIS PLANNED LAYOUT SHOWING ARE EXISTING AND NOT CHANGED OR ALTERED IN ANY MANNER, AND FURTHER, I CERTIFY THAT THIS PLAN IS IN COMPLIANCE WITH ZONING REGULATIONS COVERING SUBDIVISION OF LAND , SECTION 6, PART 5, AND FURTHER, I CERTIFY THAT THIS PLAN CONFORMS TO THE RULES AND REGULATIONS OF THE REGISTER OF DEEDS."

JOHN SAN P.L.S.

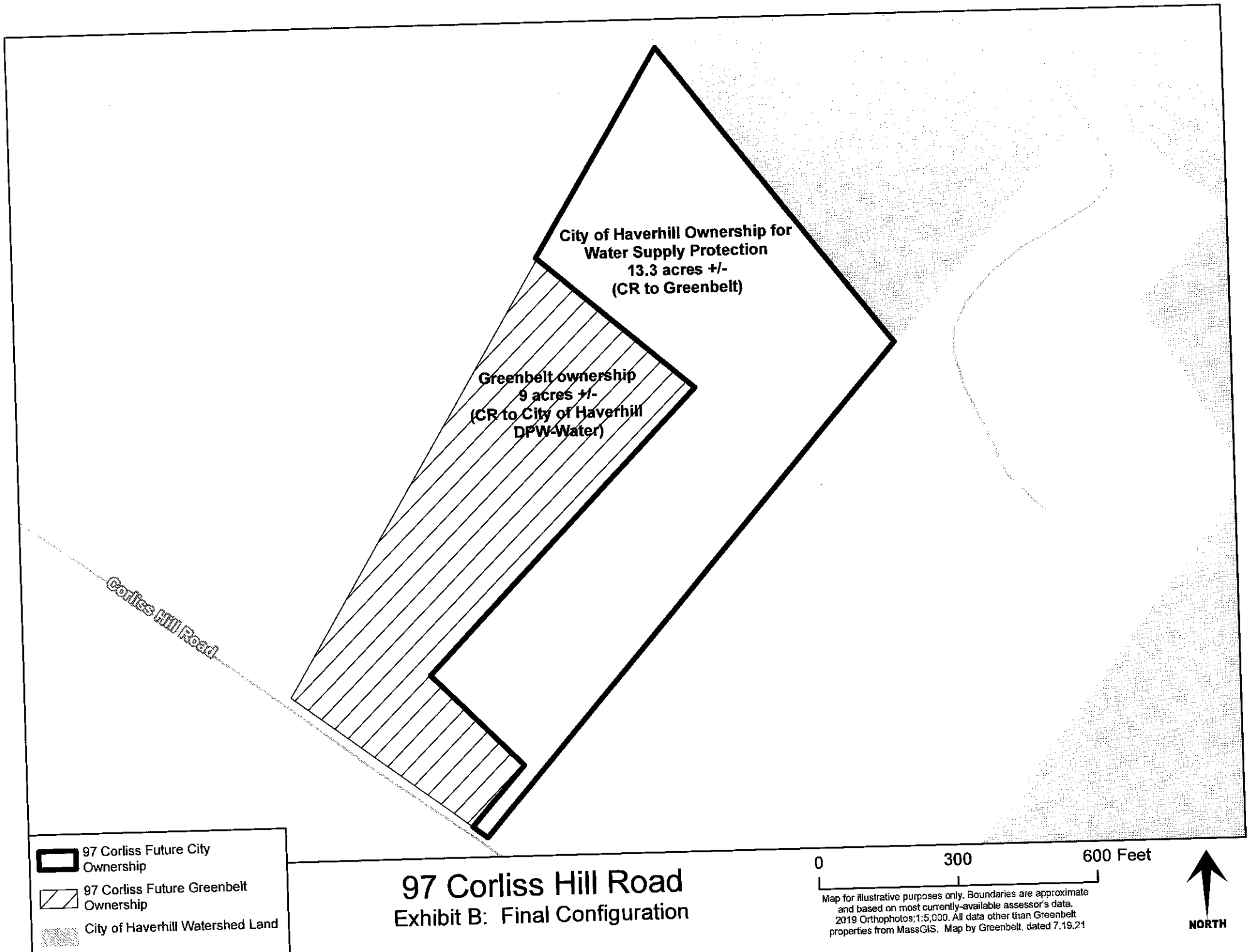
R.A.M. ENGINEERING
150 Main Street
Haverhill, Massachusetts 01830
TEL: (978) 372-0649 FAX: (978) 372-7165

GRAPHIC SCALE

EXHIBIT B

Property Division Sketch Plan

(see attached)



97 Corliss Hill Road

Exhibit B: Final Configuration

EXHIBIT C

Form of City CR

(see attached)

Exhibit C--City CR (7-21-21)

GRANTOR: City of Haverhill
GRANTEE: Essex County Greenbelt Association, Inc.
ADDRESS OF PREMISES: 97 Corliss Hill Road
FOR GRANTOR'S TITLE SEE: Southern Essex District Registry of Deeds at Book _____, Page _____.

CONSERVATION RESTRICTION

I. PREAMBLE

The City of Haverhill, a municipality organized under the laws of the Commonwealth of Massachusetts with its usual place of business located at 4 Summer Street, Haverhill, Massachusetts 01830, acting by and through its City Council, acting as the Board of Water Commissioners for the City of Haverhill Department of Public Works, Water Division by authority of Section 41 of Chapter 40 of the Massachusetts General Laws, its permitted successors and assigns ("Grantor"), acting pursuant to Sections 31, 32, and 33 of Chapter 184 of the Massachusetts General Laws, grants, with QUITCLAIM COVENANTS, Essex County Greenbelt Association, Inc., a Massachusetts not-for-profit corporation having its principal office at 82 Eastern Avenue, Essex, Massachusetts 01929, being the sole owner of the Premises as defined herein, for its successors and assigns ("Grantee"), for no consideration, IN PERPETUITY AND EXCLUSIVELY FOR CONSERVATION PURPOSES, the following Conservation Restriction on land located in the City of Haverhill containing the entirety of an XX-acre parcel of land ("Premises"), which Premises is more particularly described in Exhibit A and shown in the attached reduced copy of a survey plan in Exhibit B, both of which are incorporated herein and attached hereto.

II. PURPOSES:

This Conservation Restriction is defined in and authorized by Sections 31, 32, and 33 of Chapter 184 of the Massachusetts General Laws and otherwise by law. The purposes of this Conservation Restriction ("Purposes") are to ensure that the Premises will be maintained in perpetuity in its natural, scenic, or open condition and available for passive outdoor recreational use, and to prevent any use or change that would materially impair the Conservation Values (as defined below).

The Conservation Values protected by this Conservation Restriction include the following:

A. Open Space. The Premises contributes to the protection of the scenic and natural character of Haverhill's protected adjacent watershed land, and the protection of the Premises will enhance the open-space value of these and nearby lands. The Premises abuts land already conserved.

B. Water Supply. The Premises is located within an Active Surface Water Supply watershed, and is mapped entirely as a Zone C Surface Water Protection Area by the MA Department of Environmental Protection; thus the protection of the Premises is critical to maintaining the public drinking water supply.

C. Water Quality. The Premises offers additional protection to the East Meadow River by ensuring a vegetated cover and prevening development, thus helping to maintain water qualify for public drinking water supplied by the East Meadow River;

D. Wildlife Habitat. The Premises includes areas designated by the MA Division of Fisheries and Wildlife acting by and through its Natural Heritage and Endangered Species Program (NHESP) as "Priority Habitats of Rare and Endangered Species," the protection of which aligns with NHESP's wildlife and habitat protection objectives.

E. Public Access. Public access to trails on the Premises will be allowed for passive outdoor recreation, education, and nature study; trails on the Premises will connect to trails on adjacent protected lands.

F. Biodiversity. The Premises includes areas designated as BioMap2 Core Habitat for Species of Conservation Concern, as defined by the Massachusetts Natural Heritage and Endangered Species Program. BioMap2, published in 2010, was designed to guide strategic biodiversity conservation in Massachusetts over the next decade by focusing land protection and stewardship on the areas that are most critical for ensuring the long-term persistence of rare and other native species and their habitats, exemplary natural communities, and a diversity of ecosystems. *BioMap2* is also designed to include the habitats and species of conservation concern identified in the State Wildlife Action Plan.

G. Climate Change Resiliency. The Premises is identified as an area of average Terrestrial Resilience according to The Nature Conservancy's (TNC) Resilient Land Mapping Tool. TNC's Resilient Land Mapping Tool was developed in order to map 'climate-resilient' sites that are 'more likely to sustain native plants, animals, and natural processes into the future.' The protection of these climate resilient sites is an important step in both reducing human and ecosystem vulnerability to climate change and adapting to changing conditions.

H. Consistency with Clearly Delineated Federal, State, or Local Governmental Conservation Policy. The protection of the Premises advances government policy regarding the conservation of natural resources, including the following: Haverhill's 2016-2023 Open Space and Recreation Plan, Goals 6, 7, and 10, which address the protection of agricultural lands, and open space and recreational opportunities for the public; the Massachusetts Statewide Comprehensive Outdoor Recreation Plan Goal 1 to expand local trail networks,

and the goals of the Merimack Valley Priority Growth Strategy, specifically to preserve municipal water sources, biodiversity, and to preserve scenic landscapes and rural character.

III. PROHIBITED and PERMITTED ACTS AND USES

A. Prohibited Acts and Uses

The Grantor will not perform or allow others to perform the following acts and uses which are prohibited on, above, and below the Premises:

1. Structures and Improvements. Constructing, placing, or allowing to remain any temporary or permanent structure including without limitation any building, tennis court, landing strip, mobile home, swimming pool, asphalt or concrete pavement, graveled area, roads, sign, fence, gate, billboard or other advertising, antenna, utilities or other structures, utility pole, tower, solar panel, solar array, conduit, line, septic or wastewater disposal system, storage tank, or dam;

2. Extractive Activities/Uses. Mining, excavating, dredging, withdrawing, or removing soil, loam, peat, gravel, sand, rock, surface water, ground water, or other mineral substance or natural deposit, or otherwise altering the topography of the Premises;

3. Disposal/Storage. Placing, filling, storing or dumping of soil, refuse, trash, vehicle bodies or parts, rubbish, debris, junk, tree and other vegetation cuttings, liquid or solid waste or other substance or material whatsoever;

4. Adverse Impacts to Vegetation. Cutting, removing, or destroying trees, shrubs, grasses or other vegetation;

5. Adverse Impacts to Water, Soil, and Other Features. Activities detrimental to drainage, flood control, water conservation, water quality, erosion control, soil conservation, natural habitat, archaeological conservation, or ecosystem function;

6. Introduction of Invasive Species. Planting or introducing any species identified as invasive by the Massachusetts Invasive Plant Advisory Group or identified as invasive in such recognized inventories as the Massachusetts Introduced Pests Outreach Project, the Northeast Aquatic Nuisance Species Panel, or other such inventories, and any successor list as mutually agreed to by Grantor and Grantee;

7. Motor Vehicles. Using, parking, or storing motorized vehicles, including motorcycles, mopeds, all-terrain vehicles, off-highway vehicles, motorboats or other motorized watercraft, snowmobiles, launching or landing aircraft, or any other motorized vehicles, acknowledging that vehicles necessary for public safety (i.e., fire, police, ambulance, other government officials) may have a legal right to enter the Premises;

8. Subdivision. Subdividing or conveying a part or portion of the Premises (as compared to conveyance of the Premises in its entirety which shall be permitted), it being the Grantor's and Grantee's intention to maintain the entire Premises under unified ownership;

9. Use of Premises for Developing Other Land. Using the Premises towards building or development requirements on this or any other parcel;

10. Adverse Impacts to Stone Walls, Boundary Markers. Disrupting, removing, or destroying stone walls, granite fence posts, or any other boundary markers;

11. Residential or Industrial Uses. Using the Premises for residential or industrial purposes;

12. Inconsistent Uses. Using the Premises for commercial purposes that are inconsistent with the Purposes or that would materially impair the Conservation Values, or for any other uses or activities that are inconsistent with the Purposes or that would materially impair the Conservation Values.

B. Permitted Acts and Uses

Notwithstanding the Prohibited Acts and Uses described in Paragraph III.A., the Grantor may conduct or permit the following acts and uses on the Premises, provided they do not materially impair the Purposes and/or Conservation Values. In conducting any Permitted Act and Use, Grantor shall minimize impacts to the Conservation Values to ensure any such impairment thereto is not material.

1. Vegetation Management. Maintaining vegetation, including pruning, trimming, cutting, and mowing, and removing brush, all to prevent, control, and manage hazards, disease, insect or fire damage, and/or in order to maintain the condition of the Premises as documented in the Baseline Report (see Paragraph XV.);

2. Non-native, Nuisance, or Invasive species. Removing non-native, nuisance, or invasive species, interplanting native species, and controlling species in a manner that minimizes damage to surrounding, non-target species and preserves water quality;

3. Composting. Stockpiling and composting stumps, trees, brush, limbs, and similar biodegradable materials originating on the Premises;

4. Natural Habitat and Ecosystem Improvement. With prior written approval of the Grantee, conducting measures designed to restore native biotic communities, or to maintain, enhance or restore wildlife, wildlife habitat, ecosystem function, or rare or endangered species including planting native trees, shrubs, and other vegetation;

5. Indigenous Cultural Practices. With prior notice to the Grantee, allowing indigenous peoples to:

a. Conduct cultural land ceremonial uses. Cultural practices are defined, for the purposes of this Conservation Restriction, as including traditional spiritual ceremonies, seasonal celebrations, offerings, and cultural, educational, and interpretive programming; and
b. Harvest plant-life using sustainable methods, including regrowth and replanting to ensure sustainable populations for traditional cultural practices and non-commercial purposes;

6. Archaeological Investigations. Conducting archaeological activities, including without limitation archaeological research, surveys, excavation and artifact retrieval, but only in accordance with an archaeological field investigation plan, which plan shall also address restoration following completion of the archaeological investigation, prepared by or on behalf of the Grantor and approved in advance of such activity, in writing, by the Massachusetts Historical Commission State Archaeologist (or appropriate successor official) and by the Grantee. A copy of the results of any such investigation on the Premises is to be provided to the Grantee;

7. Trails. Maintaining and constructing trails as follows:

a. Existing Trails. Conducting routine maintenance of existing trails, which may include widening trail corridors up to X (X) feet in width overall, with a treadway up to Y (Y) feet in width.
b. New Trails. With prior written approval of the Grantee, constructing new trails or relocating existing trails, provided that any construction or relocation results in trails that conform with the width limitations above.
c. Trail Features. With prior written approval of the Grantee, constructing bog bridging, boardwalks, footbridges, railings, steps, culverts, benching, cribbing, contouring, or other such features, together with the use of motorized equipment to construct such features;

8. Signs. Constructing, installing, maintaining, and replacing signs and informational kiosks with respect to the Permitted Acts and Uses, the Purposes, the Conservation Values, trespass, public access, identity and address of the Grantor, sale of the Premises, the Grantee's interest in the Premises, boundary and trail markings, any gift, grant, or other applicable source of support for the conservation of the Premises;

9. Outdoor Passive Recreational and Educational Activities. Hiking, horseback riding, cross-country skiing, snowshoeing, nature observation, nature and educational walks and outings, outdoor educational activities, and other non-motorized outdoor recreational and educational activities; hunting may be permitted with prior written approval of the Grantee;

10. Forest Management.
a. Permitted Activities. Conducting sound silvicultural uses of the Premises, including the right to harvest forest products (as such term may be defined from time to time in Section 1 of Chapter 61 of the Massachusetts General Laws, or

successor law) or conduct other forest management activities, reestablish historic woods roads and establish new woods roads, and the use of motorized vehicles, all as necessary to conduct such activities ("Forestry Activities"), provided that any Forestry Activities are carried out pursuant to a Forest Stewardship Plan (as defined below). All Forestry Activities shall avoid any stone structures or historical and cultural resources and shall be reasonably required to prevent any damage thereto. All cutting operations shall be supervised by a licensed forester.

b. Requirement of a Forest Stewardship Plan. Before any Forestry Activities occur on the Premises, Grantor shall submit a Forest Stewardship Plan to the Grantee, the Massachusetts Department of Conservation and Recreation ("DCR") or appropriate successor agency, and to any other required state agencies for their approval. The Forest Stewardship Plan shall:

i. be prepared by a forester licensed through DCR and shall follow the "Directions for the Preparation of the Chapter 61 Forest Management Plans and Forest Stewardship Plans" (as such guidelines may be amended by DCR or its successor agency) and such statutes, regulations and directions in effect at the time of the approval of said Forest Stewardship Plan; and

ii. include provisions designed to comply with the recommended activities and guidelines and required best management practices established in the Massachusetts Forestry Best Management Practices Manual (Catanzaro, Fish & Kittredge, University of Massachusetts, Amherst & DCR; 2013) and subsequent versions as may be approved by the Forestry Bureau ("Forestry BMPs"); and

iii. address how the Forest Stewardship Plan complies with this Paragraph II.B.10; and

iv. be effective for a ten (10) year period and shall be resubmitted once every ten (10) years as necessary if additional Forestry Activities are desired.

11. Other Activities. Such other non-prohibited activities or uses of the Premises may be permitted with the prior approval of the Grantee provided that the Grantee has made a finding, such finding to be documented in writing and kept on file at the office of the Grantee, that such activities are consistent with the Reserved Rights or, as applicable, are included in an approved Forest Stewardship Plan, do not impair the conservation values and purposes of this Conservation Restriction, and, where feasible, result in a net gain in conservation value of the Premises.

C. Site Restoration

Upon completion of any Permitted Acts and Uses, any disturbed areas shall be restored substantially to the conditions that existed prior to said activities, including with respect to soil material, grade, and vegetated ground cover.

D. Compliance with Permits, Regulations, Laws

The exercise of any Permitted Acts and Uses under Paragraph III.B. shall be in compliance with all applicable federal, state and local laws, rules, regulations, zoning, and permits, and with the Constitution of the Commonwealth of Massachusetts. The inclusion of any Reserved Right requiring a permit, license or other approval from a public agency does not imply that the Grantee or the Commonwealth takes any position whether such permit, license, or other approval should be issued.

E. Notice and Approval.

1. Notifying Grantee. Whenever notice to or approval by Grantee is required, Grantor shall notify or request approval from Grantee, by a method requiring proof of receipt, in writing not less than sixty (60) days prior to the date Grantor intends to undertake the activity in question, unless a different time period is specified herein. The notice shall:

    a. Describe the nature, scope, design, location, timetable and any other material aspect of the proposed activity;
    b. Describe how the proposed activity complies with the terms and conditions of this Conservation Restriction, and will not materially impair the Purposes and/or Conservation Values;
    c. Identify all permits, licenses, or approvals required for the proposed activity, and the status of any such permits, licenses, or approvals.
    d. Describe any other material aspect of the proposed activity in sufficient detail to permit the Grantee to make an informed judgment as to its consistency with the Purposes and Conservation Values.

2. Grantee Review. Where Grantee's approval is required, Grantee shall grant or withhold approval in writing within sixty (60) days of receipt of Grantor's request. Grantee's approval shall only be granted upon a showing that the proposed activity will minimize impacts to the Conservation Values and will not materially impair the Purposes and/or Conservation Values. Grantee may require Grantor to secure expert review and evaluation of a proposed activity by a mutually agreed upon party.

3. Resubmittal. Grantee's failure to respond within sixty (60) days of receipt shall not constitute approval of the request. Grantor may subsequently submit the same or a similar request for approval.

IV. INSPECTION AND ENFORCEMENT

A. Entry onto the Premises

The Grantor hereby grants to the Grantee, and its duly authorized agents or representatives, the right to enter the Premises upon reasonable notice and at reasonable times, for the purpose of inspecting the Premises to determine compliance with or to enforce this Conservation Restriction.

B. Legal and Injunctive Relief.

1. Enforcement. The rights hereby granted shall include the right to enforce this Conservation Restriction by appropriate legal proceedings and to obtain compensatory relief, and equitable relief against any violations, including, without limitation, injunctive relief and relief requiring restoration of the Premises to its condition prior to the time of the injury (it being agreed that the Grantee will have no adequate remedy at law in case of an injunction). The rights hereby granted shall be in addition to, and not in limitation of, any other rights and remedies available to the Grantee for the enforcement of this Conservation Restriction.

2. Notice and Cure. In the event the Grantee determines that a violation of this Conservation Restriction has occurred and intends to exercise any of the rights described herein, the Grantee shall, before exercising any such rights, notify the Grantor in writing of the violation. The Grantor shall have thirty (30) days from receipt of the written notice to halt the violation and remedy any damage caused by it, after which time Grantee may take further action, including instituting legal proceedings and entering the Premises to take reasonable measures to remedy, abate or correct such violation, without further notice. Provided, however, that this requirement of deferment of action for thirty (30) days applies only if Grantor immediately ceases the violation and Grantee determines that there is no ongoing violation. In instances where a violation may also constitute a violation of local, state, or federal law, the Grantee may notify the proper authorities of such violation.

3. Reimbursement of Costs and Expenses of Enforcement. Grantor covenants and agrees to reimburse to Grantee all reasonable costs and expenses (including counsel fees) incurred by the Grantee in enforcing this Conservation Restriction or in taking reasonable measures to remedy, abate or correct any violation thereof. In the event of a dispute over the boundaries of the Conservation Restriction, Grantor shall pay for a survey by a Massachusetts licensed professional land surveyor and to have the boundaries permanently marked.

C. Non-Waiver

Enforcement of the terms of this Conservation Restriction shall be at the sole discretion of Grantee. Any election by the Grantee as to the manner and timing of its right to enforce this Conservation Restriction or otherwise exercise its rights hereunder shall not be deemed or construed to be a waiver of such rights.

D. Disclaimer of Liability

By acceptance of this Conservation Restriction, the Grantee does not undertake any liability or obligation relating to the condition of the Premises pertaining to compliance with and including, but not limited to, hazardous materials, zoning, environmental laws and regulations, or acts not caused by the Grantee or its agents.

E. Acts Beyond the Grantor's Control

Nothing contained in this Conservation Restriction shall be construed to entitle the Grantee to bring any actions against the Grantor for any injury to or change in the Premises resulting from natural causes beyond the Grantor's control, including but not limited to fire, flood, weather, climate-related impacts, and earth movement, or from any prudent action taken by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to the Premises resulting from such causes. In the event of any such occurrence, the Grantor and Grantee will cooperate in the restoration of the Premises, if desirable and feasible.

V. PUBLIC ACCESS

The Grantor grants access to present and future trails on the Premises to the general public and agrees to take no action to prohibit or discourage trail access to and use of the Premises by the general public, but only for daytime use and only as described in Paragraph III.B.9. provided that such agreement by Grantor is subject to the Grantor's reserved right to establish reasonable rules, regulations, and restrictions on such permitted recreational use by the general public for the protection of the Purposes and Conservation Values. Grantor has the right to control, limit, or prohibit by posting and other reasonable means activities or uses of the Premises not authorized in Paragraph III.B.9. The Grantor's right to grant public access across the Premises is subject to the restrictions described in this Conservation Restriction. The Grantee may require the Grantor to post the Premises against any use by the public that results in material impairment of the Conservation Values. Any public use which is permitted by the terms of this Conservation Restriction constitutes permission to use the Premises for the purposes described in Section 17C of Chapter 21 of the Massachusetts General Laws and the Grantor and Grantee hereto benefit from exculpation from liability to the extent provided in such section.

VI. TERMINATION/RELEASE/EXTINGUISHMENT

A. Procedure

If circumstances arise in the future that render the Purposes impossible to accomplish, this Conservation Restriction can only be terminated, released, or extinguished, whether in whole or in part, by a court of competent jurisdiction under applicable law after review and approval by the Secretary of Energy and Environmental Affairs of the Commonwealth of Massachusetts, or successor official ("Secretary"), and any other approvals as may be required by Section 32 of Chapter 184 of the Massachusetts General Laws.

B. Grantor's and Grantee's Right to Recover Proceeds

If any change in conditions ever gives rise to termination, release, or extinguishment of this Conservation Restriction under applicable law, then Grantee, on a subsequent sale, exchange, or involuntary conversion of the Premises, shall be entitled to a portion of the proceeds in accordance with Paragraph VI.C., subject, however, to any applicable law which expressly provides for a different disposition of the proceeds, and after complying with the terms of any gift, grant, or funding

requirements. The Grantee shall use its share of any proceeds in a manner consistent with the Purposes or the protection of the Conservation Values.

C. Grantee's Receipt of Property Right

Grantor and Grantee agree that the conveyance of this Conservation Restriction gives rise to a real property right, immediately vested in the Grantee, with a fair market value that is at least equal to the proportionate value that this Conservation Restriction bears to the value of the unrestricted Premises. The proportionate value of the Grantee's property right will be determined as of the date of termination, release, or extinguishment.

D. Cooperation Regarding Public Action

Whenever all or any part of the Premises or any interest therein is taken by public authority under power of eminent domain or other act of public authority, then the Grantor and the Grantee shall cooperate in recovering the full value of all direct and consequential damages resulting from such action. All related expenses incurred by the Grantor and the Grantee shall first be paid out of any recovered proceeds, and the remaining proceeds shall be distributed between the Grantor and Grantee in accordance with Paragraph VI.B. and Paragraph VI.C. If a less than fee interest is taken, the proceeds shall be equitably allocated according to the nature of the interest taken. The Grantee shall use its share of any proceeds in a manner consistent with the Purposes or the protection of the Conservation Values.

VII. DURATION and ASSIGNABILITY

A. Running of the Burden

The burdens of this Conservation Restriction shall run with the Premises in perpetuity, and shall be enforceable against the Grantor and the successors and assigns of the Grantor holding any interest in the Premises.

B. Execution of Instruments

The Grantee is authorized to record or file any notices or instruments appropriate to assuring the perpetual enforceability of this Conservation Restriction. The Grantor, on behalf of itself and its successors and assigns, appoints the Grantee its attorney-in-fact to execute, acknowledge and deliver any such instruments on its behalf. Without limiting the foregoing, the Grantor and its successors and assigns agree themselves to execute any such instruments upon request.

C. Running of the Benefit

The benefits of this Conservation Restriction shall run to the Grantee, shall be in gross and shall not be assignable by the Grantee, except when all of the following conditions are met:

1. the Grantee requires that the Purposes continue to be carried out;
2. the assignee is not an owner of the fee in the Premises;

3. the assignee, at the time of the assignment, qualifies under and 26.U.S.C. 170(h), and applicable regulations thereunder, if applicable, and is eligible to receive this Conservation Restriction under Section 32 of Chapter 184 of the Massachusetts General Laws; and
4. the assignment complies with Article 97 of the Amendments to the Constitution of the Commonwealth of Massachusetts, if applicable.

VIII. SUBSEQUENT TRANSFERS

A. Procedure for Transfer

The Grantor agrees to incorporate by reference the terms of this Conservation Restriction in any deed or other legal instrument which grants any interest in all or a portion of the Premises, including a leasehold interest and to notify the Grantee not less than twenty (20) days prior to the effective date of such transfer. Failure to do any of the above shall not impair the validity or enforceability of this Conservation Restriction. If the Grantor fails to reference the terms of this Conservation Restriction in any deed or other legal instrument which grants any interest in all or a portion of the Premises, then the Grantee may record, in the applicable registry of deeds, or registered in the applicable land court registry district, and at the Grantor's expense, a notice of this Conservation Restriction. Any transfer will comply with Article 97 of the Amendments to the Constitution of the Commonwealth of Massachusetts, if applicable.

B. Grantor's Liability

The Grantor shall not be liable for violations occurring after their ownership. Liability for any acts or omissions occurring prior to any transfer and liability for any transfer if in violation of this Conservation Restriction shall survive the transfer. Any new owner shall cooperate in the restoration of the Premises or removal of violations caused by prior owner(s) and may be held responsible for any continuing violations.

IX. ESTOPPEL CERTIFICATES

Upon request by the Grantor, the Grantee shall, within thirty (30) [*60 days for municipalities unless otherwise agreed upon*] days execute and deliver to the Grantor any document, including an estoppel certificate, which certifies the Grantor's compliance or non-compliance with any obligation of the Grantor contained in this Conservation Restriction.

X. NON MERGER

The parties intend that any future acquisition of the Premises shall not result in a merger of the Conservation Restriction into the fee. The Grantor agrees that it will not grant, and the Grantee agrees that it will not take title, to any part of the Premises without having first assigned this Conservation Restriction following the terms set forth in Paragraph VII.C to ensure that merger does not occur and that this Conservation Restriction continues to be enforceable by a non-fee owner.

XI. AMENDMENT

A. Limitations on Amendment

Grantor and Grantee may amend this Conservation Restriction only to correct an error or oversight, clarify an ambiguity, maintain or enhance the overall protection of the Conservation Values, or add real property to the Premises, provided that no amendment shall:

1. affect this Conservation Restriction's perpetual duration;
2. be inconsistent with or materially impair the Purposes;
3. affect the qualification of this Conservation Restriction as a "qualified conservation contribution" or "interest in land" under any applicable laws, including 26 U.S.C. Section 170(h), and related regulations;
4. affect the status of Grantee as a "qualified organization" or "eligible donee" under any applicable laws, including 26 U.S.C. Section 170(h) and related regulations, and Sections 31, 32, and 33 of Chapter 184 of the Massachusetts General Laws; or
5. create an impermissible private benefit or private inurement in violation of federal tax law, as determined by an appraisal, conducted by an appraiser selected by the Grantee, of the economic impact of the proposed amendment; or
6. alter or remove the provisions described in Paragraph VI (Termination/Release/Extinguishment); or
7. cause the provisions of this Paragraph XI to be less restrictive; or
8. cause the provisions described in Paragraph VII.C (Running of the Benefit) to be less restrictive

B. Amendment Approvals and Recording

No amendment shall be effective unless documented in a notarized writing executed by Grantee and Grantor, approved by the City of Haverhill and by the Secretary in the public interest pursuant to Section 32 of Chapter 184 of the Massachusetts General Laws, and recorded in the applicable registry of deeds or registered in the applicable land court registry district.

XII. EFFECTIVE DATE

This Conservation Restriction shall be effective when the Grantor and the Grantee have executed it, the administrative approvals required by Section 32 of Chapter 184 of the Massachusetts General Laws have been obtained, and it has been recorded in the applicable registry of deeds or registered in the applicable land court registry district.

XIII. NOTICES

Any notice, demand, request, consent, approval or communication that either party desires or is required to give to the other shall be in writing and either served personally or sent by first class mail, postage pre-paid, addressed as follows:

To Grantor: Essex County Greenbelt Association, Inc.

Director of Stewardship
P.O. Box 1026
Essex, MA 01929

To Grantee: City of Haverhill
Dept. of Public Works, Water Division
Deputy Director
40 South Porter Street
Haverhill, MA 01835

or to such other address as any of the above parties shall designate from time to time by written notice to the other or, if notice is returned to sender, to an address that is reasonably ascertainable by the parties.

XIV. GENERAL PROVISIONS

A. Controlling Law

The interpretation and performance of this Conservation Restriction shall be governed by the laws of the Commonwealth of Massachusetts.

B. Liberal Construction

Any general rule of construction to the contrary notwithstanding, this Conservation Restriction shall be liberally construed in order to effect the Purposes and the policy and purposes of Sections 31, 32, and 33 of Chapter 184 of the Massachusetts General Laws. If any provision in this instrument is found to be ambiguous, any interpretation consistent with the Purposes that would render the provision valid shall be favored over any interpretation that would render it invalid.

C. Severability

If any provision of this Conservation Restriction or the application thereof to any person or circumstance is found to be invalid, the remainder of the provisions of this Conservation Restriction shall not be affected thereby.

D. Entire Agreement

This instrument sets forth the entire agreement of the Grantor and Grantee with respect to this Conservation Restriction and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Conservation Restriction, all of which are merged herein.

XV. BASELINE DOCUMENTATION REPORT

The Conservation Values, as well as the natural features, current uses of, and existing improvements on the Premises, such as, but not limited to, trails, woods roads, structures, meadows or other cleared areas, agricultural areas, and scenic views, as applicable, are described in a

Baseline Documentation Report ("Baseline Report") prepared by Grantee with the cooperation of the Grantor, consisting of maps, photographs, and other documents and on file with the Grantee and referenced herein. The Baseline Report (i) is acknowledged by Grantor and Grantee to be a complete and accurate representation of the condition and values of the Premises as of the date of this Conservation Restriction, (ii) is intended to fully comply with applicable Treasury Regulations, (iii) is intended to serve as an objective information baseline for subsequent monitoring of compliance with the terms of this Conservation Restriction as described herein, and (iv) may be supplemented as conditions on the Premise change as allowed over time. Notwithstanding the foregoing, the parties may utilize any evidence of the condition of the Premises at the time of this grant in addition to the Baseline Report.

XVI. MISCELLANEOUS

A. Pre-existing Public Rights

Approval of this Conservation Restriction pursuant to Section 32 of Chapter 184 of the Massachusetts General Laws by any municipal officials and by the Secretary, is not to be construed as representing the existence or non-existence of any pre-existing rights of the public, if any, in and to the Premises, and any such pre-existing rights of the public, if any, are not affected by the granting of this Conservation Restriction.

B. Release of Homestead

The Grantor attests that there is no residence on or abutting the Premises (including areas excluded from the Premises) that is occupied or intended to be occupied as a principal residence by a spouse, former spouse, or children of the grantor, or a spouse, former spouse, or children of a beneficiary of the trust, if Premises is owned by a trust.

C. No Surety Interest

The Grantor attests that there is no mortgage, promissory note, loan, lien, equity credit line, refinance assignment of mortgage, lease, financing statement or any other agreement which gives rise to a surety interest affecting the Premises.

D. Prior Encumbrances

This Conservation Restriction shall be in addition to and not in substitution of any other restrictions or easements of record affecting the Premises.

E. Attached hereto and incorporated herein by reference are the following:

Signature pages:

Grantor
Grantee Acceptance
Approval of Mayor

Approval of the Secretary of Energy and Environmental Affairs of the Commonwealth of Massachusetts.

Exhibits:

Exhibit A: Legal Description of Premises
Exhibit B: Reduced Copy of Recorded Plan of Premises

DRAFT

We, the undersigned, being a majority of the City Council of the City of Haverhill, Massachusetts, hereby certify that at a public meeting duly held on _____, 2021, the City Council voted to approve and grant the foregoing Conservation Restriction to Essex County Greenbelt Association, Inc. pursuant to Section 32 of Chapter 184 and Section 8C of Chapter 40 of the Massachusetts General Laws and do hereby grant the foregoing Conservation Restriction.

CITY OF HAVERHILL CITY COUNCIL

_____

Melinda Barrett, City Council President, duly authorized

COMMONWEALTH OF MASSACHUSETTS

Essex County, ss:

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared Melinda Barrett, and proved to me through satisfactory evidence of identification which was _____ to be the person whose name is signed on the proceeding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

_____

Notary Public

My Commission Expires:

ACCEPTANCE OF GRANT

The foregoing Conservation Restriction from the City of Haverhill was accepted by Essex County Greenbelt Association, Inc. this _____ day of _____, 2021.

_____, duly authorized
Kate Bowditch, President

_____, duly authorized
Timothy Fritzinger, Treasurer

COMMONWEALTH OF MASSACHUSETTS

Essex County, ss:

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared _____, and proved to me through satisfactory evidence of identification which was _____ to be the person whose name is signed on the proceeding or attached document, and acknowledged to me that s/he signed it voluntarily for its stated purpose.

_____
Notary Public
My Commission Expires:

COMMONWEALTH OF MASSACHUSETTS

Essex County, ss:

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared _____, and proved to me through satisfactory evidence of identification which was _____ to be the person whose name is signed on the proceeding or attached document, and acknowledged to me that s/he signed it voluntarily for its stated purpose.

_____
Notary Public
My Commission Expires:

DRAFT

APPROVAL OF MAYOR OF CITY OF HAVERHILL

The undersigned, Mayor of the City of Haverhill, hereby approves the foregoing Conservation Restriction from the City of Haverhill to Essex County Greenbelt Association, Inc. in the public interest pursuant to Section 32 of Chapter 184 of the Massachusetts General Laws.

_____

James J. Fiorentini, Mayor of the City of Haverhill, duly authorized

COMMONWEALTH OF MASSACHUSETTS

Essex County, ss:

On this _____day of _____, 2021, before me, the undersigned notary public, personally appeared _____ proved to me through satisfactory evidence of identification which was personal knowledge to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose as Mayor.

_____

Notary Public

My Commission Expires:

APPROVAL OF SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS OF THE COMMONWEALTH OF MASSACHUSETTS

The undersigned, Secretary of Energy and Environmental Affairs of the Commonwealth of Massachusetts, hereby certifies that the foregoing Conservation Restriction from the City of Haverhill to Essex County Greenbelt Association, Inc. has been approved in the public interest pursuant to Section 32 of Chapter 184 of the Massachusetts General Laws.

Dated: _____, 2021

_____
Kathleen A. Theoharides
Secretary of Energy and Environmental Affairs

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss:

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared Kathleen A. Theoharides, and proved to me through satisfactory evidence of identification which was _____ to be the person whose name is signed on the proceeding or attached document, and acknowledged to me that she signed it voluntarily for its stated purpose.

_____
Notary Public
My Commission Expires:

EXHIBIT A

Legal Description of Premises

If you do not have a survey plan for the Premises, or if you choose to provide a written description in addition to the survey plan, insert that written description here.

ALL Building Envelopes and Exclusion areas MUST be defined by metes and bounds.

If providing a written metes and bounds description along with a survey plan, the written metes and bounds and those shown on the survey MUST match.

OR

If Exhibit B is a reduced copy of a survey plan and you will not provide a written metes and bounds description, follow the template provided below. This is the recommended option if you have a survey plan.]

Description of the Premises

The Premises subject to this Conservation Restriction is the entirety of *[INSERT # of and "parcels"]* of land located in the *[Town/City of XXX]*, *[County Name]* County, Commonwealth of Massachusetts, containing a total of *[Insert # of acres]* acres, shown as *[Insert parcel name as given on plan, i.e., "Parcel A" or "Lot 10"]* on a plan of land entitled *[Insert Plan Name]*, dated *[Insert Plan Date]*, prepared by *[Insert Plan creator / professional land surveyor / company name, address]*, said plan recorded at the *[Insert recording information]*, a reduced copy of which is attached hereto as Exhibit B.

Street Address:

EXHIBIT B

[Reduced Copy of *OR* Sketch] Plan of Premises

For official full size plan see [*enter County*] Registry of Deeds Plan Book _____ Page _____

[*This plan/map must show the Premises. The CR area and any exclusions or building envelopes must be clearly labeled.*

If a party other than the PLS or other professional preparer of the Plan has added features (e.g., planned trails), this should be labeled as a 'Sketch Plan of Premises' and should clarify which features are not associated with the official copy.

If this is a copy of the full size plan that has not been altered in any way, then it should be labeled as a 'Reduced Copy of Plan of Premises'.]

DRAFT

EXHIBIT D

Form of Greenbelt CR

(see attached)

GRANTOR: Essex County Greenbelt Association, Inc.
GRANTEE: City of Haverhill
ADDRESS OF PREMISES: 97 Corliss Hill Road
FOR GRANTOR'S TITLE SEE: Southern Essex District Registry of Deeds at Book _____, Page _____.

CONSERVATION RESTRICTION

I. PREAMBLE

Essex County Greenbelt Association, Inc., a Massachusetts not-for-profit corporation having its principal office at 82 Eastern Avenue, Essex, Massachusetts 01929, being the sole owner of the Premises as defined herein, for its successors and assigns ("Grantor"), acting pursuant to Sections 31, 32, and 33 of Chapter 184 of the Massachusetts General Laws, grants, with QUITCLAIM COVENANTS, to the City of Haverhill, a municipality organized under the laws of the Commonwealth of Massachusetts with its usual place of business located at 4 Summer Street, Haverhill, Massachusetts 01830, acting by and through its City Council, acting as the Board of Water Commissioners for the City of Haverhill Department of Public Works, Water Division by authority of Section 41 of Chapter 40 of the Massachusetts General Laws, its permitted successors and assigns ("Grantee"), for no consideration, IN PERPETUITY AND EXCLUSIVELY FOR CONSERVATION PURPOSES, the following Conservation Restriction on land located in Haverhill containing the entirety of an XX-acre parcel of land ("Premises"), which Premises is more particularly described in Exhibit A and shown in the attached reduced copy of a survey plan in Exhibit B, both of which are incorporated herein and attached hereto.

II. PURPOSES:

This Conservation Restriction is defined in and authorized by Sections 31, 32, and 33 of Chapter 184 of the Massachusetts General Laws and otherwise by law. The purposes of this Conservation Restriction ("Purposes") are to ensure that the Premises will be maintained in perpetuity in its natural, scenic, or open condition, and available for agricultural use and passive outdoor

recreational use, and to prevent any use or change that would materially impair the Conservation Values (as defined below).

[The fee interest in the Premises was acquired utilizing, in part, assistance from the Conservation Partnership program which requires, pursuant to Section 2A of Chapter 286 of the Acts of 2014, the conveyance of this Conservation Restriction.]

The Conservation Values protected by this Conservation Restriction include the following:

A. Open Space. The Premises contributes to the protection of the scenic and natural character of Haverhill's protected adjacent watershed land, and the protection of the Premises will enhance the open-space value of these and nearby lands. The Premises abuts land already conserved.

B. Soils and Soil Health. The majority of the Premises is mapped as Prime Farmland Soils or Farmland Soils of Statewide Importance, as identified by the USDA Natural Resources Conservation Service. The protection of the Premises will promote healthy soils and healthy soils practices as such terms are defined in Chapter 358 of the Acts of 2020, which added definitions of these terms to Section 7A of Chapter 128 of the Massachusetts General Laws.

C. Water Supply. The Premises is located within an Active Surface Water Supply watershed, and is mapped entirely as a Zone C Surface Water Protection Area by the MA Department of Environmental Protection; thus the protection of the Premises is critical to maintaining the public drinking water supply.

D. Wildlife Habitat. The Premises includes areas designated by the MA Division of Fisheries and Wildlife acting by and through its Natural Heritage and Endangered Species Program (NHESP) as "Priority Habitats of Rare and Endangered Species," the protection of which aligns with NHESP's wildlife and habitat protection objectives.

E. Public Access. Public access to trails on the Premises will be allowed for passive outdoor recreation, education, and nature study; trails on the Premises will connect to trails on adjacent protected lands.

F. Biodiversity. The Premises includes areas designated as BioMap2 Core Habitat for Species of Conservation Concern, as defined by the Massachusetts Natural Heritage and Endangered Species Program. BioMap2, published in 2010, was designed to guide strategic biodiversity conservation in Massachusetts over the next decade by focusing land protection and stewardship on the areas that are most critical for ensuring the long-term persistence of rare and other native species and their habitats, exemplary natural communities, and a diversity of ecosystems. *BioMap2* is also designed to include the habitats and species of conservation concern identified in the State Wildlife Action Plan.

G. Water Quality. The Premises offers additional protection to the East Meadow River by ensuring a vegetated cover and prevening development, thus helping to maintain water qualify for public drinking water supplied by the East Meadow River;

H. Working Farmland. The protection of the Premises will ensure that the open fields contained on the Premises will be permanently available for agriculture that is consistent with protecting the water quality of the East Meadow River.

I. Climate Change Resiliency. The Premises is identified as an area of average Terrestrial Resilience according to The Nature Conservancy's (TNC) Resilient Land Mapping Tool. TNC's Resilient Land Mapping Tool was developed in order to map 'climate-resilient' sites that are 'more likely to sustain native plants, animals, and natural processes into the future.' The protection of these climate resilient sites is an important step in both reducing human and ecosystem vulnerability to climate change and adapting to changing conditions.

J. Consistency with Clearly Delineated Federal, State, or Local Governmental Conservation Policy. The protection of the Premises advances government policy regarding the conservation of natural resources, including the following: Haverhill's 2016-2023 Open Space and Recreation Plan, Goals 6, 7, and 10, which address the protection of agricultural lands, and open space and recreational opportunities for the public; the Massachusetts Statewide Comprehensive Outdoor Recreation Plan Goal 1 to expand local trail networks, and the goals of the Merimack Valley Priority Growth Strategy, specifically to preserve municipal water sources, biodiversity, and to preserve scenic landscapes and rural character.

III. PROHIBITED and PERMITTED ACTS AND USES

A. Prohibited Acts and Uses

The Grantor will not perform or allow others to perform the following acts and uses which are prohibited on, above, and below the Premises:

1. Structures and Improvements. Constructing, placing, or allowing to remain any temporary or permanent structure including without limitation any building, tennis court, landing strip, mobile home, swimming pool, asphalt or concrete pavement, graveled area, roads, sign, fence, gate, billboard or other advertising, antenna, utilities or other structures, utility pole, tower, solar panel, solar array, conduit, line, septic or wastewater disposal system, storage tank, or dam;

2. Extractive Activities/Uses. Mining, excavating, dredging, withdrawing, or removing soil, loam, peat, gravel, sand, rock, surface water, ground water, or other mineral substance or natural deposit, or otherwise altering the topography of the Premises;

3. Disposal/Storage. Placing, filling, storing or dumping of soil, refuse, trash, vehicle bodies or parts, rubbish, debris, junk, tree and other vegetation cuttings, liquid or solid waste or other substance or material whatsoever;

4. Adverse Impacts to Vegetation. Cutting, removing, or destroying trees, shrubs, grasses or other vegetation;

5. Adverse Impacts to Water, Soil, and Other Features. Activities detrimental to drainage, flood control, water conservation, water quality, erosion control, soil conservation, natural habitat, archaeological conservation, or ecosystem function;

6. Introduction of Invasive Species. Planting or introducing any species identified as invasive by the Massachusetts Invasive Plant Advisory Group or identified as invasive in such recognized inventories as the Massachusetts Introduced Pests Outreach Project, the Northeast Aquatic Nuisance Species Panel, or other such inventories, and any successor list as mutually agreed to by Grantor and Grantee;

7. Motor Vehicles. Using, parking, or storing motorized vehicles, including motorcycles, mopeds, all-terrain vehicles, off-highway vehicles, motorboats or other motorized watercraft, snowmobiles, launching or landing aircraft, or any other motorized vehicles, acknowledging that vehicles necessary for public safety (i.e., fire, police, ambulance, other government officials) may have a legal right to enter the Premises;

8. Subdivision. Subdividing or conveying a part or portion of the Premises (as compared to conveyance of the Premises in its entirety which shall be permitted), it being the Grantor's and Grantee's intention to maintain the entire Premises under unified ownership;

9. Use of Premises for Developing Other Land. Using the Premises towards building or development requirements on this or any other parcel;

10. Adverse Impacts to Stone Walls, Boundary Markers. Disrupting, removing, or destroying stone walls, granite fence posts, or any other boundary markers;

11. Residential or Industrial Uses. Using the Premises for residential or industrial purposes;

12. Inconsistent Uses. Using the Premises for commercial purposes that are inconsistent with the Purposes or that would materially impair the Conservation Values, or for any other uses or activities that are inconsistent with the Purposes or that would materially impair the Conservation Values.

B. Permitted Acts and Uses

Notwithstanding the Prohibited Acts and Uses described in Paragraph III.A., the Grantor may conduct or permit the following acts and uses on the Premises, provided they do not materially impair the Purposes and/or Conservation Values. In conducting any Permitted Act and Use, Grantor shall minimize impacts to the Conservation Values to ensure any such impairment thereto is not material.

1. Vegetation Management. Maintaining vegetation, including pruning, trimming, cutting, and mowing, and removing brush, all to prevent, control, and manage hazards, disease, insect or fire damage, and/or in order to maintain the condition of the Premises as documented in the Baseline Report (see Paragraph XV.);

2. Non-native, Nuisance, or Invasive species. Removing non-native, nuisance, or invasive species, interplanting native species, and controlling species in a manner that minimizes damage to surrounding, non-target species and preserves water quality;

3. Composting. Stockpiling and composting stumps, trees, brush, limbs, and similar biodegradable materials originating on the Premises;

4. Natural Habitat and Ecosystem Improvement. With prior written approval of the Grantee, conducting measures designed to restore native biotic communities, or to maintain, enhance or restore wildlife, wildlife habitat, ecosystem function, or rare or endangered species including planting native trees, shrubs, and other vegetation;

5. Indigenous Cultural Practices. With prior notice to the Grantee, allowing indigenous peoples to:

    a. Conduct cultural land ceremonial uses. Cultural practices are defined, for the purposes of this Conservation Restriction, as including traditional spiritual ceremonies, seasonal celebrations, offerings, and cultural, educational, and interpretive programming; and
    b. Harvest plant-life using sustainable methods, including regrowth and replanting to ensure sustainable populations for traditional cultural practices and non-commercial purposes;

6. Archaeological Investigations. Conducting archaeological activities, including without limitation archaeological research, surveys, excavation and artifact retrieval, but only in accordance with an archaeological field investigation plan, which plan shall also address restoration following completion of the archaeological investigation, prepared by or on behalf of the Grantor and approved in advance of such activity, in writing, by the Massachusetts Historical Commission State Archaeologist (or appropriate successor official) and by the Grantee. A copy of the results of any such investigation on the Premises is to be provided to the Grantee;

7. Trails. Maintaining and constructing trails as follows:

    a. Existing Trails. Conducting routine maintenance of existing trails, which may include widening trail corridors up to X (X) feet in width overall, with a treadway up to Y (Y) feet in width.
    b. New Trails. With prior written approval of the Grantee, constructing new trails or relocating existing trails, provided that any construction or relocation results in trails that conform with the width limitations above.

c. Trail Features. With prior written approval of the Grantee, constructing bog bridging, boardwalks, footbridges, railings, steps, culverts, benching, cribbing, contouring, or other such features, together with the use of motorized equipment to construct such features;

8. Signs. Constructing, installing, maintaining, and replacing signs and informational kiosks with respect to the Permitted Acts and Uses, the Purposes, the Conservation Values, trespass, public access, identity and address of the Grantor, sale of the Premises, the Grantee's interest in the Premises, boundary and trail markings, any gift, grant, or other applicable source of support for the conservation of the Premises;

9. Outdoor Passive Recreational and Educational Activities. Hiking, horseback riding, cross-country skiing, snowshoeing, nature observation, nature and educational walks and outings, outdoor educational activities, and other non-motorized outdoor recreational and educational activities; hunting may be permitted with prior written approval of the Grantee;

10. Forest Management.

a. Permitted Activities. Conducting sound silvicultural uses of the Premises, including the right to harvest forest products (as such term may be defined from time to time in Section 1 of Chapter 61 of the Massachusetts General Laws, or successor law) or conduct other forest management activities, reestablish historic woods roads and establish new woods roads, and the use of motorized vehicles, all as necessary to conduct such activities ("Forestry Activities"), provided that any Forestry Activities are carried out pursuant to a Forest Stewardship Plan (as defined below). All Forestry Activities shall avoid any stone structures or historical and cultural resources and shall be reasonably required to prevent any damage thereto. All cutting operations shall be supervised by a licensed forester.

b. Requirement of a Forest Stewardship Plan. Before any Forestry Activities occur on the Premises, Grantor shall submit a Forest Stewardship Plan to the Grantee, the Massachusetts Department of Conservation and Recreation ("DCR") or appropriate successor agency, and to any other required state agencies for their approval. The Forest Stewardship Plan shall:

i. be prepared by a forester licensed through DCR and shall follow the "Directions for the Preparation of the Chapter 61 Forest Management Plans and Forest Stewardship Plans" (as such guidelines may be amended by DCR or its successor agency) and such statutes, regulations and directions in effect at the time of the approval of said Forest Stewardship Plan; and

ii. include provisions designed to comply with the recommended activities and guidelines and required best management practices established in the Massachusetts Forestry Best Management Practices Manual (Catanzaro, Fish & Kittredge, University of Massachusetts,

Amherst & DCR; 2013) and subsequent versions as may be approved by the Forestry Bureau ("Forestry BMPs"); and

iii. address how the Forest Stewardship Plan complies with this Paragraph II.B.10; and

iv. be effective for a ten (10) year period and shall be resubmitted once every ten (10) years as necessary if additional Forestry Activities are desired.

11. Agricultural Activities.

a. Permitted Activities. "Agricultural Activities" are collectively defined as "Animal Husbandry" and "Horticulture," defined below:

i. Grazing. Allowing farm animals, including but not limited to dairy cattle, beef cattle, horses, poultry, sheep, pigs, and goats, to graze in open fields on the Premises, and to allow bees and beekeeping, for the purpose of using, consuming, or selling such animals or a product derived from such animals in the regular course of business.

ii. Horticulture. Raising vegetables, berries, and other foods for human consumption, feed for animals, flowers, all for the purpose of selling such products in the regular course of business; or when primarily and directly used in a related manner which is incidental to those uses and represents a customary and necessary use in raising such products and preparing them for use, consumption, or market.

b. Requirement to Follow Best Agricultural Practices. Agricultural Activities shall be conducted in a manner consistent with generally accepted best management practices for sustainable farming as those practices may be identified from time to time by appropriate governmental or educational institutions such as the USDA Natural Resources Conservation Service (NRCS), UMass Extension, Northeast Organic Farming Association (NOFA), Massachusetts Department of Agricultural Resources, and the like, (collectively, "Best Agricultural Practices") and in a manner that promotes healthy soils and healthy soil practices, as such terms are defined in Chapter 358 of the Acts of 2020, which added definitions of these terms to Section 7A of Chapter 128 of the Massachusetts General Laws ("Healthy Soils and Practices"), and in a manner that does not hinder the ability of future generations to engage in Agricultural Activities on the Premises, and further in a manner that does not impair nearby waterways, particularly the East Meadow River;

c. Requirement for a Farm Conservation Plan. Agricultural Activities shall require a farm conservation plan, such as an NRCS Conservation Plan ("Farm Conservation Plan"), prepared for the Premises, and approved in writing by the Grantee. The Farm Conservation Plan shall be developed in accordance with generally-accepted Best Agricultural Practices, and shall, at a minimum, address the following:

i. Address how farming practices will prevent adverse impacts to the water quality of the East Meadow River;

ii. in the event animal grazing is proposed, establish and govern the type and number of each type of animal unit permitted on the Premises, and analyze the pasturage potential of the Premises and establish and govern the cycling of pasturage, and any other measures necessary to ensure the carrying capacity of the Premises is not exceeded in order to protect water quality, prevent soil erosion, and otherwise protect the Conservation Values; and

iii. describe how Agricultural Activities will maximize soil and water conservation, and promote Healthy Soils and Practices.

d. Agricultural Structures and Improvements. Constructing and maintaining sight-pervious fencing, hayracks, watering troughs, a mobile poultry shelter, and, with prior approval of the Grantee, one (1) wood-sided run-in shelter.

12. Other Activities. Such other non-prohibited activities or uses of the Premises may be permitted with the prior approval of the Grantee provided that the Grantee has made a finding, such finding to be documented in writing and kept on file at the office of the Grantee, that such activities are consistent with the Reserved Rights or, as applicable, are included in an approved Forest Stewardship Plan, do not impair the conservation values and purposes of this Conservation Restriction, and, where feasible, result in a net gain in conservation value of the Premises.

C. Site Restoration

Upon completion of any Permitted Acts and Uses, any disturbed areas shall be restored substantially to the conditions that existed prior to said activities, including with respect to soil material, grade, and vegetated ground cover.

D. Compliance with Permits, Regulations, Laws

The exercise of any Permitted Acts and Uses under Paragraph III.B. shall be in compliance with all applicable federal, state and local laws, rules, regulations, zoning, and permits, and with the Constitution of the Commonwealth of Massachusetts. The inclusion of any Reserved Right requiring a permit, license or other approval from a public agency does not imply that the Grantee or the Commonwealth takes any position whether such permit, license, or other approval should be issued.

E. Notice and Approval

1. Notifying Grantee. Whenever notice to or approval by Grantee is required, Grantor shall notify or request approval from Grantee, by a method requiring proof of receipt, in writing not less than sixty (60) days prior to the date Grantor intends to undertake the activity in question, unless a different time period is specified herein. The notice shall:

a. Describe the nature, scope, design, location, timetable and any other material aspect of the proposed activity;
b. Describe how the proposed activity complies with the terms and conditions of this Conservation Restriction, and will not materially impair the Purposes and/or Conservation Values;
c. Identify all permits, licenses, or approvals required for the proposed activity, and the status of any such permits, licenses, or approvals.
d. Describe any other material aspect of the proposed activity in sufficient detail to permit the Grantee to make an informed judgment as to its consistency with the Purposes and Conservation Values.

2. Grantee Review. Where Grantee's approval is required, Grantee shall grant or withhold approval in writing within sixty (60) days of receipt of Grantor's request. Grantee's approval shall only be granted upon a showing that the proposed activity will minimize impacts to the Conservation Values and will not materially impair the Purposes and/or Conservation Values. Grantee may require Grantor to secure expert review and evaluation of a proposed activity by a mutually agreed upon party.

3. Resubmittal. Grantee's failure to respond within sixty (60) days of receipt shall not constitute approval of the request. Grantor may subsequently submit the same or a similar request for approval.

IV. INSPECTION AND ENFORCEMENT

A. Entry onto the Premises

The Grantor hereby grants to the Grantee, and its duly authorized agents or representatives, the right to enter the Premises upon reasonable notice and at reasonable times, for the purpose of inspecting the Premises to determine compliance with or to enforce this Conservation Restriction.

B. Legal and Injunctive Relief

1. Enforcement. The rights hereby granted shall include the right to enforce this Conservation Restriction by appropriate legal proceedings and to obtain compensatory relief, and equitable relief against any violations, including, without limitation, injunctive relief and relief requiring restoration of the Premises to its condition prior to the time of the injury (it being agreed that the Grantee will have no adequate remedy at law in case of an injunction). The rights hereby granted shall be in addition to, and not in limitation of, any other rights and remedies available to the Grantee for the enforcement of this Conservation Restriction.

2. Notice and Cure. In the event the Grantee determines that a violation of this Conservation Restriction has occurred and intends to exercise any of the rights described herein, the Grantee shall, before exercising any such rights, notify the Grantor in writing of the violation. The Grantor shall have thirty (30) days from receipt of the written notice to halt the violation and remedy any damage caused by it, after

which time Grantee may take further action, including instituting legal proceedings and entering the Premises to take reasonable measures to remedy, abate or correct such violation, without further notice. Provided, however, that this requirement of deferment of action for thirty (30) days applies only if Grantor immediately ceases the violation and Grantee determines that there is no ongoing violation. In instances where a violation may also constitute a violation of local, state, or federal law, the Grantee may notify the proper authorities of such violation.

3. Reimbursement of Costs and Expenses of Enforcement. Grantor covenants and agrees to reimburse to Grantee all reasonable costs and expenses (including counsel fees) incurred by the Grantee in enforcing this Conservation Restriction or in taking reasonable measures to remedy, abate or correct any violation thereof. In the event of a dispute over the boundaries of the Conservation Restriction, Grantor shall pay for a survey by a Massachusetts licensed professional land surveyor and to have the boundaries permanently marked.

C. Non-Waiver

Enforcement of the terms of this Conservation Restriction shall be at the sole discretion of Grantee. Any election by the Grantee as to the manner and timing of its right to enforce this Conservation Restriction or otherwise exercise its rights hereunder shall not be deemed or construed to be a waiver of such rights.

D. Disclaimer of Liability

By acceptance of this Conservation Restriction, the Grantee does not undertake any liability or obligation relating to the condition of the Premises pertaining to compliance with and including, but not limited to, hazardous materials, zoning, environmental laws and regulations, or acts not caused by the Grantee or its agents.

E. Acts Beyond the Grantor's Control

Nothing contained in this Conservation Restriction shall be construed to entitle the Grantee to bring any actions against the Grantor for any injury to or change in the Premises resulting from natural causes beyond the Grantor's control, including but not limited to fire, flood, weather, climate-related impacts, and earth movement, or from any prudent action taken by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to the Premises resulting from such causes. In the event of any such occurrence, the Grantor and Grantee will cooperate in the restoration of the Premises, if desirable and feasible.

V. PUBLIC ACCESS

The Grantor grants access to present and future trails on the Premises to the general public and agrees to take no action to prohibit or discourage trail access to and use of the Premises by the general public, but only for daytime use and only as described in Paragraph III.B.9. provided that such agreement by Grantor is subject to the Grantor's reserved right to establish reasonable rules,

regulations, and restrictions on such permitted recreational use by the general public for the protection of the Purposes and Conservation Values. Grantor has the right to control, limit, or prohibit by posting and other reasonable means activities or uses of the Premises not authorized in Paragraph III.B.9. The Grantor's right to grant public access across the Premises is subject to the restrictions described in this Conservation Restriction. The Grantee may require the Grantor to post the Premises against any use by the public that results in material impairment of the Conservation Values. Any public use which is permitted by the terms of this Conservation Restriction constitutes permission to use the Premises for the purposes described in Section 17C of Chapter 21 of the Massachusetts General Laws and the Grantor and Grantee hereto benefit from exculpation from liability to the extent provided in such section.

VI. TERMINATION/RELEASE/EXTINGUISHMENT

A. Procedure

If circumstances arise in the future that render the Purposes impossible to accomplish, this Conservation Restriction can only be terminated, released, or extinguished, whether in whole or in part, by a court of competent jurisdiction under applicable law after review and approval by the Secretary of Energy and Environmental Affairs of the Commonwealth of Massachusetts, or successor official ("Secretary"), and any other approvals as may be required by Section 32 of Chapter 184 of the Massachusetts General Laws.

B. Grantor's and Grantee's Right to Recover Proceeds

If any change in conditions ever gives rise to termination, release, or extinguishment of this Conservation Restriction under applicable law, then Grantee, on a subsequent sale, exchange, or involuntary conversion of the Premises, shall be entitled to a portion of the proceeds in accordance with Paragraph VI.C., subject, however, to any applicable law which expressly provides for a different disposition of the proceeds, and after complying with the terms of any gift, grant, or funding requirements. The Grantee shall use its share of any proceeds in a manner consistent with the Purposes or the protection of the Conservation Values.

C. Grantee's Receipt of Property Right

Grantor and Grantee agree that the conveyance of this Conservation Restriction gives rise to a real property right, immediately vested in the Grantee, with a fair market value that is at least equal to the proportionate value that this Conservation Restriction bears to the value of the unrestricted Premises. The proportionate value of the Grantee's property right will be determined as of the date of termination, release, or extinguishment.

D. Cooperation Regarding Public Action

Whenever all or any part of the Premises or any interest therein is taken by public authority under power of eminent domain or other act of public authority, then the Grantor and the Grantee shall cooperate in recovering the full value of all direct and consequential damages resulting from such action. All related expenses incurred by the Grantor and the Grantee shall first be paid out of any

recovered proceeds, and the remaining proceeds shall be distributed between the Grantor and Grantee in accordance with Paragraph VI.B. and Paragraph VI.C. If a less than fee interest is taken, the proceeds shall be equitably allocated according to the nature of the interest taken. The Grantee shall use its share of any proceeds in a manner consistent with the Purposes or the protection of the Conservation Values.

VII. DURATION and ASSIGNABILITY

A. Running of the Burden

The burdens of this Conservation Restriction shall run with the Premises in perpetuity, and shall be enforceable against the Grantor and the successors and assigns of the Grantor holding any interest in the Premises.

B. Execution of Instruments

The Grantee is authorized to record or file any notices or instruments appropriate to assuring the perpetual enforceability of this Conservation Restriction. The Grantor, on behalf of itself and its successors and assigns, appoints the Grantee its attorney-in-fact to execute, acknowledge and deliver any such instruments on its behalf. Without limiting the foregoing, the Grantor and its successors and assigns agree themselves to execute any such instruments upon request.

C. Running of the Benefit

The benefits of this Conservation Restriction shall run to the Grantee, shall be in gross and shall not be assignable by the Grantee, except when all of the following conditions are met:

1. the Grantee requires that the Purposes continue to be carried out;
2. the assignee is not an owner of the fee in the Premises;
3. the assignee, at the time of the assignment, qualifies under and 26.U.S.C. 170(h), and applicable regulations thereunder, if applicable, and is eligible to receive this Conservation Restriction under Section 32 of Chapter 184 of the Massachusetts General Laws; and
4. the assignment complies with Article 97 of the Amendments to the Constitution of the Commonwealth of Massachusetts, if applicable.

VIII. SUBSEQUENT TRANSFERS

A. Procedure for Transfer

The Grantor agrees to incorporate by reference the terms of this Conservation Restriction in any deed or other legal instrument which grants any interest in all or a portion of the Premises, including a leasehold interest and to notify the Grantee not less than twenty (20) days prior to the effective date of such transfer. *[If the Premises was acquired by a Land Trust or similar conservation organization with a Conservation Partnership grant, insert the following:* Any transfers shall receive prior approval by Grantee to assure that the Premises is transferred to a

qualified conservation organization.] Failure to do any of the above shall not impair the validity or enforceability of this Conservation Restriction. If the Grantor fails to reference the terms of this Conservation Restriction in any deed or other legal instrument which grants any interest in all or a portion of the Premises, then the Grantee may record, in the applicable registry of deeds, or registered in the applicable land court registry district, and at the Grantor's expense, a notice of this Conservation Restriction. Any transfer will comply with Article 97 of the Amendments to the Constitution of the Commonwealth of Massachusetts, if applicable.

B. Grantor's Liability

The Grantor shall not be liable for violations occurring after their ownership. Liability for any acts or omissions occurring prior to any transfer and liability for any transfer if in violation of this Conservation Restriction shall survive the transfer. Any new owner shall cooperate in the restoration of the Premises or removal of violations caused by prior owner(s) and may be held responsible for any continuing violations.

IX. ESTOPPEL CERTIFICATES

Upon request by the Grantor, the Grantee shall, within thirty (30) days execute and deliver to the Grantor any document, including an estoppel certificate, which certifies the Grantor's compliance or non-compliance with any obligation of the Grantor contained in this Conservation Restriction.

X. NON MERGER

The parties intend that any future acquisition of the Premises shall not result in a merger of the Conservation Restriction into the fee. The Grantor agrees that it will not grant, and the Grantee agrees that it will not take title, to any part of the Premises without having first assigned this Conservation Restriction following the terms set forth in Paragraph VII.C to ensure that merger does not occur and that this Conservation Restriction continues to be enforceable by a non-fee owner.

XI. AMENDMENT

A. Limitations on Amendment

Grantor and Grantee may amend this Conservation Restriction only to correct an error or oversight, clarify an ambiguity, maintain or enhance the overall protection of the Conservation Values, or add real property to the Premises, provided that no amendment shall:

1. affect this Conservation Restriction's perpetual duration;
2. be inconsistent with or materially impair the Purposes;
3. affect the qualification of this Conservation Restriction as a "qualified conservation contribution" or "interest in land" under any applicable laws, including 26 U.S.C. Section 170(h), and related regulations;

4. affect the status of Grantee as a "qualified organization" or "eligible donee" under any applicable laws, including 26 U.S.C. Section 170(h) and related regulations, and Sections 31, 32, and 33 of Chapter 184 of the Massachusetts General Laws; or
5. create an impermissible private benefit or private inurement in violation of federal tax law, as determined by an appraisal, conducted by an appraiser selected by the Grantee, of the economic impact of the proposed amendment; or
6. alter or remove the provisions described in Paragraph VI (Termination/Release/Extinguishment); or
7. cause the provisions of this Paragraph XI to be less restrictive; or
8. cause the provisions described in Paragraph VII.C (Running of the Benefit) to be less restrictive

B. Amendment Approvals and Recording

No amendment shall be effective unless documented in a notarized writing executed by Grantee and Grantor, approved by the City of Haverhill and by the Secretary in the public interest pursuant to Section 32 of Chapter 184 of the Massachusetts General Laws, and recorded in the applicable registry of deeds or registered in the applicable land court registry district.

XII. EFFECTIVE DATE

This Conservation Restriction shall be effective when the Grantor and the Grantee have executed it, the administrative approvals required by Section 32 of Chapter 184 of the Massachusetts General Laws have been obtained, and it has been recorded in the applicable registry of deeds or registered in the applicable land court registry district.

XIII. NOTICES

Any notice, demand, request, consent, approval or communication that either party desires or is required to give to the other shall be in writing and either served personally or sent by first class mail, postage pre-paid, addressed as follows:

To Grantor: City of Haverhill
Dept. of Public Works, Water Division
Deputy Director
40 South Porter Street
Haverhill, MA 01835

To Grantee: Essex County Greenbelt Association, Inc.
Director of Stewardship
P.O. Box 1026
Essex, MA 01929

or to such other address as any of the above parties shall designate from time to time by written notice to the other or, if notice is returned to sender, to an address that is reasonably ascertainable by the parties.

A. Pre-existing Public Rights

Approval of this Conservation Restriction pursuant to Section 32 of Chapter 184 of the Massachusetts General Laws by any municipal officials and by the Secretary, is not to be construed as representing the existence or non-existence of any pre-existing rights of the public, if any, in and to the Premises, and any such pre-existing rights of the public, if any, are not affected by the granting of this Conservation Restriction.

B. Release of Homestead

The Grantor attests that there is no residence on or abutting the Premises (including areas excluded from the Premises) that is occupied or intended to be occupied as a principal residence by a spouse, former spouse, or children of the grantor, or a spouse, former spouse, or children of a beneficiary of the trust, if Premises is owned by a trust.

C. No Surety Interest

The Grantor attests that there is no mortgage, promissory note, loan, lien, equity credit line, refinance assignment of mortgage, lease, financing statement or any other agreement which gives rise to a surety interest affecting the Premises.

D. Prior Encumbrances

This Conservation Restriction shall be in addition to and not in substitution of any other restrictions or easements of record affecting the Premises.

E. Attached hereto and incorporated herein by reference are the following:

Signature pages:

Grantor
Grantee Acceptance
Approval of Mayor
Approval of the Secretary of Energy and Environmental Affairs of the Commonwealth of Massachusetts.

Exhibits:

Exhibit A: Legal Description of Premises
Exhibit B: Reduced Copy of Recorded Plan of Premises

XIV. GENERAL PROVISIONS

A. Controlling Law

The interpretation and performance of this Conservation Restriction shall be governed by the laws of the Commonwealth of Massachusetts.

B. Liberal Construction

Any general rule of construction to the contrary notwithstanding, this Conservation Restriction shall be liberally construed in order to effect the Purposes and the policy and purposes of Sections 31, 32, and 33 of Chapter 184 of the Massachusetts General Laws. If any provision in this instrument is found to be ambiguous, any interpretation consistent with the Purposes that would render the provision valid shall be favored over any interpretation that would render it invalid.

C. Severability

If any provision of this Conservation Restriction or the application thereof to any person or circumstance is found to be invalid, the remainder of the provisions of this Conservation Restriction shall not be affected thereby.

D. Entire Agreement

This instrument sets forth the entire agreement of the Grantor and Grantee with respect to this Conservation Restriction and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Conservation Restriction, all of which are merged herein.

XV. BASELINE DOCUMENTATION REPORT

The Conservation Values, as well as the natural features, current uses of, and existing improvements on the Premises, such as, but not limited to, trails, woods roads, structures, meadows or other cleared areas, agricultural areas, and scenic views, as applicable, are described in a Baseline Documentation Report ("Baseline Report") prepared by Grantee with the cooperation of the Grantor, consisting of maps, photographs, and other documents and on file with the Grantee and referenced herein. The Baseline Report (i) is acknowledged by Grantor and Grantee to be a complete and accurate representation of the condition and values of the Premises as of the date of this Conservation Restriction, (ii) is intended to fully comply with applicable Treasury Regulations, (iii) is intended to serve as an objective information baseline for subsequent monitoring of compliance with the terms of this Conservation Restriction as described herein, and (iv) may be supplemented as conditions on the Premise change as allowed over time. Notwithstanding the foregoing, the parties may utilize any evidence of the condition of the Premises at the time of this grant in addition to the Baseline Report.

XVI. MISCELLANEOUS

WITNESS my hand and seal this ____day of _____, 2021,

_____, duly authorized
Kate Bowditch, President

_____, duly authorized
Timothy Fritzinger, Treasurer

COMMONWEALTH OF MASSACHUSETTS

Essex County, ss:

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared _____, and proved to me through satisfactory evidence of identification which was _____ to be the person whose name is signed on the proceeding or attached document, and acknowledged to me that s/he signed it voluntarily for its stated purpose.

_____
Notary Public
My Commission Expires:

COMMONWEALTH OF MASSACHUSETTS

Essex County, ss:

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared _____, and proved to me through satisfactory evidence of identification which was _____ to be the person whose name is signed on the proceeding or attached document, and acknowledged to me that s/he signed it voluntarily for its stated purpose.

_____
Notary Public
My Commission Expires:

ACCEPTANCE OF CITY OF HAVERHILL BY CITY COUNCIL

We, the undersigned, being a majority of the City Council of the City of Haverhill, Massachusetts, hereby certify that at a public meeting duly held on _____, 2021, the City Council voted to approve and accept the foregoing Conservation Restriction from Esesx County Greenbelt Association, Inc. pursuant to Section 32 of Chapter 184 and Section 8C of Chapter 40 of the Massachusetts General Laws and do hereby accept the foregoing Conservation Restriction.

_____
Melinda Barrett, City Council President, duly authorized

COMMONWEALTH OF MASSACHUSETTS

Essex County, ss:

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared Melinda Barrett, and proved to me through satisfactory evidence of identification which was _____ to be the person whose name is signed on the proceeding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

_____
Notary Public
My Commission Expires:

APPROVAL OF MAYOR OF HAVERHILL

The undersigned, Mayor of the City of Haverhill, hereby approves the foregoing Conservation Restriction from Essex County Greenbelt Association, Inc. of the City of Haverhill in the public interest pursuant to Section 32 of Chapter 184 of the Massachusetts General Laws.

_____

James J. Fiorentini, Mayor of the City of Haverhill, duly authorized

COMMONWEALTH OF MASSACHUSETTS

Essex County, ss:

On this _____day of _____, 2021, before me, the undersigned notary public, personally appeared James J. Fiorentini, and proved to me through satisfactory evidence of identification which was personal knowledge to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose as Mayor.

_____

Notary Public
My Commission Expires:

APPROVAL OF SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS OF THE COMMONWEALTH OF MASSACHUSETTS

The undersigned, Secretary of Energy and Environmental Affairs of the Commonwealth of Massachusetts, hereby certifies that the foregoing Conservation Restriction from Essex County Greenbelt Association, Inc. to the City of Haverhill has been approved in the public interest pursuant to Section 32 of Chapter 184 of the Massachusetts General Laws.

Dated: _____, 2021

_____
Kathleen A. Theoharides
Secretary of Energy and Environmental Affairs

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss:

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared Kathleen A. Theoharides, and proved to me through satisfactory evidence of identification which was _____ to be the person whose name is signed on the proceeding or attached document, and acknowledged to me that she signed it voluntarily for its stated purpose.

_____
Notary Public
My Commission Expires:

EXHIBIT A

Legal Description of Premises

If you do not have a survey plan for the Premises, or if you choose to provide a written description in addition to the survey plan, insert that written description here.

ALL Building Envelopes and Exclusion areas MUST be defined by metes and bounds.

If providing a written metes and bounds description along with a survey plan, the written metes and bounds and those shown on the survey MUST match.

OR

If Exhibit B is a reduced copy of a survey plan and you will not provide a written metes and bounds description, follow the template provided below. This is the recommended option if you have a survey plan.]

Description of the Premises

The Premises subject to this Conservation Restriction is the entirety of *[INSERT # of and "parcels"]* of land located in the *[Town/City of XXX]*, *[County Name]* County, Commonwealth of Massachusetts, containing a total of *[Insert # of acres]* acres, shown as *[Insert parcel name as given on plan, i.e., "Parcel A" or "Lot 10"]* on a plan of land entitled *[Insert Plan Name]*, dated *[Insert Plan Date]*, prepared by *[Insert Plan creator / professional land surveyor / company name, address]*, said plan recorded at the *[Insert recording information]*, a reduced copy of which is attached hereto as Exhibit B.

Street Address:

EXHIBIT B

[Reduced Copy of *OR* Sketch] Plan of Premises

For official full size plan see [*enter County*] Registry of Deeds Plan Book _____ Page _____

[*This plan/map must show the Premises. The CR area and any exclusions or building envelopes must be clearly labeled.*

If a party other than the PLS or other professional preparer of the Plan has added features (e.g., planned trails), this should be labeled as a 'Sketch Plan of Premises' and should clarify which features are not associated with the official copy.

If this is a copy of the full size plan that has not been altered in any way, then it should be labeled as a 'Reduced Copy of Plan of Premises'.]

DRAFT

EXHIBIT E

Timeline

(see attached)

97 Corliss Hill Road
Haverhill, Massachusetts

TIMELINE FOR ACQUISITION UNDER M.G.L. CHAPTER 61A, SECTION 14

April 3, 2020	Statute enacted suspending statutory deadlines under Chapter 61A, Section 14, for the duration of COVID state of emergency as declared by Governor Baker plus an additional ninety (90) days following the termination of such state of emergency
June 15, 2021	State of emergency terminated
On or before August 15, 2021	City and Greenbelt execute a Memorandum of Understanding regarding (i) the taking of 13+/- forested acres of the property from Greenbelt (the "Taking"), (ii) the grant of a CR over said 13+/- acres to Greenbelt (the "City CR"), and (iii) the acceptance of a CR from Greenbelt over the remaining portion of the property (the "Greenbelt CR"), which agreement shall have a sketch plan showing the agreed upon property division and this timeline attached as exhibits
On or before August 31, 2021	Greenbelt delivers proposed forms of the City CR and the Greenbelt CR to City
September 14, 2021	Statutory deadlines under Chapter 61A, Section 14, restart
On or before October 15, 2021	City and Greenbelt agree upon forms of City CR and Greenbelt CR (subject to review by Commonwealth of Massachusetts) Greenbelt provides City with draft ANR plan for approval Greenbelt submits City CR and Greenbelt CR to EEA-DCS for approval
On or before October 31, 2021	City approves ANR Plan

November 2021	City holds public hearing for assignment of first refusal option to Greenbelt. Specifically, City holds public hearing for the Taking, the grant of the City CR and the acceptance of the Greenbelt CR City provides Greenbelt with proposed form of taking instrument and such instrument is fully negotiated between the parties
December 1-15, 2021	City Council and Mayor vote their intent to assign the first refusal option to Greenbelt Greenbelt obtains approval of its Board of Directors for all transactions City and Greenbelt execute Assignment of First Refusal Option Agreement City executes Notice of Assignment of First Refusal Option and delivers the original recordable document to Greenbelt City confirms that $150,000 has been appropriated and will be delivered in escrow prior to Closing by means of a wire transfer of immediately available funds
December 16-17, 2021	Greenbelt records Notice of Assignment of First Refusal Option in the Southern Essex District Registry of Deeds Greenbelt sends copy of recorded Notice of Assignment of First Refusal Option to landowner via certified mail
January 5, 2022	Greenbelt (i) records Notice of Exercise of First Refusal Option in the Southern Essex District Registry of Deeds and (ii) sends copy of recorded Notice of Exercise of First Refusal Option and proposed form of purchase and sale agreement to landowner via certified mail *(January 11, 2022 (120 days after September 14, 2021)= statutory deadline for recording of the Exercise of Option to Purchase)*

On or before February 28, 2022	City CR executed by City (DPW, Mayor and City Council) and Greenbelt within ten (10) business days following approval for local signature by Commonwealth of Massachusetts. City/DPW votes to accept Greenbelt CR Greenbelt CR executed by Greenbelt and City (DPW, Mayor, City Council) within ten (10) business days following approval for local signature by Commonwealth of Massachusetts. Greenbelt submits the City CR and the Greenbelt CR to the Commonwealth of Massachusetts for signature
March 22, 2022	City delivers $150,000 to the title company in escrow (such funds to be delivered by means of a wire transfer of immediately available funds) City delivers its recordable taking instrument to the title company in escrow Greenbelt wires the remaining portion of the closing funds to the title company in escrow Greenbelt and the landowner deliver to the title company in escrow all documents required for the sale of the property to Greenbelt Greenbelt delivers the signed and stamped mylar of the ANR plan, the fully executed original City CR and the fully executed original Greenbelt CR to the title company in escrow
March 31, 2022	Greenbelt purchases the property from landowner *(April 5, 2022 (90 days after recording of Notice of Exercise on January 5, 2022) = statutory deadline for closing)* Immediately following the recording of the deed to Greenbelt and the ANR plan, (i) the taking instruments is recorded, (ii) the City CR is recorded and (iii) the Greenbelt CR is recorded

EXHIBIT F

Form of Assignment of First Refusal Option

(see attached)

ASSIGNMENT OF FIRST REFUSAL OPTION

The undersigned Mayor and City Council of the **City of Haverhill**, after a public hearing duly called and held pursuant to law, hereby assign to **Essex County Greenbelt Association, Inc.**, a Massachusetts nonprofit corporation having its principal office at 82 Eastern Avenue, Essex, MA 01929 (the "Assignee"), its first refusal option pursuant to M.G.L. c. 61A, Section 14 to purchase the property located at 97 Corliss Hill Road, Haverhill, which property is more particularly described in a Purchase and Sale Agreement dated May 12, 2020, by and between Daniel Byra and Mark Byra, jointly, as Seller, and M. Ryan Norman, as Buyer.

Said assignment is made to the Assignee pursuant to M.G.L. c. 61A, Section 14.

Dated this _____day of _____, 2021.

_____
James J. Fiorentini
Mayor

_____
Melinda E. Barrett
President, City Council

_____
_____
Member, City Council

_____
_____
Member, City Council

_____
_____
Member, City Council

_____
_____
Member, City Council

ACCEPTANCE OF ASSIGNMENT

Essex County Greenbelt Association, Inc., a Massachusetts nonprofit corporation having its principal office at 82 Eastern Avenue, Essex, MA 01929, hereby accepts the foregoing Assignment of First Refusal Option from the City of Haverhill and, if it so elects to exercise the option, agrees to purchase the property subject to said assignment in conformity with the requirements of M.G.L. c. 61A, Section 14.

Dated this _____ day of _____, 2021.

Essex County Greenbelt Association, Inc.

By: _____
Katherine Bowditch
President

EXHIBIT G

Form of Notice of Assignment of First Refusal Option

(see attached)

NOTICE OF ASSIGNMENT OF FIRST REFUSAL OPTION

Reference is made to that certain Notice of Intention to Sell for Other Use dated October 20, 2020, from Daniel Byra and Mark Byra, jointly, pertaining to 97 Corliss Hill Road in Haverhill, Massachusetts, which land is more particularly described in said notice, is shown on that certain plan entitled "Proposed Site Plan of Land at 117 Corliss Hill Road, Haverhill, Massachusetts, Owner/Applicant: Leslie Salach and Michael W. Byra," prepared by R.A.M. Engineering, dated September 2008, and recorded in the Essex Southern District Registry of Deeds in Plan Book 418 as Plan 86, and is classified as agricultural and horticultural land under M.G.L. Chapter 61A.

The undersigned Mayor and City Council of the City of Haverhill hereby gives notice that, after a public hearing duly called and held pursuant to law, the City of Haverhill has, pursuant to M.G.L. Chapter 61 A, Section 14, assigned the City of Haverhill's first refusal option to purchase said land to Essex County Greenbelt Association, Inc., a Massachusetts nonprofit corporation having its principal office at 82 Eastern Avenue, Essex, MA 01929 (the "Assignee"), which Assignee is a nonprofit conservation organization.

Dated this _____ day of _____, 2021.

_____
James J. Fiorentini
Mayor

_____
Melinda E. Barrett
President, City Council

_____
Member, City Council

_____
Member, City Council

_____
Member, City Council

_____
Member, City Council

[Acknowledgment on following page]

COMMONWEALTH OF MASSACHUSETTS

_____, SS.

On this _____ day of _____, 2021, before me, the undersigned notary public, personally appeared _____, _____ of the City of Haverhill, proved to me through satisfactory evidence of identification, which was _____, to be the person whose name is signed on the preceding or attached document, and s/he acknowledged to me that s/he signed it voluntarily for its stated purpose as _____ of the City of Haverhill, as the voluntary act of such municipal corporation.

_____ *(signature)*

_____ *(printed name)*
Notary Public
My commission expires: _____

Haverhill

Engineering Department, Room 300
Tel: 978-374-2335 Fax: 978-373-8475
John H. Pettis III, P.E. - City Engineer
JPettis@CityOfHaverhill.com

8.3

August 6, 2021

MEMO TO: CITY COUNCIL PRESIDENT MELINDA BARRETT AND MEMBERS OF THE CITY COUNCIL

Subject: ***58 Kenoza Avenue – Monitoring Well***

Please see the attached request to install monitoring wells within City Right of Way (on sidewalks) adjacent to the subject parcel. Should the Council approval this request, which I support, I will issue the appropriate Right of Way Permit.

Please contact me if you have any questions.

Sincerely,

John H. Pettis III, P.E.
City Engineer

C: Mayor Fiorentini, Stankovich, Ward, Cox

2021 AUG 06 AM 10:58 CITY CLERK HAVERHILL

NEET

August 4, 2021

John H Pettis III, P.E.
City of Haverhill - Engineering Division
City Hall - Room 300
4 Summer Street
Haverhill, MA 01830-5885

Dear Mr. Pettis,

New England Environmental Technologies (NEET) has been engaged by the owner of the property located 58 Kenoza Avenue, Haverhill, MA to address an historical release of petroleum subject to the provisions established within the Massachusetts Contingency Plan (MCP) at 310 CMR 40.0000. The Site is currently recorded by the Massachusetts Department of Environmental Protection (DEP) with the Release Tracking Number of 3-35327. A Phase 1 Preliminary Site Assessment has been performed at the subject property. In order to comply with the MCP, additional investigations are necessary to delineate the extent of contamination and determine the need for further response actions.

Our drilling sub-contractor, Technical Drilling Services (TDS), applied for the installation of three groundwater monitoring wells to be placed downgradient of the release site. The purpose of the wells are to determine if groundwater is in compliance with current DEP standards and if groundwater contaminants, if present, could pose a concern regarding vapor intrusion into occupied structures.

To view additional information regarding the Site, you may go to the DEP website by following the link below and use the RTN search criteria 3-0035327.

https://eeaonline.eea.state.ma.us/portal#!/search/wastesite

The Engineering Division has requested a letter explaining the purpose of the monitoring wells prior to issuing the permit to install the wells. Hopefully this letter will satisfy that request. Please contact NEET at 978-521-1111 if there is a need for additional information.

Thank you.

John Clement, LSP
President

2021HAVDOSAMTDSHDV.GIF/PC

New England Environmental Technologies Corporation
145 South Main Street, Haverhill, MA 01835
Ph: (978) 521-1111 (978) 891-5424

Hearing September 21, 2021

Questions contact – Veasna Eang 781-907-2041

9.1

PETITION FOR POLE AND WIRE LOCATIONS

North Andover, Massachusetts

To the City Council
Of Haverhill, Massachusetts

Massachusetts Electric Company d/b/a NATIONAL GRID requests permission to locate poles, wires, and fixtures, including the necessary sustaining and protecting fixtures, along and across the following public way:

Research Dr. - National Grid to install (2) 45'C2 SO poles 83-6 and 83-7 on Research Dr. beginning at a point approximately 25 feet east of the centerline of the intersection of Broadway and Research Dr. and continuing approximately 663 feet in a north direction; pole 83-6 to be set +/- 150 feet north of pole 83-5 and pole 83-7 to be set +/- 260 feet north of pole 83-5. Both poles to be set back +/- 5-6 feet back from curb.

Location approximately as shown on plan attached.

Wherefore it prays that after due notice and hearing as provided by law, it be granted a location for and permission to erect and maintain poles and wires, together with such sustaining and protecting fixtures as it may find necessary, said poles to be erected substantially in accordance with the plan filed herewith marked – Research Dr. - Haverhill, Massachusetts.

30346085

Also, for permission to lay and maintain underground laterals, cables, and wires in the above or intersecting public ways for the purpose of making connections with such poles and buildings as each of said petitioners may desire for distributing purposes.

Your petitioner agrees to reserve space for one cross-arm at a suitable point on each of said poles for the fire, police, telephone, and telegraph signal wires belonging to the municipality and used by it exclusively for municipal purposes.

Massachusetts Electric Company d/b/a
NATIONAL GRID Dave Johnson/lla
BY _____
Engineering Department

July 21, 2021

nationalgrid

July 20, 2021

The City Council of Haverhill, Massachusetts

To whom it may concern:

Enclosed please find a petition of NATIONAL GRID, covering NATIONAL GRID pole location(s)

If you have any questions regarding this permit, please contact:

Veasna Eang 781-907-2041

Please notify National Grid's Lisa Ayres of the hearing date / time.

National Grid: Lisa Ayres; 1101 Turnpike Street; North Andover, MA 01845; # 978-725-1418

If this petition meets with your approval, please return an executed copy to:

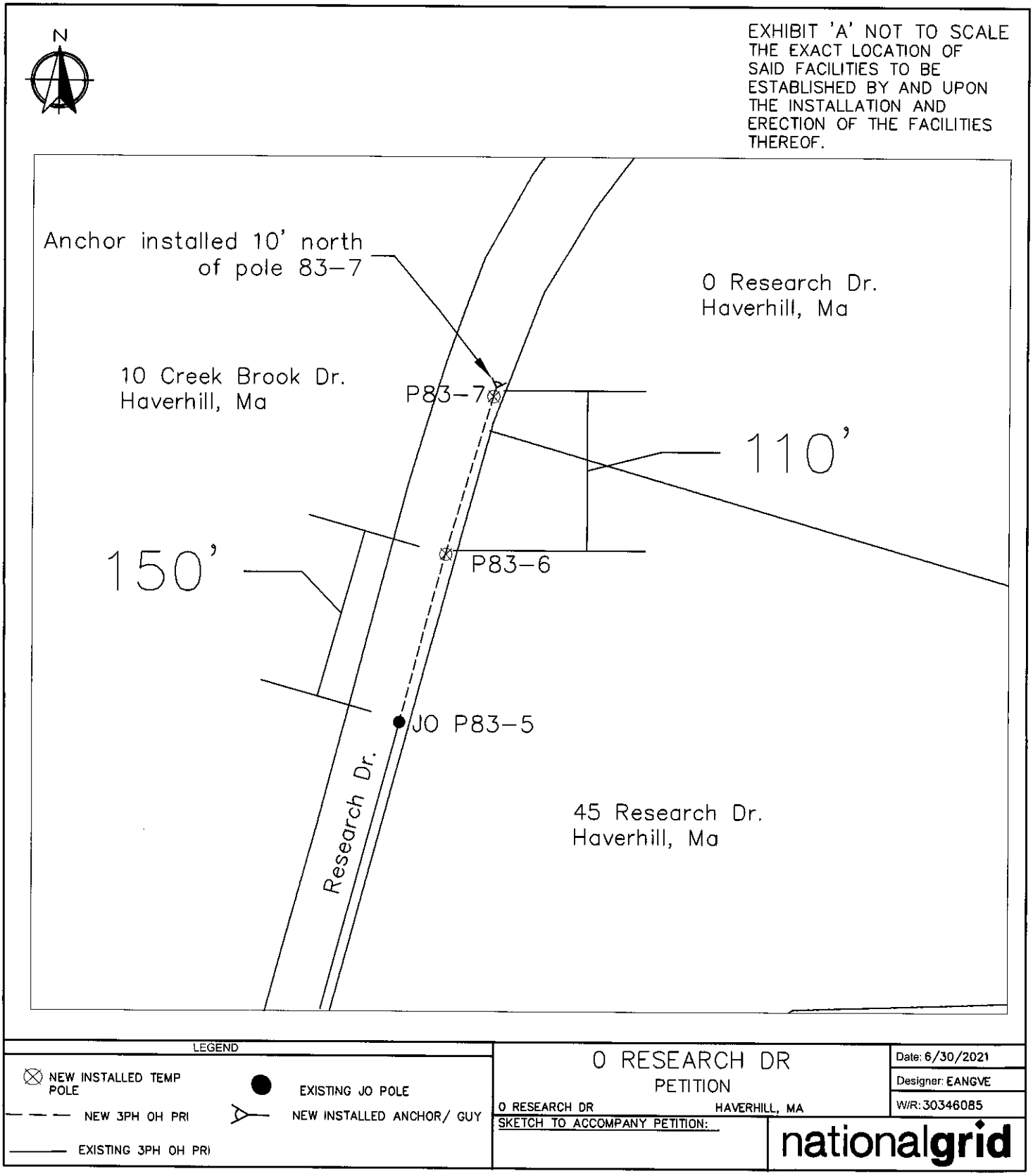
National Grid Contact: Lisa Ayres; 1101 Turnpike Street; North Andover, MA 01845.

Very truly yours,

Dave Johnson/lla

Dave Johnson
Supervisor, Distribution Design

Enclosures


N
EXHIBIT 'A' NOT TO SCALE
THE EXACT LOCATION OF SAID FACILITIES TO BE ESTABLISHED BY AND UPON THE INSTALLATION AND ERECTION OF THE FACILITIES THEREOF.
Anchor installed 10' north of pole 83-7
0 Research Dr.
Haverhill, Ma
10 Creek Brook Dr.
Haverhill, Ma
P83-7
110'
150'
P83-6
JO P83-5
Research Dr.
45 Research Dr.
Haverhill, Ma
LEGEND
NEW INSTALLED TEMP POLE
EXISTING JO POLE
NEW 3PH OH PRI
NEW INSTALLED ANCHOR/ GUY
EXISTING 3PH OH PRI
0 RESEARCH DR
PETITION
0 RESEARCH DR HAVERHILL, MA
SKETCH TO ACCOMPANY PETITION:
Date: 6/30/2021
Designer: EANGVE
W/R: 30346085
nationalgrid

Hearing September 21, 2021

Questions contact – Joe Ientile 978-766-3114

9.2

Petition of the Massachusetts Electric Company d/b/a NATIONAL GRID
Of NORTH ANDOVER, MASSACHUSETTS
For Electric Conduit Location:

To the City Council of Haverhill

Respectfully represents the Massachusetts Electric Company d/b/a NATIONAL GRID of North Andover, Massachusetts, that it desires to construct a line of underground electric conduits, including the necessary sustaining and protecting fixtures, under and across the public way or ways hereinafter named.

Wherefore it prays that after due notice and hearing as provided by law, it be granted permission to excavate the public highways and to run and maintain underground electric conduits, together with such sustaining and protecting fixtures as it may find necessary for the transmission of electricity, said underground conduits to be located substantially in accordance with the plan filed herewith marked – Washington St. - Haverhill, Massachusetts.

The following are the streets and highways referred to:

29456312 Washington St. - National Grid proposes to install approximately 66' of two sets of 500 CU secondary cable in customer installed 3-4" conduits from existing manhole B-15 to new heavy duty handhole in order to provide electric service to 21-27 Washington St.

Location approximately as shown on plan attached.

Massachusetts Electric Company d/b/a
NATIONAL GRID Dave Johnson/lla
BY _____
Engineering Department

Dated: July 21, 2021

nationalgrid

2021JUL27AM10:32HAUCITYC

July 21, 2021

The City Council Haverhill, Massachusetts

To Whom It May Concern:

Enclosed please find a petition of NATIONAL GRID covering the installation of underground facilities.

If you have any questions regarding this permit, please contact:

Joe Ientile 978-766-3114

If this petition meets with your approval, please return an executed copy to:

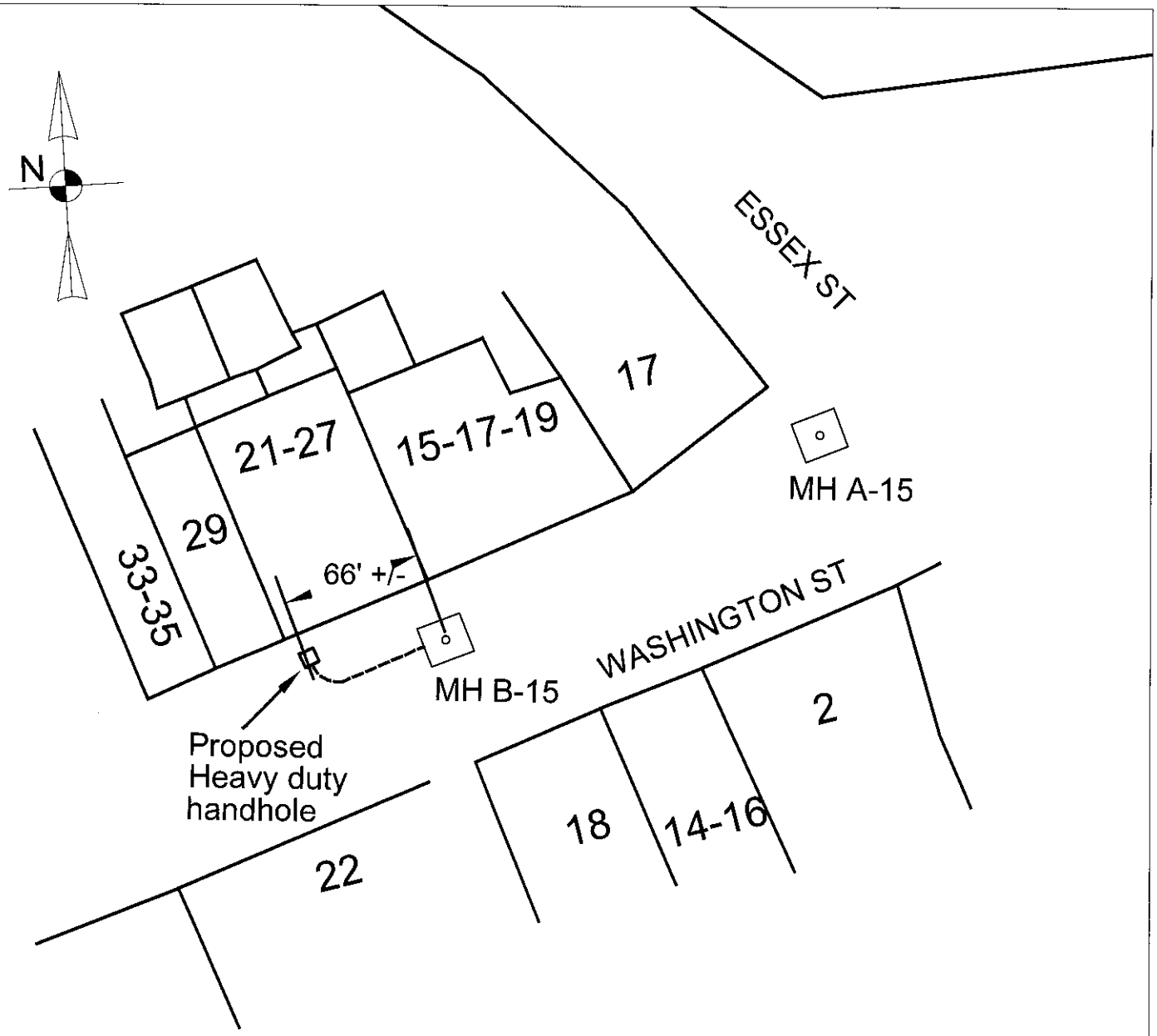
National Grid: Lisa Ayres; 1101 Turnpike Street; North Andover, MA 01845; # 978-725-1418

Very truly yours,

Dave Johnson/lla

Dave Johnson
Supervisor, Distribution Design

Enclosures



UNDERGROUND PETITION

☐ PROPOSED HEAVY DUTY HANDHOLE	⊡ EXISTING MANHOLE
	--- PROPOSED 3-4" CONDUITS WITH 2 SETS OF 500 CU SECONDARY CABLE

nationalgrid

Date: 7/19/21

Nationalgrid proposes to install approximately 66' of two sets of 500 CU secondary cable in customer installed 3-4" conduits from existing manhole B-15 to new heavy duty handhole in order to provide electric service to 21-27 Washington St, Haverhill, MA.

WORK REQUEST: 29456312

To The: City Of Haverhill

For Proposed: conduit Location: Washington St

Drawn By: S Steeves

DISTANCES ARE APPROXIMATE

Hearing August 10, 2021

BEALS+THOMAS

June 3, 2021 9D

C CSP21-10
Solar 2

10, 11

Melinda E. Barrett, President
c/o Barbara S. Arthur, Administrative Assistant
Haverhill City Council
4 Summer Street, Rm 240
Haverhill, Massachusetts

Via: FedEx and Electronic Submission

Reference: Special Permit
Hilldale Avenue Solar 2
1050 Hilldale Avenue
Haverhill, Massachusetts
B+T Project No. 3274.00

Dear Members of the City Council:

On behalf of the Applicant, BWC Camp Brook, LLC, Beals and Thomas, Inc. (B+T) respectfully submits this Special Permit Application for the installation of a dual use large-scale ground-mounted solar energy facility proposed to be located within the Business Park District (BP) and the Rural Density (RR) district. The proposed development includes the installation of a ±2.1 MW DC (1.3 MW AC) dual use large-scale ground-mounted solar energy array, also known as Agricultural Solar Tariff Generation Units (ASTGU) (the Project). Associated work will include the construction of stormwater management systems and the extension of the existing access drive located at 1050 Hilldale Avenue in Haverhill, Massachusetts (the Property).

The term "dual use" is excerpted from the Solar Massachusetts Renewable Target (SMART) program regulations (225 CMR 20.00) and associated *Guideline Regarding the Definition of Agricultural Solar Tariff Generation Units* (ASTGU). This unique ground-mounted solar project has been designed in compliance with the ATSGU project guidance, which allows for and encourages the dual use of agricultural land by incorporating specific design standards to allow continued agricultural practices to take place. Refer to the SMART Program Guideline: Agricultural Solar Tariff Generation Units (ASTGU) in Section 3.0.

CCSP 21-70
Solar 2

As a requirement to qualify for the SMART program (the Program) as a dual use facility the agricultural use is essential, and the project is required to maintain the agricultural use through the life of the array to qualify under the Programs regulations. Ongoing agricultural activity requires a dual use solar array that features increased panel height and row spacing to allow for continued agricultural practices.

According to Chapter 255, Section 7.8.3 of the Haverhill Zoning Code, large-scale ground-mounted solar energy systems are allowed within all districts, except for the Waterfront District, with a Special Permit from the City Council.

The Property has been historically utilized for agricultural purposes, specifically for producing hay. An accessory agricultural shelter and associated fenced field for the housing of livestock is also proposed to be located onsite. In accordance with Appendix A, Table 1: Table of Use and Parking Regulations this agricultural use is allowed by right within the RR District.

This filing is submitted in accordance with the Haverhill Zoning Ordinance Chapter 255, the Solar Massachusetts Renewable Target (SMART) Program, and continued coordination with the City Clerk.

As required, enclosed is an original copy of the Special Permit Application submission package and one set of full-sized Plans. The following information is included for your review:

Section 1:	Signature Form;
Section 2:	Project Narrative;
Section 3:	Additional Information;
Section 4:	Stormwater Management Information; and
Section 5:	Plans and Exhibits.

It is the Applicant's understanding that it is the responsibility of the City to produce a certified abutters list and adequately notify the surrounding abutters to the project. Additionally, a legal advertisement will be placed by the City in a paper of local circulation. A separate check payable to the City of Haverhill in the amount of $250.00 for the appropriate filing fee as confirmed by the City Clerk has also been included.

20

Melinda E. Barrett, President
Haverhill City Council
June 3, 2021
Page 3

CCSP-10
Solar 2

Should you have any questions regarding this matter or require additional information, please contact us at (508) 366-0560. We thank you for your consideration of this Application and look forward to meeting with the Council at the next available public hearing.

Very truly yours,

BEALS AND THOMAS, INC.

Jeffrey R. Murphy, PE
Civil Engineer

Enclosures

cc: Barbara S. Arthur, Administrative Assistant (1 copy via Email at citycncl@cityofhaverhill.com)
BWC Camp Brook, LLC (1 copy via Email)

IN CITY COUNCIL: June 15 2021
VOTED: that COUNCIL HEARING BE HELD AUGUST 10 2021
Attest:

_____City Clerk

CEB/jrm/aak/327400PT001

City of Haverhill, MA

08/06/2021

CCSP-21-10

City Council Special Permit

Status: Active

Date Created: Jun 3, 2021

Applicant

Caroline Booth
cbooth@bealsandthomas.com
144 Turnpike Road
Southborough, Massachusetts 01772-2104
5083660560

Location

1050 HILLDALE AVE
Haverhill, MA 01832

Owner:

DIXIELAND, LLC
69 WILDWOOD ST WILMINGTON, MA 01887

Important: Please Read Before Starting Your Application

Applicant Information

What is Your Role in This Process?
Other

IF OTHER, Please Specify
Engineering Consultant

Applicant Business/Firm Name
Beals and Thomas, Inc.

Applicant Business/Firm Phone
5083660560

Applicant Business/Firm Address
144 Turnpike Road

Applicant Business/Firm City
Southborough

Applicant Business/Firm State
MA

Applicant Business/Firm Zip
01772-2104

Property Information

Proposed Housing Plan Name
N/A

Proposed Street Name(s)
N/A

How Long Owned by Current Owner?
Approx. 10 years

Type of Dwelling(s) Planned in Project
Single Family

Lot Dimension(s)
--

Registry Plat Number, Block & Lot
585-431-22

Zoning District Where Property Located
BP - Business Park

--

Deed Recorded in Essex South Registry: Block Number
30835

Deed Recorded in Essex South Registry: Page
19

Does the Property Have Multiple Lots?
No

IF YES, How Many Lots?
1

IF YES, What Is/Are the Map, Block Lot (MBL) Number(s)?
585-431-22

Thoroughly Describe the Reason(s) for thre Special Permit
Special Permit for the use of a dual use large-scale ground-mounted solar energy array installation

Property Description

The Property is located off the west side of Hilldale Avenue and consists of an approximately 82-acre parcel. The Property contains an existing solar energy array located on the north side of the Property and an associated access drive, stormwater management system, and battery storage equipment. Portions of the site south of the existing array are currently cleared of trees. The remainder of the site is largely vegetated or contains wetland resource areas and is currently within Chapter 61A. As determined by the Haverhill Zoning Map, the east side of the Property is mapped within the Business Park District (BP) and the western side within the Rural Density (RR) district.

Current Property Use
Other

IF OTHER USE, Please Describe
Used for renewable solar energy generation

TOTAL Number of Units Planned
0

TOTAL Number of Parking Spaces Planned
0

Planned Lot Use

Lot Number
Lot 1

Lot Plat Number, Bock, Lot
585-431-22

Lot Dimensions

Number of Existing Buildings on Lot
0

Size of Existing Building(s) on Lot
N/A

Number of Buildings Planned for Lot
0

Size of Proposed Building(s)
N/A

Number of Families to be Accommodated
0

Extent of Proposed Alterations
New Construction; Commercial

IF OTHER ALTERATIONS, Please Describe

Types of Units Planned on Lot
Condominiums (for sale)

Number of Units Planned on Lot
0

Special Circumstances

Building Coverage
☐

Dimensional Variance
☐

Front Yard Setback
☐

Side Yard Setback
☐

Rear Yard Setback
☐

Lot Frontage
☐

Lot Depth
☐

Lot Area
☐

Building Height
☐

Floor Area Ratio
☐

Open Space
☐

Parking
☐

Sign Size
☐

Use
☐

Other
☐

Hearing Waiver

Agrees
No

Agreement & Signature

Agrees

☑

PLEASE READ

Office Use Only

City Council Decision
--

City Council Hearing Date
--

Reason for Council's Decision
--

City Council Members Absent
--

City Council Members Present
--

Continuance Meeting Date
--

Also Present
--

City Councilor Who Seconded Motion
--

City Councilor Who Made Motion
--

City Councilors Who Voted Against
--

City Councilors Who Abstained
--

Continuance Motion Decision
--

Who Submitted Continuance Request?
--

City Councilors Who Voted in Favor
--

Number of 12"x18" Mylar Copies
--

Appeal Expiration Date
--

Number of 24"x36" Mylar Copies
--

Number of 18"x24" Mylar Copies
--

Attachments

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

Uploaded by ... on

History

Date	Activity
Mar 24, 2021 at 7:05 am	Caroline Booth started a draft of Record CCSP-21-10
Jun 3, 2021 at 3:23 pm	Caroline Booth added attachment Stormwater Management Report to Record CCSP-21-10
Jun 3, 2021 at 3:29 pm	Caroline Booth submitted Record CCSP-21-10
Jun 3, 2021 at 3:42 pm	LINDA KOUTOULAS assigned approval step Building Inspector Review to Tom Bridgewater on Record CCSP-21-10
Jun 3, 2021 at 3:42 pm	LINDA KOUTOULAS assigned approval step Planning Director Review to William Pillsbury on Record CCSP-21-10
Jun 3, 2021 at 3:42 pm	LINDA KOUTOULAS assigned approval step City Clerk Review - Hearing Dates Set to LINDA KOUTOULAS on Record CCSP-21-10
Jun 3, 2021 at 3:42 pm	LINDA KOUTOULAS assigned approval step City Council Clerk Notified to LINDA KOUTOULAS on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step Assessor for Abutter's List to Christine Webb on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step Conservation Department Review to Robert Moore on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step DPW Review to John Pettis on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step Engineering Department Review to John Pettis on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step Fire1 Department Review to Robert O'Brien on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step Health Department Review to Bonnie Dufresne on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step Police Department Review to Robert Pistone on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step School Department Review to Mike Pfifferling on Record CCSP-21-10
Jun 3, 2021 at 3:43 pm	LINDA KOUTOULAS assigned approval step Storm Water Review to Robert Ward on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Wastewater Review to Robert Ward on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Water Department Review to Robert Ward on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Water/Wastewater Final Review to Richard Welch on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Water/Wastewater Final Review to Robert Ward on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Water Supply Review to Robert Ward on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Planning Director Approval for Agenda to William Pillsbury on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Building Inspector Approval for Agenda to Tom Bridgewater on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step First Ad Placement to Maria Bevilacqua on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Placed on Agenda to Maria Bevilacqua on Record CCSP-21-10
Jun 3, 2021 at 3:44 pm	LINDA KOUTOULAS assigned approval step Abutter Notification to Maria Bevilacqua on Record CCSP-21-10
Jun 4, 2021 at 8:20 am	Christine Webb added attachment Abutters 1050 Hilldale 585.431.22.xlsx to Record CCSP-21-10
Jun 4, 2021 at 8:20 am	Christine Webb added attachment Mailing Labels 1050 Hilldale 585.431.22.pdf to Record CCSP-21-10
Jun 4, 2021 at 8:48 am	Michael Picard assigned approval step Fire2 Department Review to Michael Picard on Record CCSP-21-10
Jun 4, 2021 at 8:48 am	Michael Picard assigned approval step Fire1 Department Review to Eric Tarpy on Record CCSP-21-10
Jun 4, 2021 at 8:55 am	LINDA KOUTOULAS assigned approval step Planning Director Review to Orlando Pacheco on Record CCSP-21-10
Jun 4, 2021 at 10:36 am	LINDA KOUTOULAS waived payment step Special Permit Filing Fee on Record CCSP-21-10
Jun 4, 2021 at 10:39 am	Mike Pfifferling approved approval step School Department Review on Record CCSP-21-10
Jun 4, 2021 at 10:40 am	Christine Webb approved approval step Assessor for Abutter's List on Record CCSP-21-10
Jun 4, 2021 at 11:44 am	Michael Picard approved approval step Fire2 Department Review on Record CCSP-21-10
Jun 4, 2021 at 12:52 pm	Bonnie Dufresne assigned approval step Health Department Review to Mark Tolman on Record CCSP-21-10
Jun 7, 2021 at 12:31 pm	Robert Ward approved approval step Wastewater Review on Record CCSP-21-10
Jun 7, 2021 at 2:17 pm	LINDA KOUTOULAS approved approval step City Clerk Review - Hearing Dates Set on Record CCSP-21-10
Jun 8, 2021 at 8:55 am	LINDA KOUTOULAS assigned approval step Second Ad Placement to LINDA KOUTOULAS on Record CCSP-21-10
Jun 8, 2021 at 8:55 am	LINDA KOUTOULAS assigned approval step City Councilor A Review to Melinda Barrett on Record CCSP-21-10
Jun 8, 2021 at 8:55 am	LINDA KOUTOULAS assigned approval step City Councilor B Review to Colin LePage on Record CCSP-21-10
Jun 8, 2021 at 8:55 am	LINDA KOUTOULAS assigned approval step City Councilor C Review to Joe Bevilacqua on Record CCSP-21-10
Jun 8, 2021 at 8:55 am	LINDA KOUTOULAS assigned approval step City Councilor D Review to John Michitson on Record CCSP-21-10
Jun 8, 2021 at 8:55 am	LINDA KOUTOULAS assigned approval step City Councilor E Review to Thomas Sullivan on Record CCSP-21-10
Jun 8, 2021 at 8:55 am	LINDA KOUTOULAS assigned approval step City Councilor F Review to Tim Jordan on Record CCSP-21-10
Jun 8, 2021 at 8:56 am	LINDA KOUTOULAS assigned approval step City Councilor G Review to Michael McGonagle on Record CCSP-21-10
Jun 8, 2021 at 8:56 am	LINDA KOUTOULAS assigned approval step City Councilor H Review to Mary Ellen Daly O'Brien on Record CCSP-21-10
Jun 8, 2021 at 8:56 am	LINDA KOUTOULAS assigned approval step City Councilor I Review to William Macek on Record CCSP-21-10
Jun 8, 2021 at 8:56 am	LINDA KOUTOULAS assigned approval step City Council Meeting to Maria Bevilacqua on Record CCSP-21-10
Jun 9, 2021 at 10:35 am	Eric Tarpy approved approval step Fire1 Department Review on Record CCSP-21-10
Jun 15, 2021 at 2:55 pm	Robert Pistone approved approval step Police Department Review on Record CCSP-21-10
Jun 17, 2021 at 11:13 am	Robert Ward approved approval step Water Supply Review on Record CCSP-21-10
Jun 17, 2021 at 11:16 am	LINDA KOUTOULAS assigned approval step Storm Water Review to Robert Moore on Record CCSP-21-10
Jun 17, 2021 at 1:06 pm	Robert Ward assigned approval step Water Department Review to Robert Ward on Record CCSP-21-10
Jun 17, 2021 at 1:16 pm	Robert Ward assigned approval step Water Department Review to Robert Ward on Record CCSP-21-10

Date	Activity
Jun 21, 2021 at 8:40 am	LINDA KOUTOULAS added attachment Mailing Labels Hilldale.pdf to Record CCSP-21-10
Jun 21, 2021 at 8:40 am	LINDA KOUTOULAS added attachment Additional abutters Hilldale.xlsx to Record CCSP-21-10
Jun 21, 2021 at 8:40 am	LINDA KOUTOULAS added attachment Additional abutters Hilldale.xlsx to Record CCSP-21-10
Jun 21, 2021 at 8:40 am	LINDA KOUTOULAS removed attachment Additional abutters Hilldale.xlsx from Record CCSP-21-10
Jun 21, 2021 at 8:52 am	Orlando Pacheco approved approval step Planning Director Review on Record CCSP-21-10
Jun 29, 2021 at 10:09 am	LINDA KOUTOULAS approved approval step City Council Clerk Notified on Record CCSP-21-10
Jul 7, 2021 at 1:21 pm	Robert Ward assigned approval step Water Department Review to Robert Ward on Record CCSP-21-10
Jul 7, 2021 at 1:23 pm	Robert Ward approved approval step Water Department Review on Record CCSP-21-10
Jul 7, 2021 at 1:23 pm	Robert Ward approved approval step Water/Wastewater Final Review on Record CCSP-21-10
Aug 2, 2021 at 1:23 pm	Bonnie Dufresne changed the deadline to Aug 02, 2021 on approval step Health Department Review on Record CCSP-21-10
Aug 3, 2021 at 8:51 am	Mark Tolman approved approval step Health Department Review on Record CCSP-21-10
Aug 5, 2021 at 8:35 am	LINDA KOUTOULAS assigned approval step DPW Review to Mike Stankovich on Record CCSP-21-10

Timeline

	Label	Status	Activated	Completed	Assignee	Due Date
	Special Permit Filing Fee	Waived	Jun 3, 2021 at 3:29 pm	Jun 4, 2021 at 10:36 am	-	-
✓	School Department Review	Complete	Jun 4, 2021 at 10:36 am	Jun 4, 2021 at 10:39 am	Mike Pfifferling	-
✓	Assessor for Abutter's List	Complete	Jun 4, 2021 at 10:36 am	Jun 4, 2021 at 10:40 am	Christine Webb	-
✓	Fire2 Department Review	Complete	Jun 4, 2021 at 10:36 am	Jun 4, 2021 at 11:44 am	Michael Picard	-
✓	Wastewater Review	Complete	Jun 4, 2021 at 10:36 am	Jun 7, 2021 at 12:31 pm	Robert Ward	-
✓	City Clerk Review - Hearing Dates Set	Complete	Jun 4, 2021 at 10:36 am	Jun 7, 2021 at 2:17 pm	LINDA KOUTOULAS	-
✓	Fire1 Department Review	Complete	Jun 4, 2021 at 10:36 am	Jun 9, 2021 at 10:35 am	Eric Tarpy	-
✓	Police Department Review	Complete	Jun 4, 2021 at 10:36 am	Jun 15, 2021 at 2:55 pm	Robert Pistone	-
✓	Water Supply Review	Complete	Jun 4, 2021 at 10:36 am	Jun 17, 2021 at 11:13 am	Robert Ward	-
✓	Planning Director Review	Complete	Jun 4, 2021 at 10:36 am	Jun 21, 2021 at 8:52 am	Orlando Pacheco	-
✓	City Council Clerk Notified	Complete	Jun 4, 2021 at 10:36 am	Jun 29, 2021 at 10:09 am	LINDA KOUTOULAS	-
✓	Water Department Review	Complete	Jun 4, 2021 at 10:36 am	Jul 7, 2021 at 1:23 pm	Robert Ward	-
✓	Water/Wastewater Final Review	Complete	Jun 4, 2021 at 10:36 am	Jul 7, 2021 at 1:23 pm	Robert Ward	-
✓	Health Department Review	Complete	Jun 4, 2021 at 10:36 am	Aug 3, 2021 at 8:51 am	Mark Tolman	08/02/2021
✓	Building Inspector Review	Active	Jun 4, 2021 at 10:36 am	-	Tom Bridgewater	-
✓	Conservation Department Review	Active	Jun 4, 2021 at 10:36 am	-	Robert Moore	-
✓	DPW Review	Active	Jun 4, 2021 at 10:36 am	-	Mike Stankovich	-
✓	Engineering Department Review	Active	Jun 4, 2021 at 10:36 am	-	John Pettis	-
✓	Storm Water Review	Active	Jun 4, 2021 at 10:36 am	-	Robert Moore	-
✓	Planning Director Approval for Agenda	Active	Jun 4, 2021 at 10:36 am	-	William Pillsbury	-
✓	Building Inspector Approval for Agenda	Active	Jun 4, 2021 at 10:36 am	-	Tom Bridgewater	-
✓	First Ad Placement	Pending	-	-	Maria Bevilacqua	-
✓	Placed on Agenda	Pending	-	-	Maria Bevilacqua	-
✓	Abutter Notification	Pending	-	-	Maria Bevilacqua	-
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Label		Status	Activated	Completed	Assignee	Due Date
✓	City Councilor A Review	Pending	-	-	Melinda Barrett	-
✓	City Councilor B Review	Pending	-	-	Colin LePage	-
✓	City Councilor C Review	Pending	-	-	Joe Bevilacqua	-
✓	City Councilor D Review	Pending	-	-	John Michitson	-
✓	City Councilor E Review	Pending	-	-	Thomas Sullivan	-
✓	City Councilor F Review	Pending	-	-	Tim Jordan	-
✓	City Councilor G Review	Pending	-	-	Michael McGonagle	-
✓	City Councilor H Review	Pending	-	-	Mary Ellen Daly O'Brien	-
✓	City Councilor I Review	Pending	-	-	William Macek	-
✓	City Council Meeting	Pending	-	-	Maria Bevilacqua	-
✓	Meeting Minutes & Decision Filed w/City Clerk	Pending	-	-	-	-

From: Michael Zhe
To: Jeffrey Murphy
Subject: FW: Pre-application questions
Date: Thursday, April 01, 2021 2:23:00 PM

See below.

From: Rose Jackson
Sent: Thursday, April 01, 2021 1:46 PM
To: Michael Zhe <mzhe@bluewavesolar.com>
Subject: Re: Pre-application questions

Hi Michael,

Dixieland, LLC grants permission to BlueWave and Beals & Thomas to submit a Special Permit and to Construct the Solar Project at 1050 Hilldale Avenue in Haverhill, MA.

Please let me know if you need anything else!

Take care,

Rose

SPECIAL PERMIT APPLICATION

HILLDALE AVENUE SOLAR 2

1050 Hilldale Avenue
Haverhill, Massachusetts

Prepared for:
BWC Camp Brook, LLC
P.O. Box 171381
Boston, MA 02117

Prepared by:
BEALS + THOMAS
CIVIL ENGINEERS | LANDSCAPE ARCHITECTS |
LAND SURVEYORS | PLANNERS |
ENVIRONMENTAL SPECIALISTS

Submitted in Compliance with the Haverhill Zoning Ordinance, Chapter 255

June 3, 2021

327400PT001

BEALS+THOMAS

June 3, 2021

Melinda E. Barrett, President
c/o Barbara S. Arthur, Administrative Assistant
Haverhill City Council
4 Summer Street, Rm 240
Haverhill, Massachusetts

Via: FedEx and Electronic Submission

Reference: Special Permit
Hilldale Avenue Solar 2
1050 Hilldale Avenue
Haverhill, Massachusetts
B+T Project No. 3274.00

Dear Members of the City Council:

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Section 1:	Signature Form;
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Section 4:	Stormwater Management Information; and
Section 5:	Plans and Exhibits.

It is the Applicant's understanding that it is the responsibility of the City to produce a certified abutters list and adequately notify the surrounding abutters to the project. Additionally, a legal advertisement will be placed by the City in a paper of local circulation. A separate check payable to the City of Haverhill in the amount of $250.00 for the appropriate filing fee as confirmed by the City Clerk has also been included.

Should you have any questions regarding this matter or require additional information, please contact us at (508) 366-0560. We thank you for your consideration of this Application and look forward to meeting with the Council at the next available public hearing.

Very truly yours,

BEALS AND THOMAS, INC.

Jeffrey R. Murphy, PE
Civil Engineer

Enclosures

cc: Barbara S. Arthur, Administrative Assistant (1 copy via Email at citycncl@cityofhaverhill.com)
BWC Camp Brook, LLC (1 copy via Email)

CEB/jrm/aak/327400PT001

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2.3.1.2 *Section 7.8.5 Review:* 2-4
2.3.1.3 *Section 7.8.6 Dimensional Requirements.* 2-10
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2.3.1.5 *Section 7.8.8 Safety and Environmental Standards* 2-12
2.3.1.6 *Section 7.8.9 Monitoring, Maintenance and Reporting* 2-13
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4.0 STORMWATER MANAGEMENT INFORMATION 4-1

5.0 PLANS AND EXHIBITS 5-1

Section 1.0
Signature Form

Name, address, phone number and signature of the project applicant, as well as all co-applicants or property owners, if any;

Applicant: BWC Camp Brook, LLC
Address: P.O. Box 171381, Boston, MA 02117
Contact number: 617-209-3122

Signature: _____ Date: 5/17/21

The name, contact information and signature of any agents representing the project applicant;

Representative: Beals and Thomas, Inc
Address: 144 Turnpike Road Southborough, MA 01772
Contact number: 508-366-0560

Signature: _____ Date: 5/18/2021

Section 2.0
Project Narrative

2.0 PROJECT NARRATIVE

2.1 Introduction

The Project proposes to construct a ±2.1 MW DC dual use large-scale ground-mounted solar energy facility, extension of the existing site access road, and associated stormwater management located at 1050 Hilldale Avenue in Haverhill, Massachusetts (the Property). The Property is located off the west side of Hilldale Avenue and consists of an approximately 82-acre parcel. The Property contains an existing 4.1 MW DC (3 MW AC) solar energy array located on the north side of the Property. The remainder of the site is currently located within Chapter 61A land, mapped within prime farmland soils, and portions of the Property have been used as hay fields in the past.

An accessory agricultural shelter and associated fenced field for the housing of livestock is proposed to be located within the RR District to the northeast of the existing array onsite as depicted on the enclosed Site Plans in Section 5.0.

The Project has been designed to utilize the existing conditions of the site, including the existing access road to the maximum extent practicable. As determined by the Haverhill Zoning Map, the east side of the Property is mapped within the Business Park District (BP) and the western side within the Rural Density (RR) district.

A Notice of Intent has been filled in parallel with this submission to the Haverhill Conservation Commission for review of the project as it relates to the natural resource areas onsite and the interests of the Massachusetts Wetlands Protection Act.

2.2 Existing Conditions

The Property is located off the west side of Hilldale Avenue and can be further identified by the Haverhill Assessors as parcel ID 585-431-22 and owned by Dixieland, LLC. The Property is bound to the south by Tattersall Farm Park and St. Josephs Cemetery, to the west by residential development, and to the north by undeveloped woodlands. The access to the Property is located across Hilldale Avenue from an industrial warehouse.

An existing 4.1 MW DC (3 MW AC) large-scale ground-mounted solar energy array occupies approximately 16.25 acres and is located on the north side of the Property. The existing array maintains an approximately 10–15-foot variable width gravel access drive that is utilized for occasional maintenance and emergency access. The existing gravel access road drive extends off the west side of Hilldale Avenue along the southern property boundary, jogs north around the wetland resource areas onsite, and continues along the south and east sides of the existing array. The point of interconnect for the existing array is located along Hilldale Avenue. Above ground utility poles are located on the north side of the existing access drive, adjacent to the site entrance.

Portions of the site have been historically utilized for agricultural purposes and more recently, the uplands to the west of the existing access road have been utilized as hay fields. With exception to the existing array, the remainder of the Property is located within Chapter 61A and is generally undeveloped, forested land.

Resource areas located throughout the site consist of Bordering Vegetated Wetlands (BVW), Bank associated with an intermittent stream, and the associated 100-foot Buffer Zone. The site also contains locally jurisdictional Certified Vernal Pools and associated vernal pool habitat. Additionally, the site contains locally jurisdictional areas including the 25-foot No-Build No Disturbance Zone and the 50-foot No-Disturbance Buffer Zones as depicted on the enclosed Site Plans. The Project has been designed to limit impacts to the resource areas onsite to the maximum extent practical.

Refer to Section 2.0 Pre-Development Conditions of the Stormwater Management Report included in Section 4.0 of this Application for detailed topographic and soils information.

2.3 Proposed Conditions

The Project consists of the proposed installation of a ±2.1 MW DC (1.3 MW AC) dual use ground-mounted solar photovoltaic energy system on approximately 21.7 acres of the Property. The Project will include construction of the access road extension, electrical equipment pads, battery storage system, stormwater management system, and single axis tracking panels mounted on racking systems supported by ground screws. The array is comprised of two panel areas, one located on the west side of the Property consisting of approximately ±1.4 MW DC and a second set of panels located to the southeast of the existing array consisting of approximately ±0.7 MW DC.

The east and west solar arrays will be surrounded by eight (8) foot high, woven wire farm fences. All entrance gates will have the same security key for emergency purposes as requested by the Fire Department. The Project has been designed to meet the applicable setback requirements outlined in the Haverhill Zoning Ordinance, as depicted on the enclosed Site Plans in Section 5.0.

Access to the Property is proposed from Hilldale Avenue through an existing access drive located along the southeastern property boundary. As depicted on the enclosed Plans, the access drive extension will be approximately 22-feet wide and constructed of gravel to provide emergency response access as required by the Haverhill Fire Department. The existing road will be maintained in its current state. A stream crossing in the form of an open-bottom box culvert is proposed to allow for adequate access to the west side of the Property. Wetland replication required under the Wetlands Protection Act has been provided as depicted on the enclosed Site Plans.

The proposed access driveways have been designed to minimize impacts to the natural resource areas onsite and evaluated using AutoTurn to facilitate turning movements for construction and emergency response vehicles and equipment.

The solar facility installation has been sited to maintain a ±435-foot offset from Hilldale Avenue (as measured from the southeast equipment pad to Hilldale Avenue), and approximately ±340-feet from the nearest abutting dwelling to the west of the site (measured from the house to the closest panel). A 150-foot vegetated buffer of existing woodland has been proposed to screen the project from abutting properties to the north.

The only proposed impervious area will consist of concrete equipment pads located adjacent to the east and west arrays, and the proposed animal shelter. The animal shelter is proposed to be approximately 20-feet by 40-feet (20'x40'). The electrical equipment pads will house the associated transformers and battery storage equipment that will be located within an enclosure that maintains automatic fire suppression and remote monitoring equipment. The electrical equipment pads have been designed within the installation fencing and to include their own emergency shutoff switch. Utilities are limited to proposed agricultural wells that will supply water spigots located throughout the proposed arrays. The proposed electric that has been sited underground to the maximum extent feasible. Refer to Section 3.0 herein for additional equipment details.

Refer to Section 3.0 Post-Development Conditions of the Stormwater Management Report included in Section 4.0 of this Application for information on existing and proposed hydrology and compliance with DEP Stormwater Management Policy.

2.3.1 Design Standards

2.3.1.1 *Section 7.8.4 General Requirements for All Large-Scale Ground-Mounted Solar Energy Systems:*

The following requirements shall apply to all such Solar Energy Systems.

1. *Compliance with Laws, Ordinances and Regulations: The construction and operation of all Large-Scale Ground-Mounted Solar Energy Systems shall be consistent with all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, electrical, and communications requirements. All buildings and fixtures forming part of a solar installation shall be constructed in accordance with the State Building Code.*

The Project has been designed in compliance with all state, local, and federal requirements including all applicable safety, construction, electrical, and communication requirements.

2. *Building Permit and Building Inspection: No Large-Scale Ground-Mounted Solar Energy System shall be constructed, installed or modified as provided in this Section without first obtaining a building permit.*

   The Applicant anticipates obtaining a building permit prior to construction once the Project has received all applicable state, local, and federal permits.

3. *Fees: The application for a building permit for a Large-Scale Ground-Mounted Solar energy System must be accompanied by the fee required for a Building Permit and Special Permit.*

   The Applicant acknowledges the following requirement.

2.3.1.2 *Section 7.8.5. Review*:

1. *Plan: The Plan must include the following:*

   a. *Property lines and physical features, including roads and topography, for the project site;*

      The Property lines and physical features have been depicted on the enclosed plans. Refer to the enclosed Site Plans.

   b. *Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, screening vegetation or structures including their height;*

      The Project proposes to alter approximately 13.8 acres of forested area onsite to actualize the design. Site grading will be minimized to the extent practical by utilizing cut and fill techniques, and the Applicant does not anticipate having to conduct earth removal from the site. There will be very little grading involved to construct the eastern array. However, import of gravel, rip-rap, sand bedding, impervious core material for stormwater basin berms, and general fill will be required in order to construct the access driveways and stormwater basins,

particularly on the western side of the site. Due to the nature of the Project and the existing conditions of the site, exterior lighting and screening vegetation or structures are not proposed at this time. Refer to the enclosed Site Plans.

c. *Locations of wetlands, Priority Habitat Areas defined by the Natural Heritage & Endangered Species Program (NHESP);*

Wetland resource areas as defined by the Massachusetts Wetland Protection Act and the Haverhill Wetlands Protection Ordinance have been identified and depicted on the enclosed Plans. The resource areas onsite are anticipated to be reviewed and confirmed by the Haverhill Conservation Commission through a Notice of Intent (NOI) filling. The Property is not mapped by Natural Heritage and Endangered Species Program (NHESP) to contain any priority habitat of rare species or estimated habitat of rare wildlife. Certified Vernal Pools are located on the Property however, no work is proposed within 450 feet of the associated vernal pool habitat.

d. *Locations of Floodplains or inundation areas for moderate or high hazard dams;*

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Numbers 25009C0086F and 25009C0067F effective July 3, 2012 the entire site is mapped as Zone X, Area of Minimal Flood Hazard and therefore, is not within the regulated flood zone nor is the Project sited on or near inundated areas for moderate or high hazard dams.

e. *Locations of Priority Heritage Landscapes and local or National Historic Districts;*

According to the Massachusetts Historical Commission (MHC) online database, the Massachusetts Cultural Resource Information System (MACRIS), accessed on February 5, 2021, the Property does not contain areas inventoried or certified by the Massachusetts Historical Commission for historic significance. The applicant will prepare and file a project notification form (PNF) with MHC prior to construction.

f. *A list of any hazardous materials proposed to be located on the site in excess of household quantities and a plan to prevent their release to the environment as appropriate;*

Battery storage systems are proposed to be contained within regulated, temperature controlled, and fire suppressant containers on concrete equipment pads. The lithium-ion battery system typically includes the following components within a contained system: Cobalt Oxide, Manganese dioxide, Nickel oxide, Carbon, and Polyvinylidene fluoride. The HVAC system used to maintain consistent temperatures is similar to the heating and cooling equipment used for a typical building. Historically, HVAC systems used the Freon (R-22) refrigerant fluid to cool, but this was banned as of January 1, 2020. R-22 has now been replaced by aR-410A (also called Puron), which is an Alkyl Halide refrigerant that does not contribute to ozone depletion. The containment fire suppression system, FM-200 (HFC-227ea) leaves no residue and does not require clean up after deployment. FM-200 is a liquified gas stored on as a liquid on site in a container and turns to a vapor when discharged to disrupt the combustion reaction to extinguish the fire. The Applicant will provide information on the battery storage systems to the Fire Department and obtain all necessary permits. The Applicant also anticipates the conduction of annual inspections for the suppression systems with the Fire Department.

g. *Blueprints or drawings of the Regulated Solar Energy System signed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts showing the proposed layout of the system and any potential shading from nearby structures;*

Refer to the Site Plans in Section 5.0.

h. *One or three line electrical diagram detailing the Regulated Solar Energy System, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and overcurrent devices;*

Refer to the enclosed one-line diagram, dated February 20,2020 in Section 5.0.

i. *Documentation of the major system components to be used, including the electric generating components, transmission systems, mounting system, inverter, etc.;*

Refer to the enclosed electrical equipment sheets included in Section 3.0.

j. *Name, address, and contact information for proposed system installer;*

The system installer will be determined prior to construction.

k. *Name, address, phone number and signature of the project applicant, as well as all co-applicants or property owners, if any;*

Applicant: BWC Camp Brook, LLC
Address: P.O. Box 171381 Boston, MA 02117
Contact number: 617-209-3122
Signature: Refer to the enclosed Signature Pages in Section 1.0.

l. *The name, contact information and signature of any agents representing the project applicant;*

Representative: Beals and Thomas, Inc
Address: 144 Turnpike Road Southborough, MA 01772
Contact number: 508-366-0560
Signature: Refer to the enclosed Signature Pages in Section 1.0.

m. *Fire protection measures;*

A 22-foot-wide road has been designed to provide adequate access as determined by the Haverhill Fire Department and battery storage systems are proposed to be contained within regulated and fire suppressant containers on concrete equipment pads. As required by the Haverhill Fire Department, the Applicant anticipates obtaining an Annual Inspection Permit for the fire suppression systems associate with the equipment containers. Site access keys will be provided to the Fire Department prior to completion of construction as necessary.

n. *Storm drainage, including means of ultimate disposal and calculations;*

Refer to the Stormwater Management Report in Section 4.0 herein.

o. *Existing trees 10" caliper or better and existing tree/shrub masses; proposed planting, landscaping, and screening. Every abutting property shall be visually screened from the project through any one or combination of the following location, distance, plantings, existing vegetation and fencing. Said screening is not required to exceed eight (8) feet in height and the Applicant shall demonstrate that the proposal provides visual screening;*

The Property currently maintains an existing ground-mounted solar energy array, agricultural fields, and is otherwise largely vegetated. The Property maintains approximately 64 acres of forested area and therefore, depicting all trees 10" caliper or larger onsite is not feasible. An aerial exhibit has been included in Section 5.0 herein. The Property abuts residential housing to the north and west and has been designed to maintain a 150-foot existing wooded buffer to act as screening between the edge of the Property and the array fencing. The Project is proposed to be located approximately 435 feet from Hilldale Avenue. The existing trees and vegetation between Hilldale Avenue and the eastern array will remain undisturbed. Due to difference in topography and existing vegetation to remain, it is anticipated that any potential view of the array from Hilldale Avenue will be very minimal. As such, no screening is proposed on this side of the project.

p. *Certified list of abutters.*

Based on feedback provided by the City Clerk, it is the Applicants understanding that it is the City's responsibility to obtain a certified list of abutters and notify abutters appropriately.

2. *Site Control: The project applicant shall submit documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed Regulated Solar Energy System.*

   The Property maintains an existing access drive to the site for the operation of the existing solar energy facility. Refer to the enclosed Site Plans in Section 5.0. The Applicant has enclosed the written statement from the landowner allowing the Applicant to apply for a Special Permit. Refer to Section 3.0 herein.

3. *Operation and Maintenance Plan:*
   The project applicant shall submit a plan for the operation and maintenance of the Regulated Solar Energy System, which shall include measures for maintaining safe access to the Regulated Solar Energy System, stormwater management consistent with City's and DEP's Stormwater Regulations and vegetation controls, as well as general procedures for operational maintenance of the Regulated Solar Energy System.

   Refer to the Stormwater Management Report in Section 4.0.

4. *Zoning: Zoning District designation for the parcel(s) of land comprising the project site (submission of a copy of a zoning map with the parcel(s) identified is suitable for this purpose).*

   Refer to the enclosed Zoning Map in Section 5.0 herein.

5. *Insurance: The project applicant shall provide proof of liability insurance.*

   Refer to the Proof of Liability Insurance enclosed in Section 3.0 herein.

6. *Financial Surety: Applicants proposing a Regulated Solar Energy System shall provide a form of surety, either through escrow account, bond or otherwise, to cover the cost of removal in the event the City must remove the Regulated Solar Energy System and remediate the landscape, in an amount and form determined to be reasonable by the Planning Director, but in no event to exceed more than 125 percent (125%) of the cost of removal and compliance with the*

additional requirements set forth herein, as determined by the project applicant and the City. Such surety will not be required for municipal Regulated Solar Energy System. The project applicant shall submit a fully inclusive estimate of the costs associated with removal, prepared by a qualified engineer. The amount shall include a mechanism for calculating increased removal costs due to inflation.

The Applicant is amenable to providing a form of surety to cover the cost of removal in the event that the City must remove the system and remediate the landscape. Refer to Section 3.0 for the associated Decommissioning Estimate.

7. *Utility Notification: Regulated Solar Energy System shall be constructed until evidence has been given to the Planning Director that the utility company that operates the electrical grid where the System is to be located has been informed of the Regulated Solar Energy System's owner or operator's intent to install an interconnected customer-owned generator. Off-grid systems shall be exempt from this requirement.*

   Refer to the enclosed Exhibit G – interconnection Service Agreement in Section 3.0 herein.

2.3.1.3 ***Section 7.8.6 Dimensional Requirements.***

The Project has been designed in compliance with the dimensional requirements as described in this Section and the Project has been sited in such an area as to not create visual impacts on the Community. Transformers and equipment will be architecturally compatible with the existing equipment onsite to the extent practical.

2.3.1.4 ***Section 7.8.7 Design and Performance Standards.***

1. Lighting: Lighting of Large-Scale, Medium-Scale, and Municipal Ground-Mounted Solar Energy Systems shall be consistent with local, state and federal law. Lighting of other parts of the System, such as appurtenant structures, shall be limited to that required for safety and operational purposes, and shall be shielded from abutting properties. Lighting of such Systems shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

   The Project does not propose lighting at this time.

2. *Signage. Signs on Large-Scale, Medium-Scale, and Municipal Ground-Mounted Solar Energy Systems shall comply with this Zoning Ordinance. A sign shall be required to identify the owner and provide a 24-hour emergency contact phone number. Such Systems shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the solar installation.*

   Signage will be displayed on the proposed entry gate to the solar facility and will contain the specified information. Signage will be installed in accordance with all local and state requirements. The signage has been detailed in the enclosed Site Plans. Refer to the Site Plans in Section 5.0 herein.

3. *Utility Connections. Electrical transformers or other utility interconnections shall be constructed as required by the utility provider and may be above ground only if necessary. Reasonable efforts shall be made to place all utility connections from the Solar Energy System underground (if feasible), depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider.*

   The utility connection is proposed to coincide with the existing electrical lines onsite and have been design underground to the maximum extent practical. Agricultural wells and spigots are proposed to be located throughout the arrays for agricultural use.

4. *Roads. Access roads shall be constructed to a minimum width of 22 feet and paved or compacted to provide suitable access for fire, police, and emergency vehicles. Such roads shall be designed to minimize removal of stone walls or street trees and minimize impacts to environmental or historic resources. Such roads shall be maintained and cleared throughout the year.*

   The existing conditions maintain an existing access road constructed of gravel. While the existing road is maintained at an average width of approximately 12 feet, it appears to have been constructed at a larger width (18-feet per record plans) for the existing array construction. Gravel shoulders which have grown in with weeds were visible during a site visit. The road provided sufficient construction access for the existing array on the site and also provides at least 22-foot clearance. All new roads have been designed to be 22-feet wide

and constructed of gravel. The Project has been reviewed by the City Engineer and the Fire Department for emergency access adequacy. The access roads have been designed to avoid impacts to the environment to the maximum extent feasible.

5. *Control of Vegetation. Herbicides may not be used to control vegetation at the For Large-Scale, Medium-Scale, and Municipal Ground-Mounted Solar Energy Systems. Mowing or the use of pervious pavers or geotextile materials underneath the solar array is a possible alternative.*

   The Project does not propose to use herbicides.

6. *Hazardous Materials. Hazardous materials stored, used, or generated on site shall not exceed the amount for a Very Small Quantity Generator of Hazardous Waste as defined by the DEP pursuant to Mass DEP regulations 310 CMR 30.000 and shall meet all requirements of the DEP including storage of hazardous materials in a building with an impervious floor that is not adjacent to any floor drains to prevent discharge to the outdoor environment. If hazardous materials are utilized within the solar equipment, then impervious containment areas capable of controlling any release to the environment and to prevent potential contamination of groundwater are required.*

   Battery storage systems are proposed to be contained within regulated sealed storage containers mounted on concrete pads and will be equipped with fire suppression systems. Refer to Section 3.0 for additional solar equipment documentation.

2.3.1.5 *Section 7.8.8 - Safety and Environmental Standards*.

1. Emergency Services. The Regulated Solar Energy System owner or operator shall provide a copy of the project summary, electrical schematic, and Plan to the Fire Chief, DPW, and Emergency Management Director. Upon request the owner or operator shall cooperate with local emergency services in developing an emergency response plan including the training of any municipal first responders. All means of shutting down the Large-Scale, Medium-Scale, and Municipal Ground-Mounted Solar Energy Systems. Regulated Solar Energy System shall be clearly marked.

The owner or operator shall identify a responsible person for public inquiries throughout the life of such System.

The Applicant is amenable to completing the following as deemed necessary prior to construction.

2. *Land Clearing, Soil Erosion and Habitat Impacts. Clearing of natural vegetation shall be limited to what is necessary for the construction, operation and maintenance of the Regulated Solar Energy System or otherwise prescribed by applicable laws, regulations, and ordinances.*

   The Project has been designed to minimize clearing of natural vegetation to the maximum extent practicable including utilizing previously cleared areas.

2.3.1.6 ***Section 7.8.9 - Monitoring, Maintenance and Reporting***

The Applicant acknowledges the requirements outlined in the above stated section pertaining to the solar installation conditions, modifications, and annual reporting as detailed in the Zoning Ordinance.

2.3.1.7 ***Section 7.8.10 - Abandonment or Decommissioning***

The Applicant acknowledges the requirements set forth by this Section including removal requirements and abandonment. Refer to Section 3.0 herein for the proposed Decommissioning Estimate.

2.3.1.8 ***Section 10.4 Special Permits***

10.4.2 Criteria

Special permits shall be granted by the special permit granting authority, unless otherwise specified herein, only upon its written determination that the proposed use or structure(s) shall not cause substantial detriment to the neighborhood or the City, taking into account the characteristics of the site and of the proposal in relation to that site. In addition to any specific factors that may be set forth in this Ordinance, such determination shall include consideration of each of the following:

1. *Community needs served by the proposal;*
   The Project will not increase demands on the City's police, fire, or school departments. The Project will provide tax revenue benefits to the City, without burdening City resources. Additionally, the SMART program provides financial incentives to farmers for the development of new solar photovoltaic energy sources in a manner that is compatible with ongoing agricultural practices. The historically farmed land will be used for agricultural purposes, creating a symbiotic relationship between the renewable energy source and the agriculture onsite for the lifespan of the Project. Furthermore, the Project is consistent with the Commonwealths policy to encourage the use of solar power as an alternative to conventional energy sources and will help to enhance the diversity of grid power generation sources. The Project will generate sustainable energy and will not produce negative effects on Haverhill's sustainability.

2. *Traffic and pedestrian flow and safety, including parking and loading;*
   The Project will also have no impact on post-construction traffic patterns or put strain on the neighboring communities. The array will not require any daily staffing for operations and therefore, will not create an influx of employees. Temporary traffic safety signs will be located along Hilldale Avenue during construction. Parking will not take place along Hilldale Avenue. Refer to the enclosed Site Plans.

3. *Adequacy of utilities and other public services;*
   Utilities for the Project only entail electric service and water. Electrical equipment will be installed in coordination with the utility company. On-site utility lines have been sited underground to the extent practical as depicted on the enclosed Site Plans. An agricultural well and water spigots are proposed throughout the array as depicted on the enclosed Site Plans.

4. *Neighborhood character and social structures;*
   The Property is surrounded largely by St. Josephs Cemetery and undeveloped properties with the only residential abutters to the northwest. The Project will be set back ±435 feet from Hilldale Avenue and fencing is proposed around the solar installation. The Project will maintain the 300 feet or more of existing vegetation

between the panels and Hilldale Avenue along the east side. The eastern array will be further obscured from view along Hilldale Avenue by the existing elevation difference and topographic ridge line. The panels on the west side of the Property are proposed no closer than ±340 feet from the nearest residential dwelling. Therefore, the Project will not negatively impact the character of the neighborhood.

5. *Impacts on the natural environment;*
   The site work required to actualize the design of the array includes grading, the installation of racking structures to hold the solar panels, establishment of the access road and associated stream crossing, and other activities detailed herein. On-going activities after the conclusion of the construction phase shall include mowing and general equipment maintenance, as discussed in the enclosed Operation and Maintenance plan. Proposed stormwater management facilities are proposed to manage stormwater runoff from the site and protect downgradient resource areas and properties.

   The Property is not mapped to contain NHESP mapped habitat nor is it located within a FEMA mapped floodplain.

   Ecological resource areas on-site include Bordering Vegetated Wetland (BVW), and the associated 100-foot Buffer Zone to BVW. In accordance with the Wetland Ordinance, Chapter 253 that also includes a 25-foot No Disturbance No Build Zone and a 50 foot No Build Zone to the following resource areas.

   In accordance with the Massachusetts Stream Crossing Standards and the Massachusetts Wetlands Protection Act, a stream crossing has been designed to access the western panel area. The proposed Project has been designed to avoid work within the resource areas onsite and the associated buffer zones to the maximum extent feasible. The Applicant anticipated filing a Notice of Intent with the Haverhill Conservation Commission for work within jurisdictional resource areas.

6. *Potential fiscal impact, including impact on City services, tax base, and employment*
   The proposed Project is located on private property and will not require any full-time staffing. The Project is not anticipated to utilize or otherwise place any burden on the City's services, while providing positive tax benefits through a payment in lieu of taxes (PILOT). The Applicant will also provide various bonds and/or sureties as required by the City for decommissioning (estimate enclosed) and other post-construction measures, which provide further fiscal support to protect the City.

Section 3.0
Additional Information

SMART Program Guideline: Agricultural Solar Tariff Generation Units (ASTGU)
Dual-Use Agricultural Plan
Written Filling Statement from Landowner
Decommissioning Estimate
Equipment Detail Sheets
Proof of Liability Insurance
Proof of Utility Notification

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
DEPARTMENT OF ENERGY RESOURCES
DEPARTMENT OF AGRICULTURAL RESOURCES

SOLAR MASSACHUSETTS RENEWABLE TARGET PROGRAM (225 CMR 20.00)

GUIDELINE

Guideline Regarding the Definition of Agricultural Solar Tariff Generation Units

Effective Date: April 26, 2018

PURPOSE

This document provides guidance regarding the manner in which a solar photovoltaic facility may qualify as an Agricultural Solar Tariff Generation Unit ("ASTGU") under the Department of Energy Resource's (Department) Solar Massachusetts Renewable Target (SMART) Program.

BACKGROUND

On April 11, 2016, Governor Baker signed Chapter 75 of the Acts of 2016 into law. The Act directs the Department to create a long-term sustainable solar incentive program to promote cost-effective solar in the Commonwealth. The Act further directed the Department to "...differentiate incentive levels to support diverse installation types and sizes that provide unique benefits..." In developing the SMART Program, the Department established six types of location based Compensation Rate Adders, one of which is provided for ASTGUs.

Given the small number of solar facilities that meet the objectives and criteria outlined in the definition of ASTGU in the Commonwealth today, but the desire to see the installation of such systems that can provide the dual-use benefits, the Department, in consultation with the Massachusetts Department of Agricultural Resources (MDAR), has developed this Guideline to clarify additional eligibility criteria not prescribed in regulation.

Adopting these provisions via Guideline, as was requested by many commenters in the initial stakeholder process that led to the promulgation of the regulation, will provide the necessary flexibility for the Department, in consultation with MDAR, to make modifications to key eligibility criteria as lessons are learned in constructing and operating ASTGUs.

Any modifications to this Guideline will only be made following an opportunity for public comment that shall remain open for at least two weeks. All capitalized terms in this Guideline are defined in 225 CMR 20.02.

225 CMR 20.00 Regulatory Provisions Specific to ASTGUs

Under the SMART program, Solar Tariff Generation Units are eligible to qualify as an ASTGU, which is defined under 225 CMR 20.02 as follows:

Agricultural Solar Tariff Generation Unit. A Solar Tariff Generation Unit located on Land in Agricultural Use or Prime Agricultural Farmland that allows the continued use of the land for agriculture.

Additionally, 225 CMR 20.06(1)(d) contains special provisions pertaining specifically to the eligibility of ASTGUs:

(d) Special Provisions for Agricultural Solar Tariff Generation Units. In order to qualify as an Agricultural Solar Tariff Generation Unit, a Solar Tariff Generation Unit must submit documentation itemized in 225 CMR 20.06(1)(d) below. All final determinations regarding the eligibility of such facilities will be made by the Department, in consultation with MDAR. A Solar Tariff Generation Unit must also submit satisfactory documentation to the Department as detailed in the Department's *Guideline Regarding the Definition of Agricultural Solar Tariff Generation Units*.

1. the Solar Tariff Generation Unit will not interfere with the continued use of the land beneath the canopy for agricultural purposes;
2. the Solar Tariff Generation Unit is designed to optimize a balance between the generation of electricity and the agricultural productive capacity of the soils beneath;
3. the Solar Tariff Generation Unit is a raised structure allowing for continuous growth of crops underneath the solar photovoltaic modules, with height enough for labor and/or machinery as it relates to tilling, cultivating, soil amendments, harvesting, *etc.* and grazing animals;
4. crop(s) to be grown to be provided by the farmer or farm agronomist in conjunction with UMass Amherst agricultural extension services, including compatibility with the design of the agricultural solar system for such factors as crop selection, sunlight percentage, *etc.*;
5. annual reporting to the Department and MDAR of the productivity of the crop(s) and herd, including pounds harvested and/or grazed, herd size growth, success of the crop, potential changes, *etc.*, shall be provided after project implementation and throughout the SMART incentive period; and
6. other system design information, which shall include, but not be limited to:
    a. dual-use type, *e.g.*, ground mount racking, pole towers, tracking, *etc.*;
    b. total gross acres of open farmland to be integrated with the project;
    c. type of crop(s) to be grown, including grazing crops;
    d. pounds of crop(s) projected to be grown and harvested, or grazed;
    e. animals to be grazed with herd size(s); and
    f. design drawing including mounting system type (fixed, tracking), panel tilt, panel row spacing, individual panel spacing, for pole towers tower spacing and mounting height, *etc.*

Additional Provisions for ASTGUs

Provided a Solar Tariff Generation Unit meets all program eligibility criteria in 225 CMR 20.00, in particular the provisions relating to ASTGUs prescribed in 225 CMR 20.02 and 20.06(1)(d), a Solar Tariff Generation Units must also satisfy the following provisions to qualify as an ASTGU. Note that these provisions take into account the entire useful life of the solar photovoltaic array with consideration for the variety of possible agricultural activities and crops that could take place on farm land over that timeframe. In other words, they do not simply consider present use.

The parameters defined in Section A below will allow for the variety and flexibility of potential farming operations at any given farm throughout the life of the solar photovoltaic array. These parameters are stated as minimums, giving farms the flexibility to determine and finalize farming operations. Applicants complying with the additional provisions in Section A below will be reviewed in an expedited process.

DOER intends to develop a standard design tool (SMART Tool) to be mandated for use by all Agricultural Solar Generation Tariff Unit applicants, and to be used by developers and farmers alike to demonstrate meeting the SMART regulations and Guidelines. The SMART Tool will be designed to:

a) assist in the design of an Agricultural Solar Generation Tariff Unit by understanding the shading impact on all the land beneath, behind, and throughout the farmed area, of various dual-use array system designs and layouts;

b) provide a farm plan template to be used by the landowner to propose their active agricultural production plan consistent with the array configuration and shading profile and compliant with the Guideline requirements; and

c) provide an annual reporting form template compliant with the Guideline requirements.

A. System Design Parameters:

1. Panel Height Requirements

   a. For fixed tilt ASTGUs, the minimum height of the lowest panel point shall be eight (8) feet above ground;

   b. For tracking ASTGUs, the minimum height of the panel at its horizontal position shall be 10 feet above ground;

2. Maximum Direct Sunlight Reduction Requirements

   All ASTGUs must demonstrate that the maximum sunlight reduction from the panel shading on every square foot of land directly beneath, behind and in the areas adjacent to and within the ASTGU's design shall not be more than 50% of baseline field conditions;

3. Growing Season/Time of Day Considerations

   The typical growing season shall be considered to be March through October, with sunlight hour conditions with maximum 50% sunlight reduction to be between 10AM and 5PM for March and October, and from 9AM to 6PM from April through September;

4. Maximum Size

   The maximum AC rated capacity of an ASTGU shall be two MW in the first two Capacity Blocks of each Distribution Company's service territory. The Department, in consultation with MDAR, will make an evaluation as to whether or not this provision shall be adjusted in subsequent Capacity Blocks.

B. Waiver from Additional Provisions

DOER recognizes the variety and, in some cases, the uniqueness of farming operations where some of the Additional Provisions for an ASTGU may not be required to achieve the objectives of the ASTGU. To address this issue, a landowner may request that DOER issue a waiver from any of the Additional Provisions for an ASTGU that is not contrary to the law or the intent of the regulations. All waiver requests should be submitted to DOER.SMART@state.ma.us.

In order to request a waiver, the applicant must provide the Department with the following:

1. Plan Development

   Develop a plan that:

   a. describes how the applicant will integrate the ASTGU into their farming operation;

   b. demonstrates that a waiver does not result in a diminishment in the agricultural production capacity of the land; and

   c. demonstrates that the primary use of the land is for agricultural or horticultural production, as defined under M.G.L. Chapter 61A.

2. Justification and Substantiation

   An applicant must provide justification as to why an ASTGU design is necessary for the proposed agricultural operations on the relevant parcel of land.

3. Additional Documentation

   An applicant must provide documentation for each specific aspect of the design parameters from Section A of this Guideline for which the ASTGU requires a waiver as follows:

   a. Panel Height Requirements: Provide documentation demonstrating how the proposed design will allow for the variety and flexibility of a variety of potential farming operations at the farm throughout the term of the SMART Tariff.

   b. Maximum Direct Sunlight Reduction Requirements:

      i. Demonstrate how the proposed dual use design will provide equal or greater total agricultural yields than if both the agricultural crop and the solar array were grown and installed separately, utilizing the same amount of total land area for the comparison;

      ii. Demonstrate how each square foot of land will be used for agriculture production;

      iii. Demonstrate how the design will be able to accommodate a variety of potential agricultural products throughout the twenty year term of the SMART Tariff.

   c. Growing Season/Time of Day Considerations: Provide documentation on how the time of season and day data in Section A is not relevant to the farming practice and operation, currently, and for the term of the SMART Tariff.

   d. Other: For all other requirements for which a waiver is being sought, please describe the waiver(s) requested, why the proposed alternatives require a waiver, and how these alternatives will meet the intention of the ASTGU regulations.

From: Michael Zhe
To: Jeffrey Murphy
Subject: FW: Pre-application questions
Date: Thursday, April 01, 2021 2:23:00 PM

See below.

From: Rose Jackson
Sent: Thursday, April 01, 2021 1:46 PM
To: Michael Zhe <mzhe@bluewavesolar.com>
Subject: Re: Pre-application questions

Hi Michael,

Dixieland, LLC grants permission to BlueWave and Beals & Thomas to submit a Special Permit and to Construct the Solar Project at 1050 Hilldale Avenue in Haverhill, MA.

Please let me know if you need anything else!

Take care,

Rose

BWC CAMP BROOK, LLC – DUAL-USE AGRICULTURAL PLAN

Parties and Background:

Landowner – Dixieland, LLC (Dixieland)

Rose Jackson, Manager of Dixieland, LLC grew up with her father working this 82-acre farm since the mid 1970's. Put into the Luongo Family Trust followed by Dixieland, LLC in 2011, this 61A classified property has been maintained in continuous agricultural operation. Dixieland is planning to convert the existing 5.5-acre hay field along with approximately 8 acres of forested land to a grazing operation with optionality for crop diversification, as part of this proposed dual-use solar project.

Farm Manager – Solar Agricultural Services, Inc. (SolAg)

Iain Ward, President of Solar Agricultural Services, Inc. has almost two decades of experience in diversified agricultural production, implementation of agricultural best management practices, food safety compliance, and farm succession planning. The SolAg team acts as a liaison between BWC Camp Brook, LLC, Dixieland and Riverflock to incorporate innovative procedures that foster the integrity of on-site soils and agricultural production along with the long-term agricultural reporting required by the State as part of the SMART program.

Farmer – Riverflock Farm LLC (Riverflock)

Jacob Quiring, Manager of Riverflock Farm, LLC out of Kingston, NH has over a decade of experience working in fruit, vegetable, and livestock production. Jacob was a dairy technician at Appleton Farms in Hamilton, MA and most recently the flock manager at Lillooet Sheep and Cheesery in Boxford, MA, from which will come the foundation flock for Riverflock. Riverflock is establishing a dairy sheep operation in Kingston and intends to use Dixieland's dual-use pasture for intensive rotational grazing of lambs.

Site Preparation Plan:

The nature of this dual-use solar array brings the opportunity to incorporate innovative methods of land clearing and soil preparation. Instead of typical removal of trees and stumps from the site combined with grading of topsoil, this project contemplates on-site grinding of slash and stumps such that their biomass can be re-incorporated and foster the natural microbial activity of the soil. This practice will also reduce potential solar panel construction related soil compaction. Post construction seed bed preparation will be conducted using methods and machinery proven to foster the germination of diverse cover crops (including over 12 different species of grass and legumes recommended by the USDA - Natural Resources

Conservation Service) followed by the seasonally appropriate planting of a permanent pollinator friendly sheep pasture mix.

Grazing Plan:

As part of its project design, BWC Camp Brook, LLC is integrating necessary agricultural infrastructure such as a well and water line, fencing, power supply, heavy use area and shelter. In so doing, the financial barrier of entry for a beginning farmer (or any farmer) is low. Riverflock will have the ability to simply transport its flock of 30-40 lambs to the site at the appropriate time and begin grazing.

It is anticipated that grazing on-site will commence in May/June and extend until October/November. Utilizing portable electric fencing within the perimeter fence line will allow for intensive rotational grazing with the flock being moved to new sections of pasture once a day or every other day depending upon growing conditions. Alongside direct observation of available forage, the height of grass, etc., Riverflock will use a grazing chart to record where the flock has grazed and how long the rest period has been in order to anticipate the grazing sequence. It is anticipated that this grazing strategy will reduce weed pressure and the need for mechanical mowing, however Riverflock favors mechanical mowing over chemical weed control. Should the need arise, hay will be used to supplement the forage needs of the flock.

Marketing Plan:

Riverflock intends to start milking a flock of 30 sheep in late 2021. Initially, all milk will be sold to Bell & Goose Cheese Company for a new line of sheep milk cheeses. It is anticipated that in 2022, Riverflock will use a portion of its milk for yogurt and kefir production. Besides wholesale and value-added dairy sales, Riverflock intends to supply several farmers markets and farm stands with lamb and wool products.

BEALS + THOMAS

June 3, 2021

Melinda E. Barrett, City Council President
Haverhill City Council
4 Summer Street
Haverhill, MA 01830

Reference: Decommissioning Plan
Hilldale Avenue Solar 2
1050 Hilldale Avenue
Haverhill, Massachusetts
B+T Project No. 3274.00

Dear President Barrett and Councilors:

On behalf of the Applicant, BWC Camp Brook, LLC, Beals and Thomas, Inc. respectfully submits this Decommissioning Plan and associated exhibit in support of the Hilldale Avenue Solar 2 Project. Based upon my review of the documentation provided, the cost to decommission the site in 20 years is approximately $87,900. In my professional experience with projects of this type and size, this financial surety value is comparable to decommissioning proposals approved by other towns.

Very truly yours,

BEALS AND THOMAS, INC.



Jeffrey R. Murphy 6/3/2021

Jeffrey R. Murphy, PE
Civil Engineer

Enclosure: Exhibit A: Decommissioning Documentation

NBB/JRM/327400LT003

Exhibit A: Decommissioning Documentation

Project: Hilldale Avenue Solar 2
Location: 1050 Hilldale Avenue

Decommissioning Timeline - Decommissioning of the system will occur within 120 days following the 20 year end of lease term.

The anticipated life of the solar panels is expected to be 20 years

Key assumptions include the fact that the fencing, electrical cabinetry, solar racks, solar panels, wiring and all other equipment are all one hundred percent recyclable, therefore, the primary cost of decommissioning is the labor to dismantle and load as well as the cost of trucking. The concrete pads will be broken up at the site and brought to an ABC recycling facility where it will be accepted without a charge. All ofther recyclables will be brought to the nearest Transfer Station.

The following items from the 2.1MW array will be recycled:

2 Inverters
2 Transformers
2 Switchgear
3 Battery Storage Containers
181 Racks
5,320 Linear feet of fencing
9 Utility Poles
2,870 Linear feet of cable

Estimated cost of labor and equipment:	**Cost**
Bobcat	$250/Day
Labor	$28/HR
Trucking	$72/HR
Backhoe/Excavator	$1000/Week
Bulldozer	$2500/Week

1. Remove Panels:

The panels are bolted in. A laborer needs to unbolt the panel and remove the panel off the rack.

Calculation - [Panel Removal Rate * Total # of Panels * Labor Rate] = Total Panel Removal Cost
3min/panel * 4,706 Panels * $28/hr =** **$ 6,588.40

2. Remove Rack Wiring:

The panels are plugged together in the same manner as an electrical cord from a light is plugged into a wall socket. A laborer needs only reach over and pull the plug. The string wires lie in a tray. A laborer needs only reach into the tray and remove the strands of wire.

Calculation - [Panel Removal Rate * Total # of Panels * Labor Rate]
= Panel Removal Cost
1min/panel * 4,706 Panels * $28/hr =** **$ 2,196.13

3. Dismantle Racks:

Calculation - [Total # of Racks * Rack Removal Rate * Labor Rate]
= Total Rack Dismantling Cost
181 Total Racks * 2 hr/rack * $28/hr =** **$ 10,136.00

4. Load Racks:

Calculation - [Total Racks * Rack Removal Rate * (Labor Cost + Bobcat Cost)]
= Total Load Rack Cost
181 Racks * 10min/rack * ($28/hr + $250/hr) =** **$ 8,386.33

5. Remove and Load Electrical Equipment (Inverters, Transformers, Switchgear, Storage Containers):

Total # of units: 2 Invertes + 2 Transformers + 2 Switchgear + 3 Storage Containers

Calculation - [Elec. Equip Removal Rate * Total # of Units * (Labor Rate + Bobcat Cost)]

= Total Elec. Equip. Removal Cost

1 Unit/hr * 9 Units * ($28/hr*$31/hr) = $ **531.00**

6. Break Up Concrete Pads:

The concrete will be broken up using an excavator and jackhammer

Calculation - [1 Pad Area/day * # of Pad Areas * (Excavator Cost + Labor Rate)]

= Total Concrete Pad Removal

5 Pad Areas * 8hr * ($25/hr + $28/hr) = $ **2,120.00**

7. Remove Cable:

Calculation - [Total Cable Linear Footage * Cable Removal Rate * (Labor Cost + Backhoe Cost)]

= Total Cable Removal Cost

2,870ft * 2min/ft * (1hr/60min)*($28/hr + $25/hr)= $ **5,070.33**

8. Remove Screws:

Calculation - [(Total # of Racks * 4 Screws/rack)/Removal Rate * (Labor Cost + Excavator Cost)] = Total Screw Removal Cost

(181 Racks*4)/100 per day * 8hr/day * ($28/hr + $25/hr) = $ **3,069.76**

9. Utility Pole Removal:

Calculation - [Total # of Utility Poles * Pole Removal cost] = Total Cost to Remove Poles

9 Poles * $500/pole = $ **4,500.00**

10. Remove Fence:

Calculation - [Total Fence Length / fence Removal Rate * (Labor Cost + Bobcat Cost)]

= Total Fence Removal Cost

5,320ft / 500ft per day * ([$28/hr * 8hr/day] +$250) = $ **5,043.36**

11. Grading and Gravel Road Removal:

Calculation - [Rough Grading (Days * Bulldozer Cost) + Fine Grading (Days*Bulldozer Cost)]

= Total Grading Cost

5 Days * $2500/week + 1 Day * $2500/week) = $ **3,000.00**

12. Seed Disturbed Areas:

Calculation - [Re-Seeding area*Hydroseed Cost] = Total Seeding of Disturbed Area Cost

108,300 sqft * $.06/sqft = $ **6,498.00**

13. Trucking Cost

Round Trip to transfer station = ±20 miles - including loading/unloading it's estimated to take 1hr per truckload

Calculation - [Total Truckloads * Round Trip to Transfer Station * (Trucking Cost+Labor Cost)]

= Total Trucking to Transfer Station

20 Truckloads * 1hr * ($72/hr + $28/hr) = $ **2,000.00**

Total Projected Decommissioning Cost:

1. Remove Panels:	$	6,588.40
2. Remove Rack Wiring:	$	2,196.13
3. Dismantle Racks:	$	10,136.00
4. Load Racks:	$	8,386.33
5. Remove and Load Electrical Equipment (Inverters, Transformers, Switchgear, Storage Containers):	$	531.00
6. Break Up Concrete Pads:	$	2,120.00
7. Remove Cable:	$	5,070.33
8. Remove Screws:	$	3,069.76

9. Utility Pole Removal:	$	4,500.00
10. Remove Fence:	$	5,043.36
11. Grading and Gravel Road Removal:	$	3,000.00
12. Seed Disturbed Areas:	$	6,498.00
13. Trucking Cost	$	2,000.00
Total Cost	**$**	**59,139.32**

Total Cost after 20 Year (2.0% inflation Rate) $87,877.92

FV = PV x (1+r)^n
FV = Future Value
PV = Present Value
r = Rate of Retuen
n = Number of Periods

Total Decommissioning Cost **$87,900.00**

Introduction, Samsung new battery platform

- E3 2P12S compact platform with 100Ah

Tentative Design; Subject to Change

2019 02 20

Rev 02



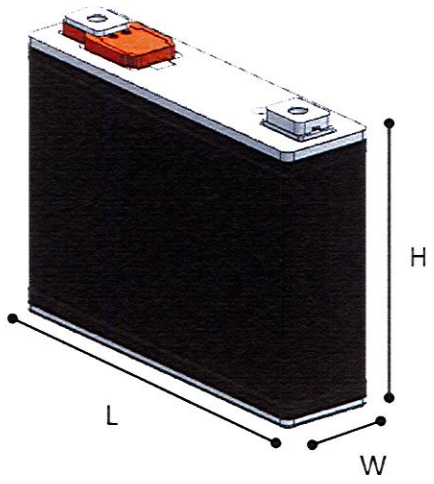
SAMSUNG SDI SAMSUNG

Cell

Tentative Design; Subject to Change

Reference use only
All described data is TBD

- NCM-based high reliability battery cell (shared with and derived from SDI's EV solutions)
- Solid metal cell exterior body → Robust mechanical design supports **long term usage**
- Cell dimensions are identical across the line of ESS cells. Cell chemistry is tailored to application.



Item		E2 94Ah	E3 100Ah
Cell Dimension, L x H x W [mm] (excluding terminals)		173 x 125 x 45	
Weight [g]		2,100	2,150
Capacity [Ah] (nominal)		**94**	**100**
Design Energy [Wh] (nominal)		345.9	368
Energy Density	Gravimetric [Wh/kg]	164.7	171.1
	Volumetric [Wh/L]	355.5	378.2
Voltage	Max [V]	4.15	4.15
	Nominal [V]	3.68	3.68
	Min [V]	2.70	2.70

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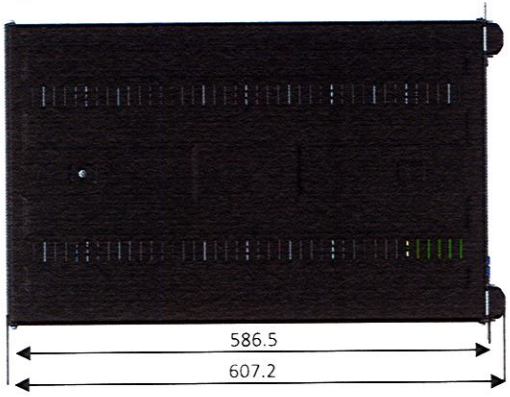
- Diverse platform : Can cover various application with cost effective solutions

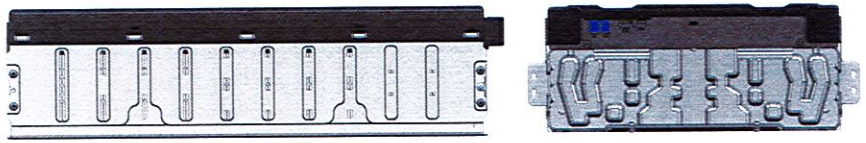
Classification		E2 (94Ah 22S)	E3 (100Ah 2P12S)
Image			
Cell		94Ah	100Ah
Configuration		22S1P	2P12S
Design Energy [kWh] (nominal)		7.61	8.83
Power [kW]	Continuous (CHG/DCHG)	3.805 (0.5CP)	4.42 (0.5CP)
	Peak	-	-
Operating Voltage(V)		70.4 - 91.3	38.4 ~ 49.8
Dimension (W×L×H)		370 × 586.5 × 160	370 × 637 × 160
Weight (kg)		< 53	< 58
E-Density	Gravimetric [Wh/kg]	143.6	152.3
	Volumetric [Wh/L]	219.2	234.2
Recommended application		0.5CP ↓ (1 equivalent cycle per day application)	

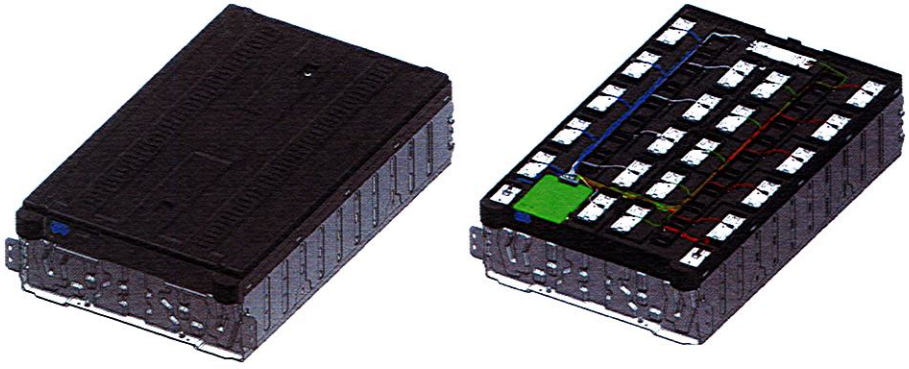
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22S Module

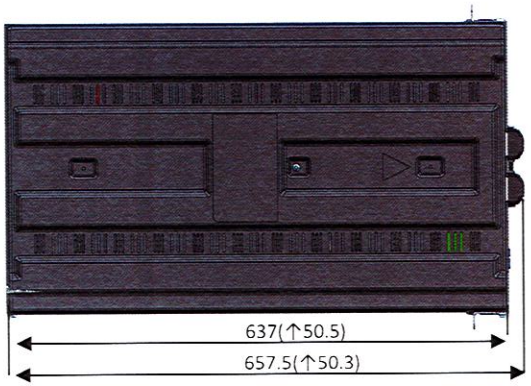


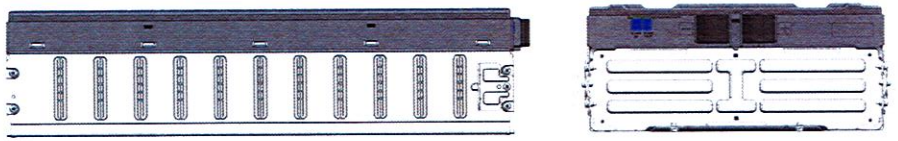


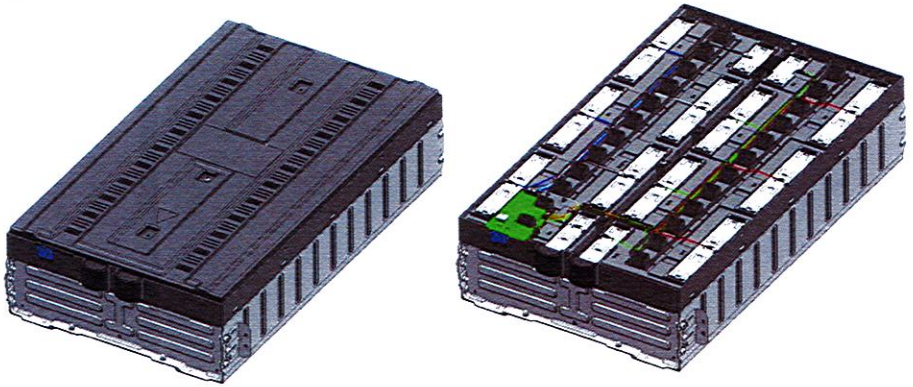


Size: D586.5(607.2) X W370 X H160 Weight: 53Kg

2P12S Module







Size: D637(657.5↑50.3) X W370 X H160 Weight 58Kg

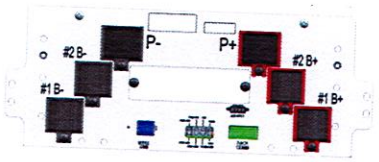
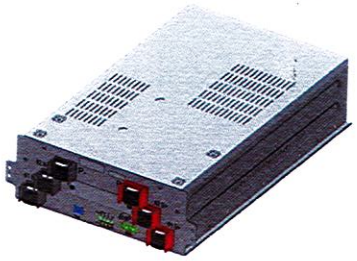
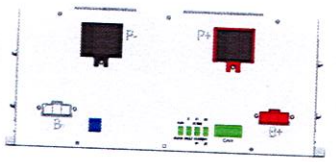
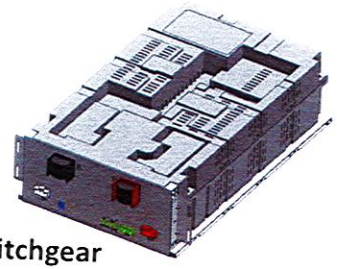
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Tentative Design; Subject to Change

Reference use only
All described data is TBD

- Rack BMS and protective devices are placed in the same box
- Designed with redundancy: DC contactor and fuse equipped on **both** poles
- Enhanced power connection: solid bus-bars are used

Switchgear design and protection components can be changed according to application type

Classification		E2 – 2String	E3 – Single string
Image		 	  Plastic switchgear
Dimension		413.4 X 586.2 X 160	413.4 X 586.2 X 160
Weight		15Kg	T.B.D
Protect Device	DC Contactor (+)	GPR-H500A x 2	GPR-H500A x 1
	DC Contactor (-)	GPR-H500A x 1	GPR-H500A x 1
	DC Fuse (+)	1500V 80A x 2	1200V 160A x 1
	DC Fuse (-)	1200V 200A x 1	1200V 160A x 1
Dielectric strength		AC 3000V for 60sec	AC 3000V for 60sec

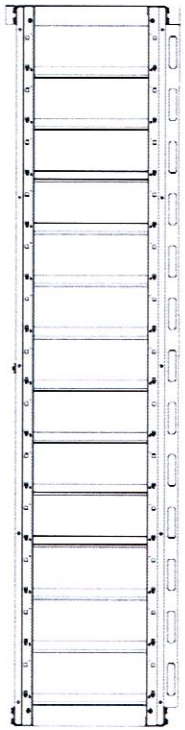
SAMSUNG SDI SAMSUNG

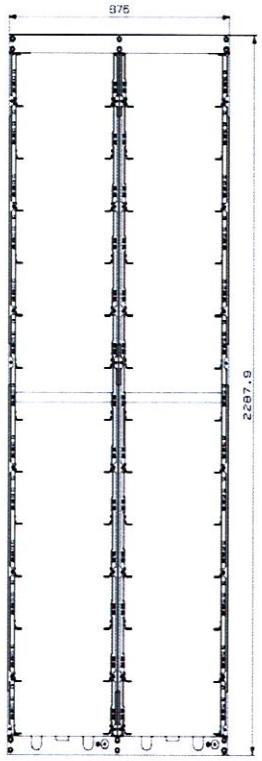
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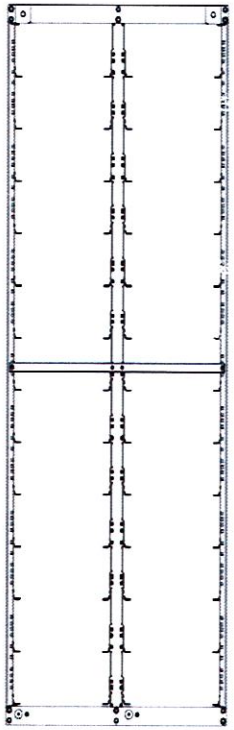
Rack frame

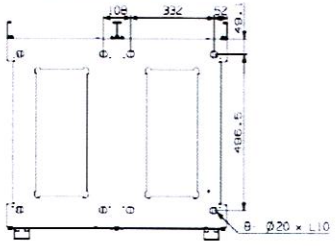
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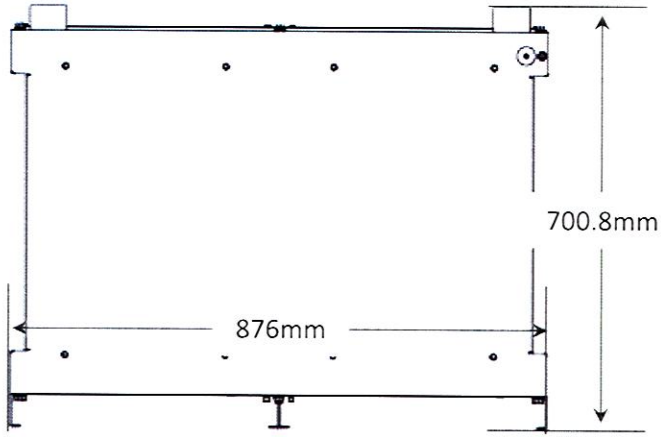
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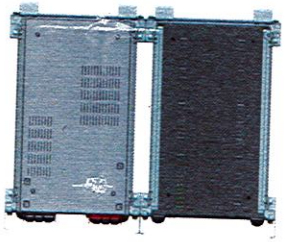
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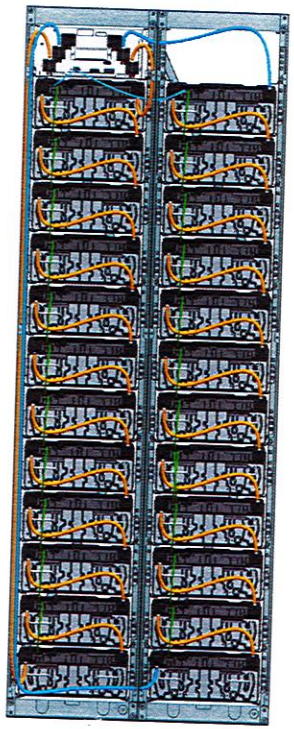
Rack

Tentative Design; Subject to Change

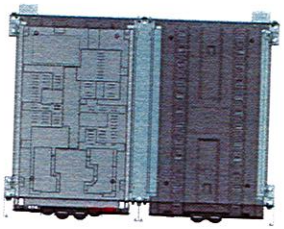
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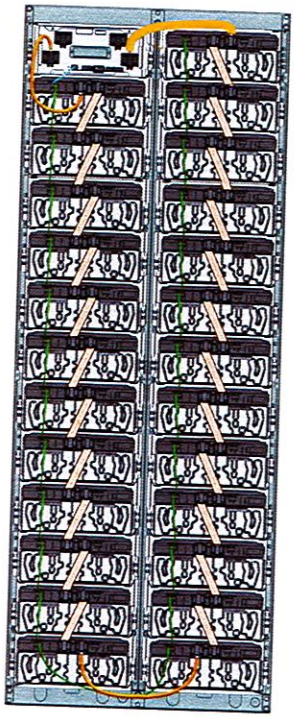
Classification	E2 Rack	E3 Rack
Cell	94Ah	100Ah
Configuration	198S2P (9x2module) 220S2P (10x2module) 242S2P (11x2module) 264S2P (12x2module) 286S2P (13x2module)	2P204S (17module) 2P228S (19module) 2P252S (21module) 2P276S (23module) 2P300S (25module)
Energy [kWh]	198S2P 136.9 220S2P 152.2 242S2P 167.4 264S2P 182.6 286S2P 197.9	2P204S 150.1 2P228S 167.8 2P252S 185.5 2P276S 203.1 2P300S 220.8
Operating Voltage(V)	633.6 ~ 821.7 704.0 ~ 913.0 774.4 ~ 1004.3 844.8 ~ 1095.6 915.2 ~ 1186.9	652.8 ~ 846.6 729.6 ~ 946.2 806.4 ~ 1045.8 883.2 ~ 1145.4 960 ~ 1245
Weight(kg)	730 (for 264S)	TBD
Dimension (mm) W	876 x 702 x 2290 (264S)	876 x 712 x 2290 (300S)
E-Density (Wh/L) with 13 slots dual Rack	129	155
Recommended application	0.5CP ↓ (1 equivalent cycle per day application)	0.5CP ↓ (1 equivalent cycle per day application)





※ 264S2P Rack





※ 2P300S Rack

SAMSUNG SDI SAMSUNG

All information contained in this product description is subject to change at any time without notice to, or approval by, the customer. Its affiliates assume no liability for any errors or omissions in the content of this product description

April 5th, 2017

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To whom it may concern,

RE: Islanding detection method used by SMA Sunny Central inverters SC-1850-US, SC-2200-US, SC-2500-EV-US and SC-2750-EV-US, and by SMA Sunny Central Storage inverters SCS-2200-US, SCS-2475-US, SCS2-500-EV-US and SCS-2750-EV-US

This letter is to inform National Grid about the islanding detection methods in the SMA Sunny Central inverters SC-1850-US, SC-2200-US, SC-2500-EV-US and SC-2750-EV-US, and by SMA Sunny Central Storage inverters SCS-2200-US, SCS-2475-US, SCS2-500-EV-US and SCS-2750-EV-US.

National Grid Requested Information	Response
Identify the inverter manufacturer	SMA
Identify the inverter model	SC-1850-US, SC-2200-US, SC-2500-EV-US, SC-2750-EV-US SCS-2200-US, SCS-2475-US, SCS-2500-EV-US, SCS-2750-EV-US
Contact information for the inverter manufacturer	Ravi Dodballapur Ravi.Dodballapur@sma-america.com Director Application Engineering 6020 West Oaks Blvd, Suite 300 Rocklin, CA 95765-3714 U.S.A. www.SMA-America.com
Identify if the inverter is 3-phase or 1-phase.	3 phase

Provide brief description of island detection method proposed. The description shall be sufficient to determine whether the inverter employs positive feedback on one or more grid parameters, and what parameter(s) the positive feedback is applied to.	Sunny Central inverters and Sunny Central Storage inverters are equipped with passive islanding detection methods and with active islanding detection systems. Passive Islanding detection methods are based on a (passive) measurement of the grid values. Active method means that the inverter makes something active and gets back a reaction of the grid. This reaction is very different in case of an islanding grid instead of a grid connected operation. SMA uses as passive Islanding methods the voltage and frequency measurement, and as active detection system the escalating frequency shift method.
Does the inverter employ active or passive islanding detection? Provide documentation confirming that the islanding detection is "turned on" in the proposed inverter.	Both methods are used. Passive Islanding Detection is always activated (inverters always monitor the frequency and the voltage). Active Islanding Detection is activated depending on the grid settings. For the US, the inverters come by default configured with IEEE1547 and this requires Active Islanding Detection on. Please, see the annex 1 with some grid codes and their Active Islanding Detection default value.
For active islanding detection, various methods are available in the market. Identify the type of detection proposed. Is the method based on Sandia Frequency Shift, Sandia Voltage Shift, Impedance Detection with Positive Feedback, or Other? If Other, specify.	The active islanding detection method that SMA Sunny Central inverters and Sunny Central Storage inverters use is the "escalating frequency shift". This method uses the measured values of the grid frequency and adds a small error to the control loop which leads to escalating error in case of an island forming.
Does the active islanding detection utilize positive feedback?	Yes
If utilizing positive feedback, is the positive feedback response bi-directional, or unidirectional? In other words, is the perturbation in the same direction as the deviation from nominal?	Bi-directional. The processor calculates every cycle the difference between a long term mean value of the grid frequency and the actual measured value. This difference is multiplied with an internal and an external (settable) factor. The result is saved in the current controller as an additional phase angle. A different phase angle between grid voltage and feed in current results into a different reactive power. In an island grid a change in the frequency causes different reactive power.

	So in the next cycle, the delta between long term mean value and actual value of the frequency will be higher which results in a higher phase angle for the current controller. Finally the frequency drifts exponentially to a higher or lower value.
If the islanding detection is the same to meet both UL1741 and UL1741 SA, state here. Otherwise, please describe how the islanding detection changed from when the inverter was listed to UL1741 to when it was listed to UL1741 SA. Alternatively, two separate letters may be provided for each firmware version.	Same.
Identify all functions verified by UL1741 SA as compatible with unintentional islanding compliance.	See Annex 4.
Identify all functions that are not verified by UL1741 SA as compatible with unintentional islanding compliance.	None.
For each function verified in item 11b above, identify any parameters that adversely affect islanding detection and identify the worst case tests used in UL1741 SA.	
Attach a PDF of the UL1741/UL1741 SA test results file with the filename: Manufacturer_Model_UL1741_SA_Test_Results_Date.PDF	Included in Annex 4.
Indicate the filename/compressed folder name for inverter models provided as Manufacturer_Model_UL1741_SA_Inverter_Model. Note: If inverter models and validation data are not provided per the requirements in Section 3, the Customer will be required to operate in Specified PF mode per ESB756, with Q(V), Volt/VAR functions OFF, and Frequency-Watt Functions OFF, and normal ramp rate.	Included in Annex 4.
Does the inverter use an isolation transformer?	Yes, external isolation transformer

If yes, what is the low voltage phase to neutral voltage?	In the Low voltage side of the transformer there is no neutral connection. In case there is a neutral, this shouldn't be grounded. Voltage between phases is from 385V up to 600V depending on inverter model. See Annex 2 (datasheets)
Is there a self-protective overvoltage setting at 1.4pu voltage per ESB756 or lower, set to 1ms or less total clearing time activated in the inverter? If not, is there another means to meet the requirements in ESB 756 B, C, or D section 10.3? Indicate the settings and total clearing time here.	The inverters are synchronized with the voltage of the grid and they are not capable of limiting the AC voltage, only the current which is injected into the grid. Maximum operating voltage is 1.20pu, inverter then disconnects. If FRT (Fault Ride Through) is required, parameters can be set to Ride Through 1.4pu for 1 second maximum.
Specifically, how do the inverter controls limit the AC output voltage when generation exceeds available load?	When the inverters are connected to the grid the generation does not exceeds the load. In case it is necessary to stop the inverters, the DC is disconnected and the production is zero. In case the power needs to be limited, the inverters reduce the current they inject into the grid; this can be achieved by moving the operating point in the DC side to a higher voltage with lower power generation.
Identify the inverter firmware version that incorporates the above features.	All firmware versions

For further details on Islanding Detection, please see Annex 3 Islanding Detection technical document.

1. ANNEX: ACTIVE ISLANDING DETECTION. DEFAULT VALUE FOR SOME GRID CODES IN THE US

The table below shows the default value of the Active Islanding Detection mode depending on the grid code selection. SMA can also change the AID mode selection upon request.

SC xxxx Grid types	
Parameter-Name	Description
Aid.Mod	Active islanding detection, activation
GRID CODE	PRESET VALUE
US IEEE1547	SWITCH_STT_ENABLE
US ERCOT	SWITCH_STT_DISABLE
US HECO	SWITCH_STT_DISABLE
US NERC	SWITCH_STT_DISABLE
US WECC	SWITCH_STT_DISABLE
US IESO CAISO	SWITCH_STT_DISABLE
US PGE CAISO	SWITCH_STT_DISABLE
US PRC024 W	SWITCH_STT_ENABLE
US PRC024 E	SWITCH_STT_ENABLE
US PRC024 ERCOT	SWITCH_STT_ENABLE
US MA NE ISO	SWITCH_STT_DISABLE

2. ANNEX: DATASHEET SUNNY CENTRAL 1850-US / 2200-US / 2500-EV-US / 2750-EV-US

SUNNY CENTRAL
1850-US / 2200-US / 2500-EV-US / 2750-EV-US



Unmatched Power Density

- Small footprint simplifies site preparation and logistics
- Industry leading over-dimensioning capabilities
- Integrated voltage supply for internal consumption and external loads

Robust Performance

- Precision air-cooling enables greater reliability and simpler service compared to liquid cooled inverters
- Best-in-class performance in any environment
- DC/AC Ratio up to 250%

Grid Management

- Conforms to all known grid requirements worldwide
- Provides Q on demand

Superior Integration

- Improved DC connection area
- Easily accessible bay for connecting site specific equipment
- Available as a stand-alone inverter or solution with medium-voltage block and tracker auxiliary rack

SUNNY CENTRAL
1850-US / 2200-US / 2500-EV-US / 2750-EV-US

Maximum power density and simple integration for 1,000 V and 1,500 V PV projects

The Sunny Central family features an output of up to 2,750 kVA with 1,500 V DC systems. Fewer system components are needed due to the integrated DC fuse servicing switches and convenience power. The inverter also includes integrated control power and a network switch. OptiCool™ precision air cooling keeps this central inverter running smoothly, even in extreme ambient temperatures. It also protects against sand and dust intrusion. The Sunny Central inverter is the central component of the SMA Utility Power System and offers industry leading DC:AC ratios. In conjunction with the medium-voltage block 2.0, DC technology, power plant controlling system and SMA Service, it offers maximum ROI for utility-scale PV projects.

SUNNY CENTRAL 1000 V

Technical Data	Sunny Central 1850-US	Sunny Central 2200-US
Input (DC)		
MPP voltage range V_{DC} (at 25 °C / at 50 °C)[8]	570 to 950 V / 850 V	570 to 950 V / 850 V
Min. input voltage $V_{DC,min}$ / Start voltage $V_{DC,start}$	545 V / 645 V	545 V / 645 V
Max. input voltage $V_{DC,max}$	1000 V	1000 V
Max. input current $I_{DC,max}$ (at 25 °C / at 50 °C)	3960 A / 3600 A	3960 A / 3600 A
Max. short-circuit current $I_{SC,PV}$	6400 A	6400 A
Number of DC inputs (24/28/32)[9]	● / ○ / ○	● / ○ / ○
Max. number of DC cables per DC input (for each polarity)	2 x 800 kcmil, 2 x 400 mm²	2 x 800 kcmil, 2 x 400 mm²
Integrated zone monitoring	○	○
Available DC fuse sizes (per input)	200 A, 250 A, 315 A, 350 A, 400 A, 450 A, 500 A	
Output (AC)		
Nominal AC power (at 25 °C / at 40 °C / at 50 °C)	1850 kVA / 1850 kVA / 1850 kVA	2200 kVA / 2080 kVA / 2000 kVA
Nominal AC active power at cos φ =0.9 (at 25 °C / at 40 °C / at 50 °C)	1666 kW / 1666 kW / 1666 kW	1980 kW / 1872 kW / 1800 kW
Nominal AC current $I_{AC,nom}$ = Max. output current $I_{AC,max}$	3300 A	3300 A
Nominal AC current $I_{AC,nom}$	2774 A	3300 A
Max. total harmonic distortion	< 3% at nominal power	< 3% at nominal power
Nominal AC voltage / nominal AC voltage range[1][7]	385 V / 308 V to 462 V	385 V / 308 V to 462 V
AC power frequency / range	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz
Min. short-circuit ratio at the AC terminals	> 2	> 2
Power factor at rated power / displacement power factor adjustable[7]	1 / 0.8 overexcited to 0.8 underexcited	
Efficiency		
Max. efficiency / European efficiency / CEC efficiency[2]	98.6% / 98.4% / 98.0%	98.6% / 98.4% / 98.0%
Protective Devices		
Input-side disconnection point	DC load break switch	
Output-side disconnection point	AC circuit breaker	
DC overvoltage protection	Surge arrester, type I	
AC overvoltage protection (optional)	Surge arrester, class I	
Lightning protection (according to IEC 62305-1)	Lightning Protection Level III	
Overcurrent protection device (according to NEC, ANSI/NFPA 70)	3600 A	
Ground-fault monitoring / remote ground-fault monitoring	○ / ○	
Insulation monitoring	○	
Degree of protection: electronics / air duct / connection area (as per IEC 60529)	IP65 / IP34 / IP34	
Degree of protection (as per UL 50E)	Type 3R	
General Data		
Dimensions (W / H / D)	2780 / 2318 / 1588 mm (109.4 / 91.3 / 62.5 inch)	
Weight	< 3400 kg / < 7496 lb	
Self-consumption (max.[3] / partial load[4] / average[5])	< 8100 W / < 1800 W / < 2000 W	
Self-consumption (standby)	< 300 W	
Internal auxiliary power supply	Integrated 8.4 kVA transformer	
Operating temperature range[7]	-25 °C to 60 °C / -13 °F to 140 °F	
Temperature range (standby)	-40 °C to 60 °C / -40 °F to 140 °F	
Temperature range (storage)	-40 °C to 70 °C / -40 °F to 158 °F	
Noise emission[6]	66.4 dB(A)	66.3 dB(A)
Max. permissible value for relative humidity (condensing / non-condensing)	> 95% to 100% (2 month/year) / 0% to 95%	
Maximum operating altitude above MSL[7] 2000 m	●	
Fresh air consumption	6500 m³/h	
Features		
DC connection	Terminal lug on each input	
AC connection	With busbar system (three busbars, one per line conductor)	
Communication	Ethernet, Ethernet/IP, Modbus TCP/IP	
Enclosure / roof color	RAL 9016 / RAL 7004	
Display	HMI touchscreen (10.1")	
Supply transformer for external loads	○ (2.5 kVA)	
Standards and directives complied with	UL 1741 chapters 31 CRD 6I, UL 1741-SA, UL 1998, UL 840 Category IV, EMC FCC Part 15 Class A, IEEE 1547, BDEW	
	CISPR 22:2008 modified class A, FCC Part 15 Class A	
Type designation	SC 1850-US-10	SC 2200-US-10

● Standard features ○ Optional

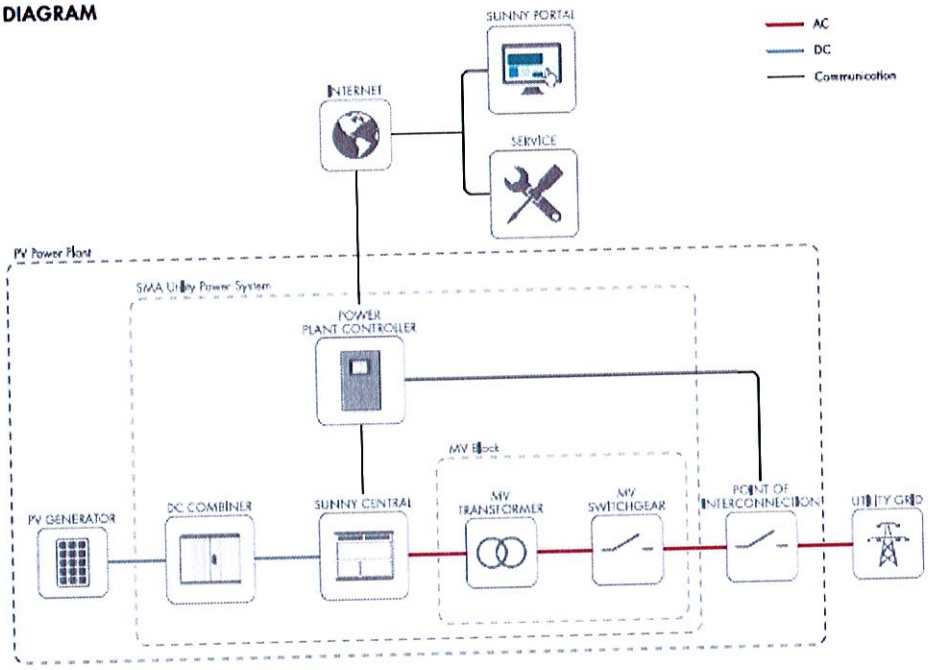
1) At nominal AC voltage < 385 V, nominal AC power decreases in the same proportion
2) Efficiency measured with internal power supply
3) Self-consumption at rated operation
4) Self-consumption at < 75% Pn at 25 °C
5) Self-consumption averaged out from 5% to 100% Pn at 25 °C
6) Sound pressure level at a distance of 10 m
7) Values apply only to inverters. Permissible values for SMA MV solutions from SMA can be found in the corresponding data sheets.
8) At unity power factor
9) Ungrounded systems available with 24 inputs only

SUNNY CENTRAL 1500 V

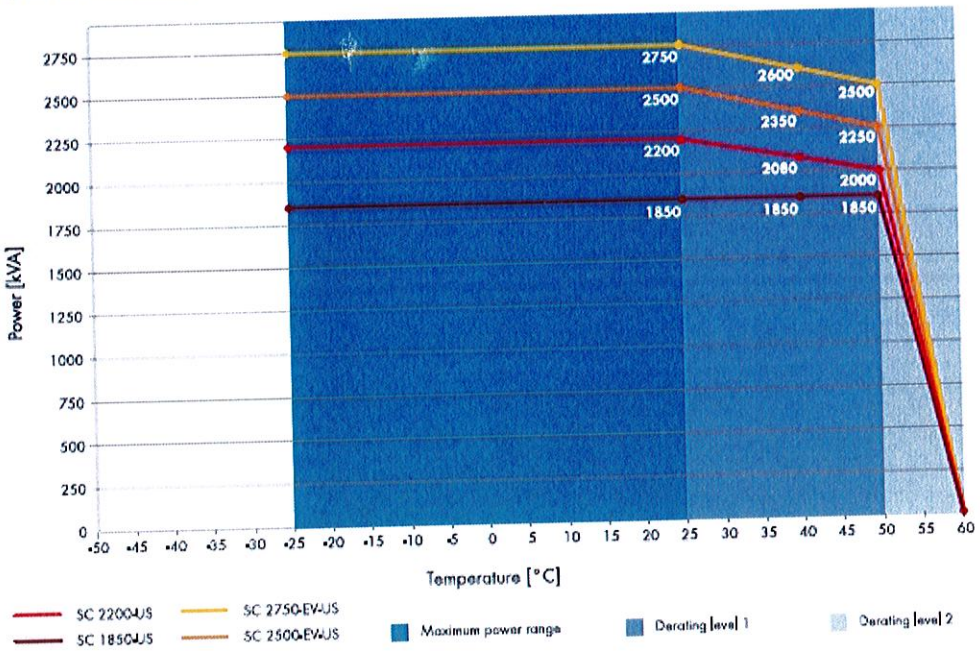
Technical Data	Sunny Central 2500-EV-US	Sunny Central 2750-EV-US
Input (DC)		
MPP voltage range V_{DC} (at 25 °C / at 50 °C)	850 V to 1425 V / 1275 V	875 V to 1425 V / 1275 V
Min. input voltage $V_{DC,min}$ / Start voltage $V_{DC,Start}$	778 V / 878 V	849 V / 999 V
Max. input voltage $V_{DC,max}$	1500 V	1500 V
Max. input current $I_{DC,max}$ (at 25 °C / at 50 °C)	3000 A / 2700 A	3300 A / 2970 A
Max. short-circuit current rating	6400 A	6400 A
Number of DC inputs (20/24)	● / ○	● / ○
Max. number of DC cables per DC input (for each polarity)	2 x 800 kcmil, 2 x 400 mm²	2 x 800 kcmil, 2 x 400 mm²
Integrated zone monitoring	○	○
Available DC fuse sizes (per input)	200 A, 250 A, 315 A, 350 A, 400 A, 450 A, 500 A	
Output (AC)		
Nominal AC power at cos φ =1 (at 25 °C / at 40 °C / at 50 °C)	2500 kVA / 2350 kVA / 2250 kVA	2750 kVA / 2600 kVA / 2500 kVA
Nominal AC power at cos φ =0.9 (at 25 °C / at 40 °C / at 50 °C)	2250 kW / 2115 kW / 2025 kW	2475 kW / 2340 kW / 2250 kW
Nominal AC current $I_{AC,nom}$ = Max. output current $I_{AC,max}$	2624 A	2646 A
Nominal AC current $I_{AC,nom}$	2624 A	2646 A
Max. total harmonic distortion	< 3% at nominal power	< 3% at nominal power
Nominal AC voltage / nominal AC voltage range[1] [9]	550 V / 440 V to 660 V	600 V / 480 V to 660 V
AC power frequency	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz
Min. short-circuit ratio at the AC terminals	> 2	> 2[9]
Power factor at rated power / displacement power factor adjustable[9]	1 / 0.8 overexcited to 0.8 underexcited	
Efficiency		
Max. efficiency[2] / European efficiency[3] / CEC efficiency[3]	98.6% / 98.3% / 98.0%	98.7% / 98.6% / 98.5%*
Protective Devices		
Input-side disconnection point	DC load-break switch	DC load-break switch
Output-side disconnection point	AC circuit breaker	AC circuit breaker
DC overvoltage protection	Surge arrester, type I	Surge arrester, type I
AC overvoltage protection (optional)	Surge arrester, class I	Surge arrester, class I
Lightning protection (according to IEC 62305-1)	Lightning Protection Level III	Lightning Protection Level III
Overcurrent protection device (according to NEC, ANSI/NFPA 70)	3600 A	3600 A
Ground-fault monitoring / remote ground-fault monitoring	○ / ○	○ / ○
Insulation monitoring	○	○
Degree of protection: electronics / air duct / connection area (as per IEC 60529)	IP65 / IP34 / IP34	IP65 / IP34 / IP34
Degree of protection (as per UL 50E)	Type 3R	Type 3R
General Data		
Dimensions (W / H / D)	2780 / 2318 / 1588 mm (109.4 / 91.3 / 62.5 inch)	
Weight	< 3400 kg / < 7496 lb	
Self-consumption (max.[4] / partial load[5] / average[6])	< 8100 W / < 1800 W / < 2000 W	
Self-consumption (standby)	< 370 W	
Internal auxiliary power supply	Integrated 8.4 kVA transformer	
Operating temperature range[9]	-25 to 60 °C / -13 to 140 °F	
Temperature range (standby)	-40 to 60 °C / -40 to 140 °F	
Temperature range (storage)	-40 to 70 °C / -40 to 158 °F	
Noise emission[7]	66,3 dB(A)	64,3 dB(A)
Max. permissible value for relative humidity (condensing / non-condensing)	95% to 100% (2 month / year) / 0 % to 95%	
Maximum operating altitude above MSL[8] 2000 m / 3000 m	● / ○ (earlier temperature-dependent de-rating)	
Fresh air consumption	6500 m³/h	
Features		
DC connection	Terminal lug on each input	
AC connection	With busbar system (three busbars, one per line conductor)	
Communication	Ethernet, Ethernet/IP, Modbus TCP/IP	
Enclosure / roof color	RAL 9016 / RAL 7004	
Display	HMI touchscreen (10.1")	
Supply transformer for external loads	○ (2.5 kVA)	
Standards and directives complied with	UL 62109-1, UL 1741 (Chapter 31, CDR 6I), UL 1741-SA, NEC 2011/2014, UL 1998, IEEE 1547, IEEE 693, MIL-STD-810G, BDEW, CE	
EMC standards (pending)	CISPR 22:2008 modified class A, FCC Part 15 Class A	
● Standard features ○ Optional *Preliminary data, September 2017		
Type designation	SC-2500-EV-US-10	SC-2750-EV-US-10

1) At nominal AC voltage, nominal AC power decreases in the same proportion
2) Efficiency measured without internal power supply
3) Efficiency measured with internal power supply
4) Self-consumption at rated operation
5) Self-consumption at < 75% Pn at 25 °C
6) Self-consumption averaged out from 5% to 100% Pn at 25 °C
7) Sound pressure level at a distance of 10 m
8) Values apply only to inverters. Permissible values for SMA MV solutions from SMA can be found in the corresponding data sheets.
9) A short-circuit ratio of < 2 requires a special approval from SMA

SYSTEM DIAGRAM



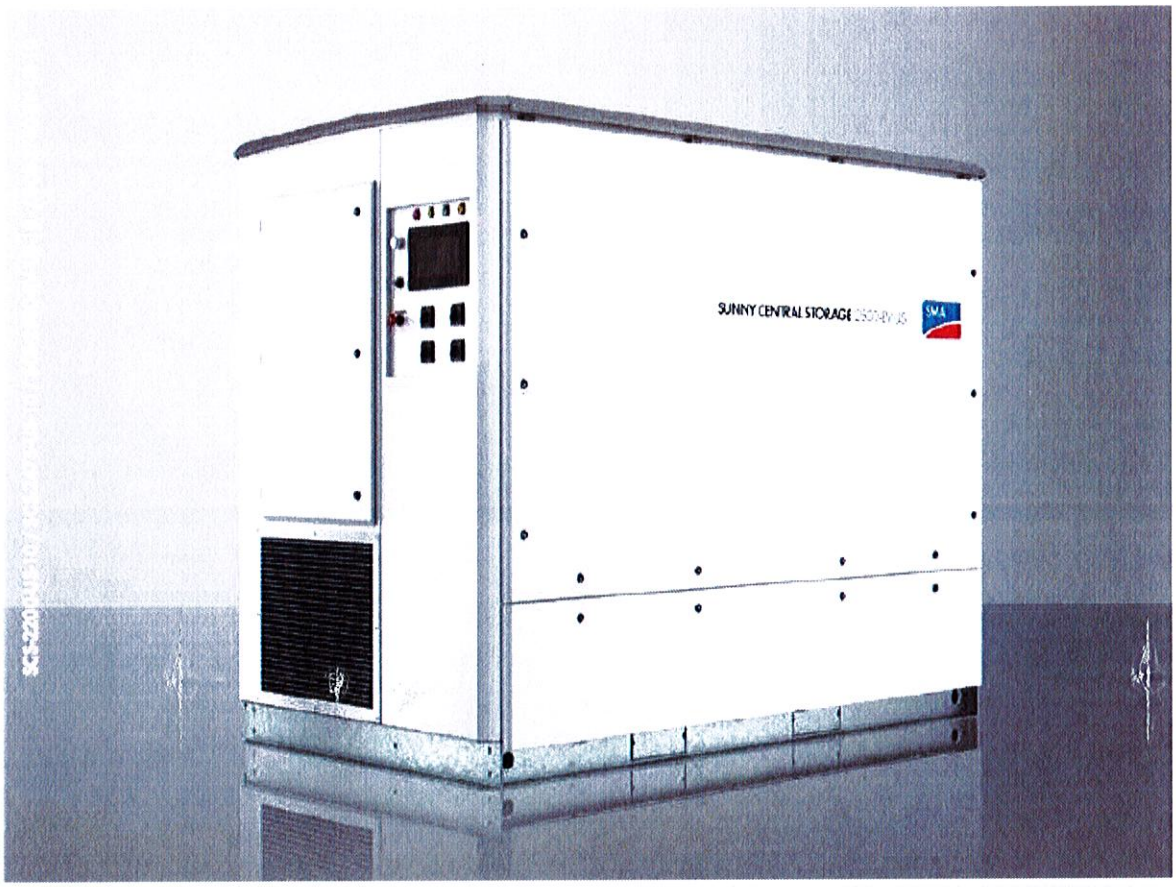
TEMPERATURE BEHAVIOR



Toll Free +1 888 4 SMA USA
www.SMA-America.com

SMA America, LLC

SUNNY CENTRAL STORAGE
2200-US / 2475-US / 2500-EV-US / 2750-EV-US



Efficient

- High power density
- Max. efficiency is 98.7%
- Lower transportation costs (up to 4 inverters in a standard shipping container)

Robust

- Proven OptiCool™ technology for intelligent, effective cooling
- Can be installed worldwide outdoors in any ambient condition

Flexible

- Conforms to all relevant grid requirements worldwide
- Four quadrant operation for full reactive power support
- Stand-alone device or a medium-voltage block solution

Versatile

- Integrated battery communication
- Customized monitoring and control of inverters
- Grid management functions for dynamic grid support
- Integrated voltage supply for internal consumption and external loads

SUNNY CENTRAL STORAGE
2200-US / 2475-US / 2500-EV-US / 2750-EV-US

A full power class lineup for 1,000 and 1,500 V applications

Grid-connected storage systems enable the integration of large amounts of intermittent renewable energy into the utility grid while ensuring maximum grid stability. The Sunny Central Storage is the central component of the SMA system solution for integration of large-scale storage systems. It is designed to compensate fluctuations in solar energy generation and offers comprehensive grid management services such as automatic frequency control. The battery inverter is optimized for continuous operation at nominal load and temperature of -25°C to +50°C. Thanks to its wide DC voltage range, it is compatible with various types of battery technologies. The Sunny Central Storage is also available as a medium-voltage block solution.

SUNNY CENTRAL STORAGE
2200-US / 2475-US

Technical Data	SCS 2200-US	SCS 2475-EV-US
Battery side (DC)		
DC Voltage range (at 25 °C / at 50 °C)[1]	570 V to 950 V / 950 V	634 V to 1000 V / 1000V
Minimal / Maximal DC voltage	545 V / 1000 V [2]	614 V / 1000 V
Max. DC current (at 25 °C / at 50 °C)	3960 A / 3600 A	3960 A / 3600 A
Max. interruption current capability[3]	6400 A	6400 A
Max. DC power	2235 kW	2515 kW
Number of DC cables per polarity	26	
Grid side (AC)		
Max. AC power (at 25 °C / at 50 °C)	2200 kVA / 2000 kVA	2475 kVA / 2250 kVA
Max. AC current (at 25 °C / at 50 °C)	3300 A / 3000 A	3292 A / 2993 A
Max. total harmonic distortion	< 3% at nominal power	
Nominal AC voltage / nominal AC voltage range	385 V / 308 V to 462 V	434 V / 347 V to 520 V
AC power frequency / range	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz	
Power factor at rated power / displacement power factor adjustable	1 / 0 underexcited to 0 overexcited [10]	
Efficiency		
Max. efficiency[4] / European efficiency[5] / CEC efficiency[5]	98.6% / 98.4% / 98.0%	
Protective Devices		
Input-side disconnection point	DC load-break switch	
Output-side disconnection point	AC circuit breaker	
DC overvoltage protection	Surge arrester, type I	
Lightning protection (according to IEC 62305-1)	Lightning Protection Level III	
Ground-fault monitoring / remote ground-fault monitoring	○ / ○	
Insulation monitoring	●	
Degree of protection: electronics / air duct & connection area (UL 50)	Type 3R / Type 1	
General Data		
Dimensions (W / H / D)	2780 mm / 2318 mm / 1588 mm	
Weight	< 3400 kg	
Self-consumption (max.[6] / partial load[7] / average[8])	< 8100 W / < 1800 W / < 2000 W	
Self-consumption (standby)	< 300 W	
Auxiliary power supply: integrated 8.4 kVA transformer / external	○ / ○	
Operating temperature range	-25 °C to 60 °C	
Noise emission[9]	66.4 dB(A)	
Temperature range (standby)	-40 °C to 60 °C	
Temperature range (storage)	-40 °C to 70 °C	
Max. permissible value for relative humidity (condensing / non-condensing)	95% to 100% (2 month/year) / 0% to 95%	
Maximum operating altitude above MSL 2000 m / 3000 m	● / ○ (with power reduction)	
Fresh air consumption	6500 m³/h	
Features		
DC connection	Terminal lugs on each input (without fuse) with NEMA lug hole pattern	
AC connection	With busbar system (three busbars, one per line conductor)	
Communication	Modbus TCP	
Enclosure / roof color	RAL 9016 / RAL 7004	
Display	○ HMI touchscreen (10.1")	
Supply transformer for external loads	○ (2.5 kVA)	
Certification and approvals	UL 1741, UL 1741 SA[11], IEEE 1547, UL 1998, UL 840 Cat. IV	
EMC standards	IEC / EN 61000-6-4, IEC / EN 61000-6-2, EN 55022, CISPR 22:2008 modified class A, FCC Part 15 Class A	
● Standard features ○ Optional		
Type designation	SCS-2200-US-10	SCS-2475-EV-US-10

1) Another voltage range can be offered on request
2) With power derating
3) Battery short circuit disconnection has to be done on the battery side
4) Efficiency measured without internal power supply
5) Efficiency measured with internal power supply, test configuration similar to PV inverter
6) Self-consumption at rated operation
7) Self-consumption at < 75% Pn at 25 °C
8) Self-consumption averaged out from 5% to 100% Pn at 25 °C
9) Sound pressure level at a distance of 10 m
10) Depending on the DC voltage
11) Only for PF 1 / 0.8 underexcited to 0.8 overexcited

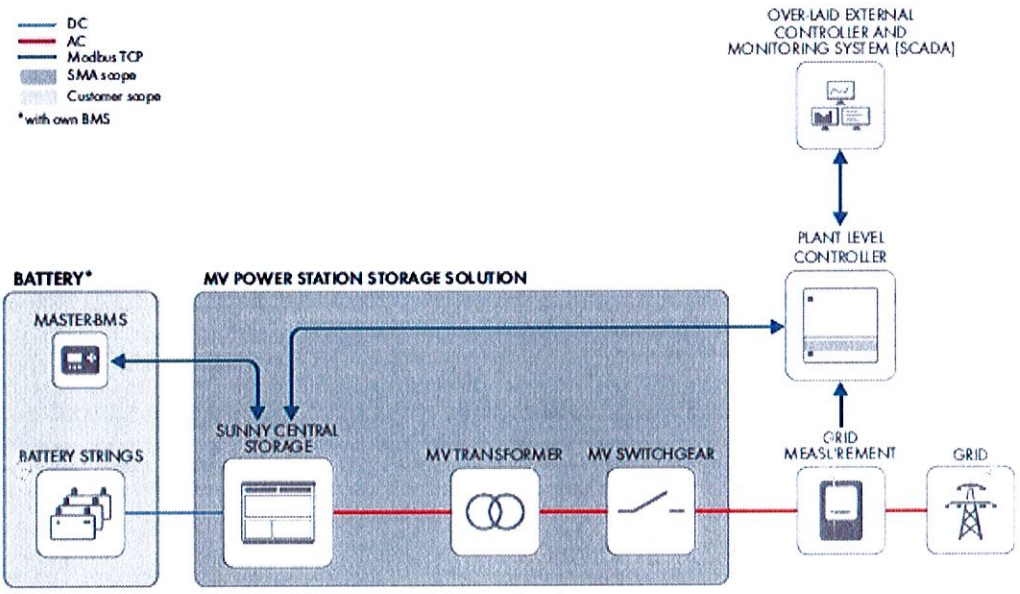
SUNNY CENTRAL STORAGE
2500-EV-US / 2750-EV-US

Technical Data	SCS 2500-EV-US	SCS 2750-EV-US
Battery side (DC)		
DC Voltage range (at 25°C / at 50°C)[1]	850 V to 1425 V / 1250 V	875 V to 1425 V/ 1275 V
Minimal / Maximal DC voltage[2]	778 V / 1500 V	849 V / 1500 V
Max. DC current (at 25°C / at 50°C)	3000 A / 2700 A	3206 A / 2700 A
Max. interruption current capability[2]	6400 A	6400 A
Max. DC power	2540 kW	2795 kW
Number of DC cables per polarity	26	
Grid side (AC)		
Max. AC power (at 25°C / at 50°C)	2500 kVA / 2250 kVA	2750 kVA / 2500 kVA
Max. AC current (at 25°C / at 50°C)	2624 A / 2362 A	2646 A / 2405 A
Max. total harmonic distortion	< 3% at nominal power	
Nominal AC voltage / nominal AC voltage range	550 V / 440 V to 660 V	600 V / 480 V to 660 V
AC power frequency / range	50 Hz / 47 Hz to 53 Hz 60 Hz / 57 Hz to 63 Hz	
Power factor at rated power / displacement power factor adjustable	1 / 0 underexcited to 0 overexcited[10]	
Efficiency		
Max. efficiency[6] / European efficiency[4] / CEC efficiency[5]	98.6% / 98.3% / 98.0%	98.7% / 98.6% / 98.5%
Protective Devices		
Input-side disconnection point	DC load-break switch	
Output-side disconnection point	AC circuit breaker	
DC overvoltage protection	Surge arrester, type I	
Lightning protection (according to IEC 62305-1)	Lightning Protection Level III	
Ground-fault monitoring / remote ground-fault monitoring	o / o	
Insulation monitoring	●	
Degree of protection: electronics / air duct & connection area (UL 50)	Type 3R / Type 1	
General Data		
Dimensions (W / H / D)	2780 mm / 2318 mm / 1588 mm	
Weight	< 3400 kg	
Self-consumption (max.[6] / partial load[7] / average[8])	< 8100 W / < 1800 W / < 2000 W	
Self-consumption (standby)	< 370 W	
Auxiliary power supply: integrated 8.4 kVA transformer / external	o / o	
Operating temperature range	-25°C to 60°C	
Noise emission[9]	64.3 dB(A)	
Temperature range (standby)	-40°C to 60°C	
Temperature range (storage)	-40°C to 70°C	
Max. permissible value for relative humidity (condensing / non condensing)	95% to 100% (2 month/year) / 0% to 95%	
Maximum operating altitude above MSL 2000 m / 3000 m	● / o (with power reduction)	
Fresh air consumption	6500 m³/h	
Features		
DC connection	Terminal lugs on each input (without fuse) with NEMA lug hole pattern	
AC connection	With busbar system (three busbars, one per line conductor)	
Communication	Modbus TCP	
Enclosure / roof color	RAL 9016 / RAL 7004	
Display	o HMI touchscreen (10.1")	
Supply transformer for external loads	o (2.5 kVA)	
Certification and approvals	UL 62109-1, UL 1741 Chapter 13 CRD 61, UL 1741 SA[11], IEEE 1547, UL 1998	
EMC standards	IEC / EN 61000-6-4, IEC / EN 61000-6-2, EN 55022, CISPR 22:2008 modified class A, FCC Part 15 Class A	
● Standard features o Optional		
Type designation	SCS-2500-EV-US-10	SCS-2750-EV-US-10

1) Another voltage range can be offered on request
2) With power derating
3) Battery short circuit disconnection has to be done on the battery side
4) Efficiency measured without internal power supply
5) Efficiency measured with internal power supply, test configuration similar to PV inverter, preliminary
6) Self-consumption at rated operation
7) Self-consumption at < 75% Pn at 25°C
8) Self-consumption averaged out from 5% to 100% Pn at 25°C
9) Sound pressure level at a distance of 10 m
10) Depending on the DC voltage
11) Only for PF 1 / 0.8 underexcited to 0.8 overexcited

SUNNY CENTRAL STORAGE APPLICATIONS

- Provides ancilliary grid services
- Supports the growth of renewable energy in public grids
- Increases fuel saving potential in PV hybrid diesel systems



By combining several of these schemes, higher power systems can be realized

Grid-connected functions

- Setpoints for active and reactive power
- Static grid support Q(U), (P(f) on request)
- Dynamic grid support (FRT)
- Active islanding detection (AID)
- High compatibility with different battery types

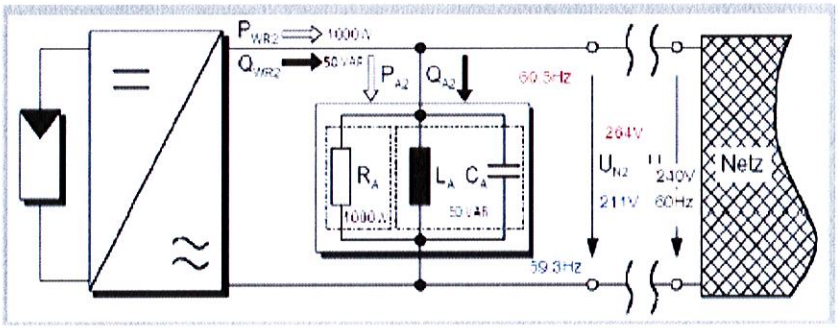
Compatible with energy management system functionalities

- External static grid supporting functions
- Ramp-rate control of PV power
- Peak shaving
- Energy shifting
- Genset optimization control
- Reducing necessary spinning reserve of gensets
- Battery start-up and stop sequence
- Operates the battery within optimal operation window

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Anti-Islanding Protection Systems



Scope:

This document describes the active and passive Anti islanding protection system which is used in Sunny Boy, Sunny Tripower and Sunny Central inverters.

Autor:

Manfred Doch (Technical Product Management)

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1 Capability to work in an islanding grid

The Sunny Boy, Sunny Tripower and Sunny Central solar inverters are designed for the grid-tied operation and not for island operation. Taking this into account a stabile operation in an island grid (e.g. after disconnection of a part of the utility grid) is not possible over a relevant time. Opposite to the Sunny Island or the Sunny Backup inverters these devices are not equipped with control facilities for stabilization (voltage and frequency) of the island grid. Such control facilities are absolutely necessary in order to supply consumers in the island grid by means of solar inverters over a certain time.

Due to the small operation window of voltage and frequency of the inverter typical imbalances in terms of generation and consumption in the island grid (for active as well as reactive power) will result in a deactivation of the inverter by the grid monitoring (in case the thresholds are exceeded). An imbalance of the active power results in a voltage change, imbalance of the reactive power results in a frequency change.

A balance between generation of power and consumption of power is theoretically possible but can be considered as improbable in real operation. The current flowing between the utility grid and the partial grid (which shall than be an island grid), must be nearly zero. This applies for the 50 Hz components as well as all harmonic components.

2 Anti-Islanding Protection Systems (Overview)

The Sunny Boy, Sunny Tripower and Sunny Central inverters are equipped with passive islanding detection methods and also with a active islanding detection system.

Passive Islanding detection methods are based on a (passive) measurement of the grid values. Active methods means that the inverter makes something active and gets back a reaction of the grid. This reaction is very different in case of a islanding grid instead of a grid connected operation.

SMA uses as passive Islanding methods the voltage and frequency measurement and as active detection system the escalating frequency shift method.

3 Technical description of the protection methods

3.1 Passive islanding detection

The passive methods for islanding detection are the voltage and frequency monitoring of the inverters. Both measurements are single failure safe - that means that the system checks itself by plausibility tests e.g. by comparing the measured values of a redundant measuring system.

The voltage measurement is realized by a voltage transformer and a processor with analog digital converter which works with a high sampling rate. The RMS value is calculated by the processor.

The frequency measuring is realized by a PLL algorithm in the processor or by a zero crossing detection of the grid voltage and measuring of the cycle time in the processor between two zero crossings.

Both values (grid voltage and frequency) will be monitored and compared with the allowed limits continuously (every cycle). Some devices are additionally equipped with a monitoring of the rate of change of frequency (ROCOF).

3.2 Active islanding detection

The active islanding detection „escalating frequency shift" uses the measured values of the grid frequency. The processor calculates every cycle the difference between a long term mean value of the grid frequency and the actual measured value. This difference is multiplied with a internal and a external (settable) factor. The result is committed to the current controller as additional phase angel. A different phase angel between grid voltage and feed in current results to a different reactive power. In a islanding grid causes a different reactive power a change in the frequency (see 7.1). So in the next cycle the delta between long term mean value and actual value of the frequency will be higher which results in a higher phase angel for the current controller. Finally the frequency drifts exponential to a high or low value.

⇒ The inverter detects the islanding grid by a fast drift of the frequency caused by the active variation of the phase angel.

The disconnection is done by the normal frequency monitoring. In case that the trip time for the over/under frequency is too long a second stage with wide limits but short trip time could be set to guarantee a short trip time for the islanding detection.

4 Expected performance in the presence of other PV inverters, synchronous generators, and/or induction generators

The frequency value is the same for all connected inverters so that all inverters with the escalating frequency shift method push the frequency in the same direction. So there is no difference between one or a greater number of devices concerning the islanding detection. In case that generators with other Islanding detection methods are connected, there will also be no problem for detecting the islanding grid. The reason therefore is that the above mentioned frequency limits are close to the rated value and only a small change in the reactive power is sufficient to shift the frequency out of allowed area. E.g. in the case that there are other generators with 50% of the total feed in power, the inverters with the escalating frequency shift method are able to detect the islanding grid. In general it is sufficient that a small number of the generators detects the islanding and disconnect, because the other generators will then also disconnect because the special condition for an islanding grid (generated active and reactive power is nearly equal to the consumed active an reactive power) is not valid any more.

5 Expected performance for islands resulting from fault conditions and islands resulting from switching

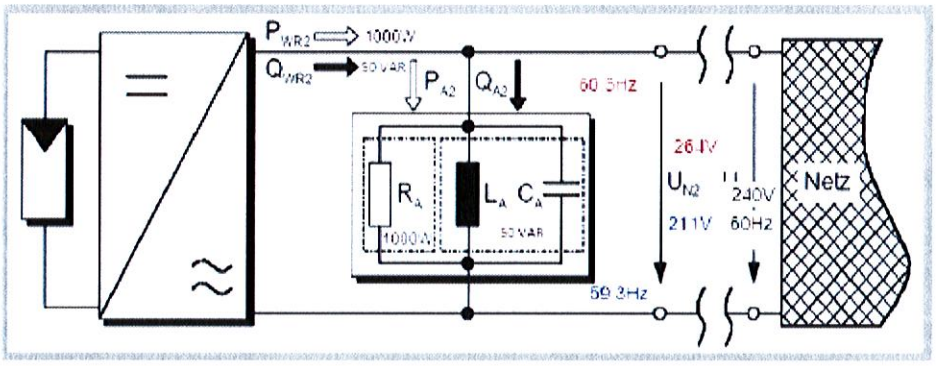
At fault conditions like a short circuit in the line results that a islanding is not possible because the special condition for islanding is not given. A islanding is only possible when the generated active and reactive power is nearly equal to the consumed active and reactive power. When e.g. a PV-plant is tripped by a external switch (e.g. remote controlled by the DNO) then the inverter stops immediately because the voltage at their clamps goes up to high values.

6 Known non-detection zones for each algorithm used and for the system as a whole

There are no non-detection zones for the active islanding protection of the SMA inverters. Even for the very unlikely case that the generated active and reactive power is 100% equal to the consumed power (for the 50Hz component and the harmonics), which means there is no change in the frequency at the crossover to the islanding grid, the inverter detects the islanding grid. The reason therefore is that the jitter of the frequency measurement causes a minimal jitter in the phase angel. This minimal jitter in the phase angel is enough to start the escalating frequency drift.

7 Annex

7.1 Influence of reactive power to the frequency in a islanding system



Picture 1: Islanding system with inverter and Load

Grid ties inverter set their active power depending on the DC power from the generator. The reactive power is defined by the phase angel (control of inverter).

In the example above the inverter feeds in with 1000W and 50 VAR. The load R_A, L_A & C_A have fix values. The voltage U_{N2} is then defined by P_{WR2} and R_A.

$$U_{N2} = \sqrt{(R_A * P_{WR2})}$$

This shows that the variable value of the active power has an influence to the islanding voltage but not to the frequency.

The equal consideration could be done for the reactive power. The formula is more complex and is not shown here. But it should be clear that X_A depends on the frequency when L_A and C_A are fix values. Then Q_A must be equal with Q_{WR2} in the circuit above (disconnected from the grid).

= A alternation of Q_{WR2} will also result in a different frequency.

7.2 Influence of the active islanding method to the quality of the feed in current at normal operation

At normal operation (grid connected) the active islanding method "escalating frequency shift" has no relevant influence to quality of the feed in current. The grid frequency is stable and so the active islanding method didn't cause a relevant phase angel at the current controller and so there is no influence to the feed in current.

Frequency deviations in the grid are normally slow, so that there is also no influence to the feed in current by the active islanding method. For the special case that the grid frequency changes fast the escalating frequency shift method causes a small reactive power for a short time. A alternation of the frequency by the caused reactive power is not possible when the grid is still present. After short time (<1 min) the long term mean value of the frequency goes to the new value of the grid frequency and the inverter reduces the (small) reactive power caused by the active islanding detection to zero.

4. ANNEX. UL CERTIFICATE AND TEST RESULTS

CERTIFICATE OF COMPLIANCE

Certificate Number	20171016-E210376
Report Reference	E210376-20150421
Issue Date	2017-OCTOBER-16
Issued to:	SMA Solar Technology AG Sonnenallee 1 34266 Niestetal GERMANY
This is to certify that representative samples of	GRID-SUPPORT UTILITY INTERACTIVE INVERTERS, CONVERTERS AND ACCESSORIES FOR USE IN INDEPENDENT POWER SYSTEMS SEE ADDENDUM PAGE FOR MODELS
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	SEE ADDENDUM PAGE
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program

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CERTIFICATE OF COMPLIANCE

Certificate Number 20171016-E210376
Report Reference E210376-20150421
Issue Date 2017-OCTOBER-16

SC-1850-US, SC-2200-US, SCS-2200-US, SCS-2475-US

Safety Standard	Evaluated to the requirements of the Standard for Safety for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, UL 1741, Second Edition, dated September 7, 2016. Including the requirements in UL 1741 Supplement A, sections as noted in the Technical considerations CAN/CSA C22.2 No. 107.1-1, "General Use Power Supplies.", Reaffirmed 2011 ANSI/UL 1998, Software in Programmable Components.
Grid Interconnection Requirements	IEEE 1547, IEEE 1547.1, Standards for Interconnecting Distributed Resources with Electric Power Systems. UL 1741, SA Advanced Inverter Testing
Source Requirement Document (SRD)	PG&E Electric Rule 21. SCE Rule 21. SDG&E Rule 21.

Detailed Testing Summary	Test Standard(s) and Section(s)	Fixed / Adjustable	Pass / Fail
UNINTENTIONAL ISLANDING WITH GRID SUPPORT FUNCTIONS ENABLED	UL 1741 SA 8	N/A	Pass
HIGH VOLTAGE RIDE-THROUGH DURATION	UL 1741 SA 9.1	Adjustable	Pass
HIGH VOLTAGE RIDE-THROUGH / MUST TRIP MAGNITUDES	UL 1741 SA 9.2	Adjustable	Pass
HIGH VOLTAGE MUST TRIP CLEARING TIMES	UL 1741 SA 9.2	Adjustable	Pass
LOW VOLTAGE RIDE-THROUGH DURATION	UL 1741 SA 9.1	Adjustable	Pass
LOW VOLTAGE RIDE-THROUGH / MUST TRIP MAGNITUDES	UL 1741 SA 9.2	Adjustable	Pass
LOW VOLTAGE MUST TRIP CLEARING TIMES	UL 1741 SA 9.2	Adjustable	Pass
HIGH FREQUENCY RIDE-THROUGH DURATION	UL 1741 SA10.1	Adjustable	Pass

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HIGH FREQUENCY RIDE-THROUGH / MUST TRIP MAGNITUDES	UL 1741 SA10.2	Adjustable	Pass
HIGH FREQUENCY MUST TRIP CLEARING TIMES	UL 1741 SA10.2	Adjustable	Pass
LOW FREQUENCY RIDE-THROUGH DURATION	UL 1741 SA10.1	Adjustable	Pass
LOW FREQUENCY RIDE-THROUGH / MUST TRIP MAGNITUDES	UL 1741 SA10.2	Adjustable	Pass
LOW FREQUENCY MUST TRIP CLEARING TIMES	UL 1741 SA10.2	Adjustable	Pass
NORMAL RAMP RATE	UL 1741 SA 11.2	Adjustable	Pass
"SOFT START" RAMP RATE	UL 1741 SA 11.4	Adjustable	Pass
SPECIFIED POWER FACTOR	UL 1741 SA 12	Adjustable	Pass
VOLT/VAR MODE (Q(V))	UL 1741 SA 13	Adjustable	Pass
FREQUENCY-WATT (FW)	UL 1741 SA 14	Adjustable	Pass
VOLT-WATT (VW)	UL 1741 SA 15	-	-

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Report Reference E210376-20150421
Issue Date 2017-OCTOBER-16

Inverter Firmware Version:		
UL 1998	Date	Version/Revision
Compliant	2018-02-22	04.00.25.R

Inverter Ratings - Output	All models, with individual differences as shown		
	SC-1850-US	SC-2200-US SCS-2200-US	SCS-2475-US
Output phase configuration	3-Phase Delta With no N connection	3-Phase Delta With no N connection	3-Phase Delta With no N connection
Nominal (line to line) output voltage V ac	385	385	434
Operating voltage range V ac	308 - 462	308 - 462	347 - 520
Line Synchronization Characteristics	Method 2	Method 2	Method 2
Normal out frequency Hz	60	60	60
Rated output current (A ac)	3000	3300	3300
Rated output power, (kW)	1850	2200	2475
Max. Branch Circuit overcurrent protection (A ac)	3600	3600	3600
Maximum Air Ambient (°C)	50	50	50

Other ratings:	
Max. output fault current (A) / duration (ms)	3525Arms / 178ms
Max. utility backfeed current to PV input (A)	0
Line Synchronization Characteristics / In-rush current	Method 2 / 282A
Limits of accuracy of voltage measurement	+/- 5 V
Limits of accuracy of frequency measurement	+/- 0.06 Hz
Manufacturers stated accuracy of time response for voltage trips	0.1 %
Manufacturers stated accuracy of time response for frequency trips	0.1 %
*Enclosure Ratings	3R

INTERCONNECTION INTEGRITY TEST CATEGORIES.	
C62.42.2 Ring Wave Surge Category	3.89 kV
C62.42.2 Combination Wave Surge Category	3.69 kV @ 0.05kA
C37.90.1 RF Immunity - compliance	YES
C37.90.2 Communication circuit - compliance	YES

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Magnitude and time Limits - Utility interconnection voltage magnitude limits, Ride Through time limits and trip times:						
Nominal voltage	/ Single/Split phase					
UL 1741 SA9:	Magnitudes (% of nominal)		Ride Through (Seconds) (+)		Must Trip (Seconds)	
Boundary designation (**)	Min	Max	Min	Max	Min	Max
HV2	112	120	0.05	0.05	0.16	0.16
HV1	112	120	0.15	12	0.2	12.5
LV1	49	86	0.15	20	0.2	20.5
LV2	49	86	0.15	10	0.2	10.5
LV3	49	86	0.15	1	0.2	1.25

Magnitude and time Limits - Utility interconnection Frequency magnitude limits, Ride Through time limits and trip times:						
Nominal Frequency:	60 Hz					
UL 1741 SA10:	Magnitudes (Frequency)		Ride Through (Seconds) (+)		Must Trip (Seconds)	
Boundary designation	Min	Max	Min	Max	Min	Max
HF2	60.6	62.1	0.05	0.05	0.16	0.16
HF1	60.1	62.1	0.13	299	1.00	299.6
LF1	57	58.5	0.13	299	1.00	299.6
LF2	57	58.5	0.05	0.05	0.16	0.16

SA11 Ramp Rate test ratings (RR/SSRR)		
Minimum **normal** ramp-up rate	0.17	%Irated/SEC
Maximum **normal** ramp-up rate	100	%Irated/SEC
Minimum **soft start** ramp-up rate	0.17	%Irated /SEC
Maximum **soft start** ramp-up rate	100	%Irated /SEC

SA12 SPF Specified Power Factor (INV3)	
Minimum Inductive (Underexcited) Power Factor (<0)	-0.8
Minimum Capacitive (Overexcited) Power Factor (>0)	+0.8

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Issue Date 2017-OCTOBER-16

SA13 Volt/Var Mode (VV) extent of curve range settings				
Settings		Qmax Values - Maximums	Qmin Values - Minimums	Units
Reactive power production setting	Q_1	60	0	%Sac_rtg
Reactive power absorption setting at the left edge of the deadband	Q_2	0	0	%Sac_rtg
Reactive power absorption setting at the right edge of the deadband	Q_3	0	0	%Sac_rtg
Reactive power absorption setting	Q_4	0	-60	%Sac_rtg

Settings		Maximum	Minimum	Units
The voltage at Q_1	V_1	98	85	%Vnom
The voltage at Q_2	V_2	100	87	%Vnom
The voltage at Q_3	V_3	113	100	%Vnom
The voltage at Q_4	V_4	115	102	%Vnom

SA14 Frequency-Watt (FW) extent of curve range settings				
Settings	Frequency		Power level	
Low end of the adjustment range of the start of the curtailment function	F_{start_min}	60	100	%Pac_rtg
High end of the adjustment range of the start of the curtailment function	F_{start_max}	62	100	%Pac_rtg
Low end of the adjustment range of the endpoint of the curtailment function	F_{stop_min}	60.5	0	%Pac_rtg
High end of the adjustment range of the endpoint of the curtailment function	F_{stop_max}	63	0	%Pac_rtg

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Report Reference E210376-20150421
Issue Date 2017-OCTOBER-16

SA15 Volt-Watt (VW) extent of curve range settings				
Settings	Volts		Power level	
Low end of the adjustment range of the start of the curtailment function	V_{start_min}	N/A	N/A	Watts
High end of the adjustment range of the start of the curtailment function	V_{start_max}	N/A	N/A	Watts
Low end of the adjustment range of the endpoint of the curtailment function	V_{stop_min}	N/A	N/A	Watts
High end of the adjustment range of the endpoint of the curtailment function	V_{stop_max}	N/A	N/A	Watts

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somera

HIGH EFFICIENCY MONO-Si PV MODULES

vikramsolar

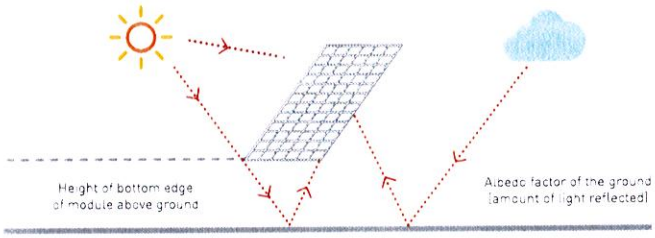
CREATING CLIMATE FOR CHANGE

SOMERA VSMDHT.72.AAA.05 | MONOCRYSTALLINE SOLAR PV MODULES | 144 CELLS | 380-420 WATT

SOMERA P-DUPLEX HALF-CELL144 P-TYPE BIFACIAL MODULE



- **UP TO 27 YEARS** linear power warranty
- **HIGHER LIFETIME YIELD** by using transparent Dupont® backsheet
- **UP TO 15% POWER GAIN** from ground facing side
- Bypass diodes and innovative series-parallel connections enable the module to perform better in **PARTIAL SHADOW CONDITIONS**
- Half-cell generates only half the current, lowering heat production and **LESS HOT SPOT**, increasing module reliability
- **LIGHT WEIGHT** easy to install bifacial module



INCREASED SHADE TOLERANCE



HALF-CELL MODULE

Functions like two parallel modules, enabling the half-cell string to work in partial shading

CE PTL US CERTIFIED

P Applicable in USA | U Applicable in Europe, Indian Subcontinent and ROW (excluding USA) | I Applicable in India

QUALITY AND SAFETY

- 27 years of linear power output warranty **
- Rigorous quality control meeting the highest international standards
- 100% EL tested to minimise micro crack
- Certified for salt mist corrosion resistance – severity VI
- Excellent anti-PID performance
- Positive power tolerance

APPLICATIONS

- Utility scale applications
- Greenhouse applications
- Agricultural industry applications

TECHNICAL DATA

SOMERA P-DUPLEX HALF-CELL

144 P-TYPE BIFACIAL MODULE

vikramsolar

CREATING CLIMATE FOR CHANGE

THIS DATASHEET IS APPLICABLE FOR: SOMERA VSMDHT.72.AAA.05 (AAA=380-420)

Electrical Data[1,2]

All data refers to STC (AM 1.5, 1000 W/m², 25°C)

Peak Power P_{max} (Wp) (0~ +4.99Wp)	380	385	390	395	400	405	410	415	420
Maximum Voltage V_{mpp} (V)	40.3	40.4	40.5	40.6	40.7	40.8	41.1	41.3	41.4
Maximum Current I_{mpp} (A)	9.43	9.53	9.62	9.73	9.83	9.92	9.97	10.06	10.14
Open Circuit Voltage V_{oc} (V)	47.2	47.3	47.4	47.5	47.6	47.7	48.0	48.2	48.2
Short Circuit Current I_{sc} (A)	10.05	10.17	10.28	10.39	10.51	10.61	10.67	10.77	10.88
Module Efficiency η(%)	18.63	18.88	19.13	19.37	19.62	19.86	20.11	20.35	20.60

1) STC: 1000 W/m² irradiance, 25°C cell temperature, AM1.5g spectrum according to EN 60904-3. 2) Power measurement uncertainty is within +/- 3%

Electrical Parameters at NOCT[3]

Power (W)	281.2	284.9	288.6	292.3	296.0	299.7	303.4	307.1	310.8
V@P_{max} (V)	37.1	37.2	37.3	37.4	37.4	37.6	37.8	38.0	38.1
I@P_{max} (A)	7.56	7.64	7.72	7.81	7.89	7.96	8.00	8.07	8.14
V_{oc} (V)	43.6	43.7	43.8	44.0	44.0	44.2	44.4	44.6	44.6
I_{sc} (A)	8.05	8.14	8.23	8.31	8.40	8.48	8.54	8.62	8.71

3) NOCT: Irradiance 800 W/m², ambient temperature 20°C, wind speed 1 m/sec

Equivalent Bifacial Output

Bifacial Gain	Overall Power output (W)						
5%	410	415	420	425	431	436	441
10%	429	435	440	446	451	457	462
15%	449	454	460	466	472	477	483

Temperature Coefficients (Tc) permissible operating conditions

Tc of Open Circuit Voltage (β)	-0.27%/°C
Tc of Short Circuit Current (α)	0.065%/°C
Tc of Power (γ)	-0.35%/°C
Maximum System Voltage	1500V
NOCT	45°C ± 2°C
Temperature Range	-40°C to + 85°C

Mechanical Data

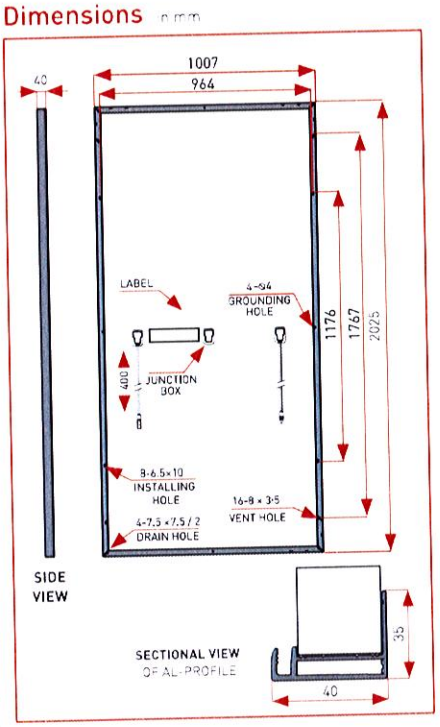
Length × Width × Height	2025 × 1007 × 40 mm(79.72 × 39.64 × 1.57 inches)
Weight	22.8 kg (50.26 lbs)
Junction Box	IP68/IP67, Split Junction Box with individual bypass diodes
Cable & Connectors#	400 mm length cables,MC4 Compatible/MC4 Connectors
Application Class	Class A (Safety class II)
Superstrate	3.2 mm (0.125 inches) high transmission low iron tempered glass, AR coated
Cells	72 Mono PERC (144 half-cells) P-Type Bifacial solar cells
Back Sheet	High Transmittance Composite film with Clear Tedlar® from Dupont®
Frame	Anodized aluminium frame with twin wall profile
Mechanical Load Test	5400 Pa (Snow load), 2400 Pa (Wind load)
Maximum Series Fuse Rating	20 A

Warranty and Certifications

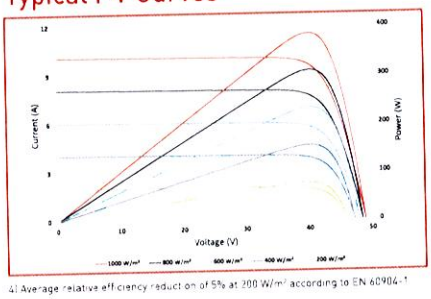
Product Warranty**	10 years
Performance Warranty**	Linear Power Warranty for 27 years with 3% for 1st year degradation and 0.65% from year 2 to year 27
Approvals and Certificates^	IEC 61215 : 2016, IEC 61730 : 2016, IEC 61701, IEC 62716, IEC 60068-2-68, IEC 62804, CE, CEC (California), UL 1703

^ All certifications under progress. ** Refer to Vikram Solar's warranty document for terms and conditions. # 1200mm (47.24 inches) cable length is also available

Dimensions in mm

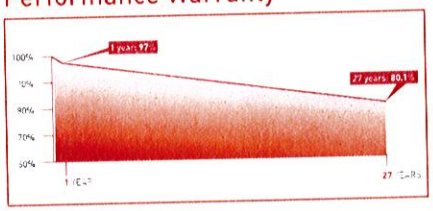


Typical I-V Curves[4]



4) Average relative efficiency reduction of 5% at 200 W/m² according to EN 60904-1

Performance Warranty



Packaging Information

Quantity /Pallet	27
Pallets/Container (40'HC)	22
Quantity/Container (40'HC)	594

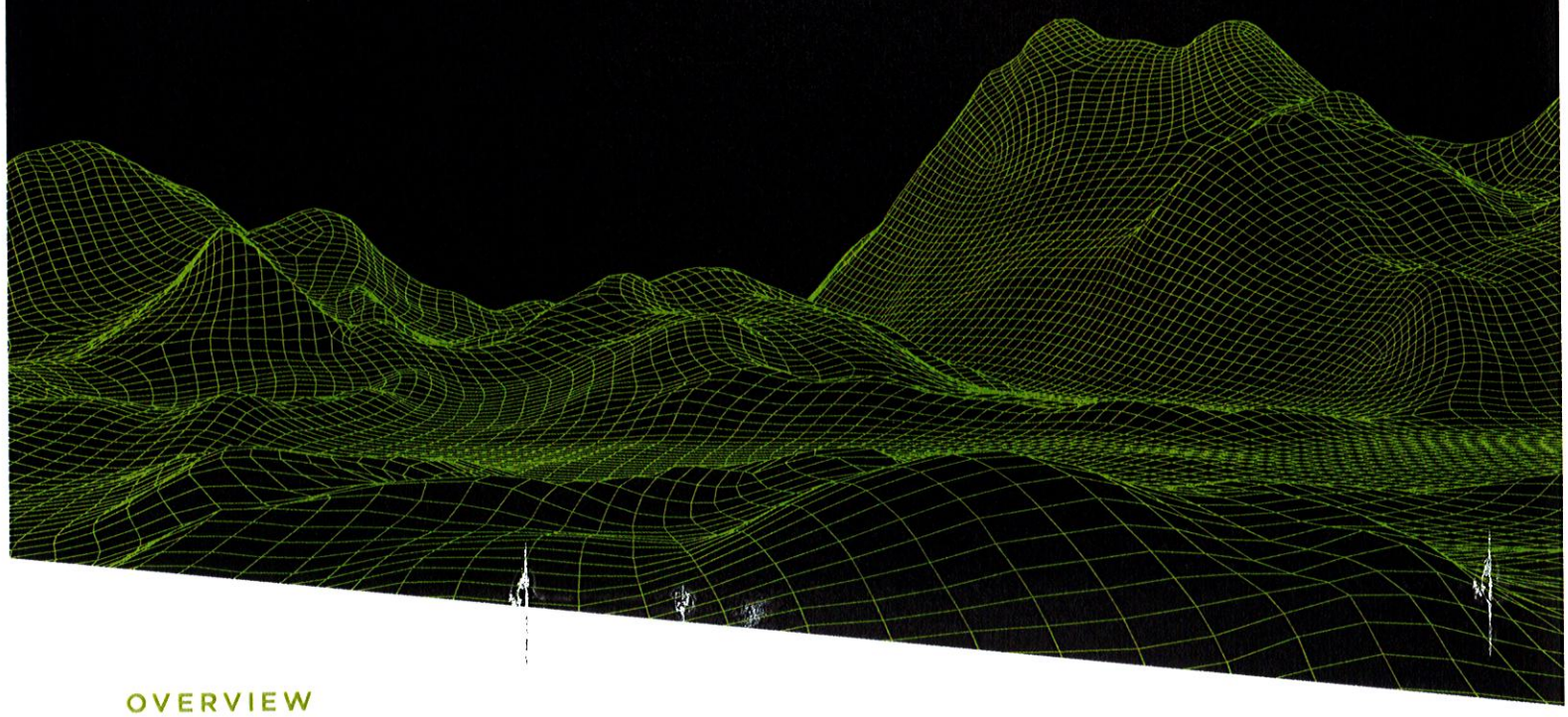
CAUTION: READ SAFETY AND INSTALLATION MANUAL BEFORE USING THE PRODUCT

Specifications included in this datasheet are subject to change without notice. Electrical data without guarantee. Please confirm your exact requirement with the company representative while placing your order.

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TERRATRAK

SINGLE AXIS TRACKER



OVERVIEW

TerraTrak, a subsidiary of TerraSmart, is a revolutionary single-axis, self-powered tracker focused on optimizing solar plant energy yield through tracker automation, software intelligence, and electronics.

Focused on accelerating innovation to provide maximum value, TerraTrak will be driven by the solar industry's latest advancement, PeakYield™ Technology. PeakYield™ is a combination of software intelligence and site design techniques that optimize all elements of TerraTrak performance. Lowered operating costs, maximized land utilization, industry leading live data visibility, and enhanced revenue can all be expected on TerraTrak projects.

TerraTrak's optimized A-frame is specifically designed to seamlessly integrate with TerraSmart's ground screw solution. TerraSmart's ground screw foundation is known to penetrate in the most arduous of soils containing rock and hilly terrain. TerraTrak's A-frame design paired with the TerraSmart ground screw provides more stability and peak efficiency at increased heights.

Built upon TerraSmart's legacy of having installed over 3 gigawatts (GW) of quality ground screw foundations, TerraTrak will be the first cost-effective tracker optimized to navigate hilly, challenging sub-surface solar sites. Tracker sites once not thought possible will now become economically viable with TerraTrak's PeakYield™ Technology.

MIL-STD-810G

MECHANICAL

Tracking Technology	Horizontal single-axis self-powered tracker Wired version in development
Modules Per Row	Up to 93 standard framed modules (~2m x 1m)
Module Orientation	2 high in portrait Optimized for bifacial gain Zero backside shading
Drive System	Independent row design 12 vdc motorized slew drive Zero grid power consumption
Range of Motion	± 60°
Bushing	High impact polymer Lubricant-free dry bushings
Bushing Housings	Hard stops at each foundation Integrated torque tube translation mitigation
Fasteners	Standard sizes Self locking No special tools required
Material Coatings	HDG, inline pre-galvanization powder coating
Corrosion	ISO 9223 C2, C3
Max Site Slope Grade	20% N/S, unlimited E/W
Adjustable Foundations	Flexibility in installation allows market leading adjustability
Stable Design	Inherently stiff structure does not require dampers

ELECTRICAL

DC Capacity per Row	33.49kW* assuming 385W x 87 mods/row
Grounding	Self-grounding racking
Electrical Subsystem	Self-powered and wireless
Controls Enclosure	NEMA 4x
UL Compliance	2703 / 3703
FCC Compliance	Part 15.247, part 15 subpart C, intermodulation & radiated emissions
Operating temperature	-20° C to 60° C
Battery	Next generation lithium ion

DIMENSIONS AND FIELD

Typical Dimensions	When horizontal - height 2.95m/9.67ft width 3.96m/13ft, length 44.8m/147.0ft (87 module row)

REQUIREMENTS

GCR	No minimum, typical 28% to 50%
Foundations	Terrasmart ground screw and A-frame I-beam & C-channel compatible 7 foundations per row
Maximum Wind Speed	Configurable up to 135 mph
Flood Clearance	Adjustable to site requirements
Leading Edge	No minimum, typical 18"

*Actual Banner to Peak is a 400+ Feature

SAFETY AND FEATURES

Stowing	Designed to withstand max site conditions
Control System	Self preserving protocol
Software	Automatic alert notifications Cloud based dashboard Machine learning
Wire Management	Customizable to user needs 3rd part, monitoring integration & modbus implementation

INSTALLATION/COMMISSIONING

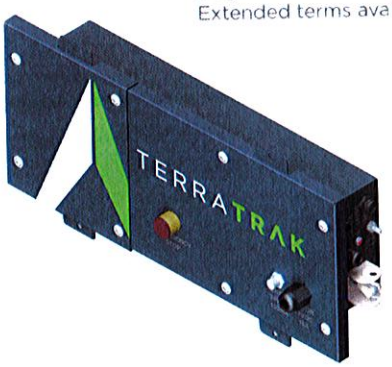
Module Attachment	Screwless fastening & grounding clips Standard m6 or m8 hardware (optional) 2 modules per rail
Ease of Installation	Field ready assemblies
Commissioning Method	Efficient bulk site process

OPERATIONS

Solar Tracking Method	NREL astronomical algorithm with PeakYield™ and backtracking
Communications	Site assets: self-healing mesh network technology Long range 802.15.4 radios, crc-16 Scada: MODBUS via TCP 4g LTE communications
Weather Monitoring	Wind speed, snow depth and flood height

SERVICES & WARRANTY

Design Services	Drone surveying Warranty foundation design Tracker layout Foundation layout PE stamped detailed mechanical/ Structural drawings Topography review Grading plan
Training	Traksmart courses, optional on-site training
Warranty	10 year structural 5 year on drive and control system 20 years on screw foundations Extended terms available



Row Box

1. Product and Company Identification USA, EU

Important Note: As a solid, manufactured article, exposure to hazardous ingredients is not expected with normal use. This battery is an article pursuant to 29 CFR 1910.1200 and, as such, is not subject to the OSHA Hazard Communication Standard requirement. The information contained in this Material Safety Data Sheet contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Commercial product name
MODEL CM0940R0003A (94Ah capacity)

Use of the substance/preparation
Lithium-Ion battery

Company/undertaking identification

Manufacturer
SAMSUNG SDI Co. LTD
428-5 Gongse-dong, Giheung-gu, Yongin-si,
Gyeonggi-do, 446-577 Korea
Telephone: ++82 31 210 8535
Telefax: ++82 31 210 8289

Contact person: Euiryong Bang

Telephone:

Responsible Department: Development Team
Responsible for the safety data sheet: er.bang@samsung.com

Further Information
Battery-System: Lithium-Ion (Li-ion)
Voltage: 3.68V
Anode (negative electrode): based on intercalation graphite
Cathode (positive electrode): based on lithiated metal oxide (Cobalt, Nickel, Manganese)

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Remark:

The information and recommendations set forth are made in good faith and believed to be accurate as of the date of preparation. SAMSUNG SDI Co., Ltd. makes no warranty, expressed or implied, with respect to this information and disclaims all liabilities from reliance on it.

2. Hazards Identification USA

Route(s) of Entry

There is no hazard when the measures for handling and storage are followed.

Signs and Symptoms of Exposure

In case of cell damage, possible release of dangerous substances and a flammable gas mixture.

OSHA Hazard Communication: This material is not considered hazardous by the OSHA Hazard Communication Standard 29CFR 1910.1200.

Carcinogenicity (NTP): Not listed
Carcinogenicity (IARC): Not listed
Carcinogenicity (OSHA): Not listed

Special hazards for human health and environment

There is no hazard when the measures for handling and storage are followed.
In case of cell damage, possible release of dangerous substances and a flammable gas mixture.

2. Hazards Identification USA, EU

Explication of special hazards for human health and environment

Not classified as dangerous according to directive 1999/45/EEC
There is no hazard when the measures for handling and storage are followed.
In case of cell damage, possible release of dangerous substances and a flammable gas mixture.

3. Composition/information on ingredients USA, EU

Hazardous components

EC-No.	CAS-No.	Chemical name	Quantity	EU-Classification
215-154-6	1307-96-6	Cobalt oxide	< 30 %	Xn, N R22435053
215-202-6	1313-13-9	Manganese dioxide	< 30 %	Xn R20/22
215-215-7	1313-99-1	Nickel oxide	< 30 %	Carc. Cat. 1, T R49-43-48/23--53
231-153-3	7440-44-0	Carbon	10 - 30 %	
		Electrolyte (*)	10 - 20 %	Carc. Cat. 3, C, R10-34-40-43
	24937-79-9	Polyvinylidene fluoride (PVdF)	< 10 %	
231-072-3	7429-90-5	Aluminium foil	2 - 10 %	

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231-159-6	7440-50-8	Copper foil	2 - 10 %	
		Aluminium and inert materials	5 - 10 %	

Full text of each relevant R phrase can be found in heading 16.

Further Information
For information purposes:
(*) Main ingredients: Lithium hexafluorophosphate, organic carbonates

Because of the cell structure the dangerous ingredients will not be available if used properly.
During charge process a lithium graphite intercalation phase is formed.

Mercury content: Hg < 0.1mg/kg

Cadmium content: Cd < 1mg/kg

Lead content: Pb: < 10mg/kg

4. First Aid Measures USA, EU

General information
The following first aid measures are required only in case of exposure to interior battery components after damage of the external battery casing.
Undamaged, closed cells do not represent a danger to the health.

After inhalation
Ensure of fresh air. Consult a physician.

After contact with skin
In case of contact with skin wash off immediately with plenty of water. Consult a physician.

After contact with eyes
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical treatment by eye specialist.

After ingestion
Drink plenty of water.
Call a physician immediately.

5. Fire Fighting Measures USA, EU

Suitable extinguishing media
Cold water and dry powder in large amount are applicable.
Use metal fire extinction powder or dry sand if only few cells are involved.

Special hazards arising from the chemical
May form hydrofluoric acid if electrolyte comes into contact with water.
In case of fire, the formation of the following flue gases cannot be excluded:
Hydrogen fluoride (HF), Carbon monoxide and carbon dioxide.

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Protective equipment and precautions for firefighters
Wear self-contained breathing apparatus and protective suit.
Additional information
If possible, remove cell(s) from fire fighting area. If heated above 125°C, cell(s) can explode/vent. Cell is not flammable but internal organic material will burn if the cell is incinerated.

6. Accidental Release Measures USA, EU

Personal precautions
Use personal protective clothing.
Avoid contact with skin, eyes and clothing.
Avoid breathing fume and gas.

Environmental precautions
Do not discharge into the drains/surface waters/groundwater.
Methods for cleaning up/taking up
Take up mechanically and send for disposal.

7. Handling and Storage USA, EU

Handling

Advice on safe handling
Avoid short circuiting the cell. Avoid mechanical damage of the cell. Do not open or disassemble.
Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.

Storage

Requirements for storage rooms and vessels
Storage at room temperature (approx. 20°C) at approx. 20-50% of the nominal capacity (OCV approx. 3.5-3.7 V).
Keep in closed original container.

8. Exposure Controls/Personal Protection Exposure limit values Exposure limits USA

8. Exposure controls/personal protection Exposure limit values Exposure limits (EH40) EU

CAS-No.	Chemical name	ml/m³	mg/m³	F/ml	Category	Origin
7440-44-0	Graphite, respirable	- -	4 -		TWA (8 h) STEL (15 min)	WEL WEL

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Additional advice on limit values
During normal charging and discharging there is no release of product.

Occupational exposure controls
No specific precautions necessary.

Protective and hygiene measures
When using do not eat, drink or smoke. Wash hands before breaks and after work.

Respiratory protection
No specific precautions necessary.

Hand protection
No specific precautions necessary.

Eye protection
No specific precautions necessary.

Skin protection
No specific precautions necessary.

9. Physical and Chemical Properties USA, EU

Appearance

Form:	Solid
Color:	Various
Odor:	Odorless

Important health, safety and environmental information

Test method	
pHValue:	n.a.
Flash point:	n.a
Lower explosion limits:	n.a.
Vapour pressure:	n.a.
Density:	n.a.
Water solubility:	Insoluble
Ignition temperature:	n.a.

10. Stability and Reactivity USA, EU

Stability
Stable

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Conditions to avoid
Keep away from open flames, hot surfaces and sources of ignition. Do not puncture, crush or incinerate.

Materials to avoid
No materials to be especially mentioned.

Hazardous decomposition products
In case of open cells, there is the possibility of hydrofluoric acid and carbon monoxide release.

Possibility of Hazardous Reactions
Will not occur

Additional information
No decomposition if stored and applied as directed.

11. Toxicological Information USA, EU

Empirical data on effects on humans
If appropriately handled and if in accordance with the general hygienic rules, no damages to health have become known.

12. Ecological Information USA, EU

Further information
Ecological injuries are not known or expected under normal use. Do not flush into surface water or sanitary sewer system.

13. Disposal Considerations USA, EU

Advice on disposal
For recycling consult manufacturer.

Contaminated packaging
Disposal in accordance with local regulations.

14. Transport Information USA, EU

US DOT 49 CFR 172.101

Proper shipping name	
Lithium-ion batteries	
ID Number:	UN3480
Hazard Class or Division:	9
Packing group:	II
Label:	9

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Land transport (ADR/RID)

UN number:	3480
ADR/RID class:	9
Classification code:	M4
Warning plate	
Hazard label:	9



ADR/RID packing group:	II
Limited quantity:	LQ 0
Tunnel restriction code:	E
Description of the goods	Lithium-ion batteries

Other applicable information (land)
LQ 0: No exemption under the conditions of 3.4.2.
Transport category: 2

Marine transport

UN number:	3480
IMDG code:	9
Marine pollutant:	No
Hazard label:	9



IMDG packing group:	II
EmS:	F-A, S-I
Limited quantity:	None
Description of the goods	Lithium-ion batteries

Air transport

UN/ID number:	3480
ICAO/IATA-DGR:	9
Hazard label:	9



ICAO packing group:	II
Limited quantity Passenger:	-
IATA-packing instructions - Passenger:	965

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IATA-max. quantity - Passenger:	5 kg G
IATA-packing instructions - Cargo:	965
IATA-max. quantity - Cargo:	35 kg G
Description of the goods	Lithium-ion batteries

Other applicable information

Lithium equivalent:	29.6g
Wh-rating per cell:	346 Wh

15. Regulatory Information USA

U.S. Regulations

National Inventory TSCA
SAMSUNG SDI certifies that all chemical components of the Model CS0600R0005B (60 Ah capacity) Lithium-Ion Battery are listed on the US EPA TSCA 8(b) Inventory or are exempt from listing.

SARA
To the best of our knowledge this product contains no toxic chemicals subject to the supplier notification requirements of Section 313 of the Superfund Amendments and Reauthorization Act (SARA/EPCRA) and the requirements of 40 CFR Part 372.

15. Regulatory information EU

Labeling
Hazardous components which must be listed on the label
As an article the product does not need to be labeled in accordance with EC directives or respective national laws.

EU regulatory information
1999/13/EC (VOC): 0 %

16. Other Information USA

Hazardous Materials Information Label (HMIS)
Health: 0
Flammability: 0
Physical Hazard: 0

NFPA Hazard Ratings
Health: 0
Flammability: 0
Reactivity: 0
Unique Hazard:

16. Other Information EU

Full text of R-phrases referred to under sections 2 and 3
R10 Flammable.

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R20/22	Harmful by inhalation and if swallowed.
R22	Harmful if swallowed.
R34	Causes burns.
R40	Limited evidence of a carcinogenic effect.
R43	May cause sensitization by skin contact.
R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R49	May cause cancer by inhalation.
R50	Very toxic to aquatic organisms.
R53	May cause long-term adverse effects in the aquatic environment.

Further Information USA, EU

Data of sections 4 to 8, as well as 10 to 12, do not necessarily refer to the use and the regular handling of the product (in this sense consult package leaflet and expert information), but to release of major amounts in case of accidents and irregularities. The information describes exclusively the safety requirements for the product
(s) and is based on the present level of our knowledge. This data does not constitute a guarantee for the characteristics of the product(s) as defined by the legal warranty regulations. "(n.a. = not applicable; n.d. = not determined)"

The data for the hazardous ingredients were taken respectively from the last version of the sub-contractor's safety data sheet.

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Material Safety Data Sheet

FM-200®

Version 2.1

Revision Date 07/11/2011

Ref. 130000036866

This SDS adheres to the standards and regulatory requirements of the United States and may not meet the regulatory requirements in other countries.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	FM-200®
Tradename/Synonym	:	FE-227 2-Hydroperfluoropropane Propane, 1,1,1,2,3,3,3-Heptafluoro- HFC-227eaHP 2-Hydroheptafluoropropane Heptafluoropropane 2-H-heptafluoropropane 1,1,1,2,3,3,3-Heptafluoropropane R-227 R227 HFC-227ea
MSDS Number	:	130000036866
Product Use	:	Fire extinguishing agent
Manufacturer	:	DuPont 1007 Market Street Wilmington, DE 19898
Product Information	:	1-800-441-7515 (outside the U.S. 1-302-774-1000)
Medical Emergency	:	1-800-441-3637 (outside the U.S. 1-302-774-1139)
Transport Emergency	:	CHEMTREC: 1-800-424-9300 (outside the U.S. 1-703-527-3887)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Misuse or intentional inhalation abuse may lead to death without warning.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Rapid evaporation of the liquid may cause frostbite.

Potential Health Effects

Skin : Contact with liquid or refrigerated gas can cause cold burns and frostbite.

Eyes : Contact with liquid or refrigerated gas can cause cold burns and frostbite.

Inhalation : Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.
Other symptoms potentially related to misuse or inhalation abuse are: Anaesthetic effects, Light-headedness, dizziness, confusion, incoordination, drowsiness, or unconsciousness, irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Carcinogenicity
None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, or OSHA, as a carcinogen.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
1,1,1,2,3,3,3-Heptafluoropropane	431-89-0	100 %

SECTION 4. FIRST AID MEASURES

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes. Take off all contaminated clothing immediately. Consult a physician. Wash contaminated clothing before re-use. Treat for frostbite if necessary by gently warming affected area.

Eye contact : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Consult a physician if necessary.

Inhalation : Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.

Ingestion	:	Is not considered a potential route of exposure.
General advice	:	Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt seek medical advice.
Notes to physician	:	Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, that may be used in situations of emergency life support should be used with special caution.

SECTION 5. FIREFIGHTING MEASURES

Fire and Explosion Hazard	:	The product is not flammable. Hazardous decomposition products : Hydrogen fluoride, Carbonyl fluoride
Suitable extinguishing media	:	This material is a fire extinguishing agent.

SECTION 6. ACCIDENTAL RELEASE MEASURES

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Safeguards (Personnel)	:	Evacuate personnel, thoroughly ventilate area, use self-contained breathing apparatus. Keep upwind of leak - evacuate until gas has dispersed.
Spill Cleanup	:	Ventilate area using forced ventilation, especially low or enclosed places where heavy vapors might collect.

SECTION 7. HANDLING AND STORAGE

Handling (Personnel)	:	Do not breathe gas. Avoid contact with skin, eyes and clothing. Provide sufficient air exchange and/or exhaust in work rooms. For personal protection see section 8. Wash hands thoroughly after handling. Wash clothing after use. Decomposition will occur when product comes in contact with open flame or electrical heating elements. Handle in accordance with good industrial hygiene and safety practice.

Storage	:	Valve protection caps and valve cutlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Separate full containers from empty containers. Keep at temperature not exceeding 52 °C. Do not store near combustible materials. Keep container tightly closed in a dry and well-ventilated place. Store in original container. Protect from contamination. Avoid area where salt or other corrosive materials are present.
Storage temperature	:	< 52 °C (< 126 °F)

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls	:	Use only with adequate ventilation. Keep container tightly closed.
Personal protective equipment Respiratory protection	:	Wear NIOSH approved respiratory protection as appropriate.
Hand protection	:	Additional protection: Impervious gloves
Eye protection	:	Safety glasses with side-shields Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.
Skin and body protection	:	Where there is potential for skin contact, have available and wear as appropriate, impervious gloves, apron, pants, jacket, hood and boots.
Protective measures	:	Self-contained breathing apparatus (SCBA) is required if a large release occurs.

Exposure Guidelines

Exposure Limit Values

1,1,1,2,3,3,3-Heptafluoropropane

AEL *	(DUPONT)	1,000 ppm	8 & 12 hr. TWA

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Liquefied gas
Odor	:	none
Melting point/range	:	-131 °C (-204 °F)
Boiling point	:	-16.3 °C (2.7 °F)
Vapour Pressure	:	4,547 hPa at 25 °C (77 °F)
Density	:	1.388 g/cm3 at 25 °C (77 °F) (as liquid)

SECTION 10. STABILITY AND REACTIVITY

Stability	:	Stable at normal temperatures and storage conditions.
Incompatibility	:	Alkali metals Alkaline earth metals, Powdered metals, Powdered metal salts
Hazardous decomposition products	:	Hazardous decomposition products , Hydrogen fluoride , Carbonyl fluoride, Carbon monoxide, Carbon dioxide
Hazardous reactions	:	Polymerization will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

FM-200®

Inhalation 4 h LC50	:	> 788698 ppm , rat
Inhalation	:	dog Cardiac sensitization
Dermal	:	not applicable
Oral	:	not applicable
Skin irritation	:	No skin irritation, Not tested on animals

		Not expected to cause skin irritation based on expert review of the properties of the substance.
Eye irritation	:	No eye irritation, Not tested on animals Not expected to cause eye irritation based on expert review of the properties of the substance.
Sensitisation	:	Does not cause skin sensitization., Not tested on animals Not expected to cause sensitization based on expert review of the properties of the substance.
		Did not cause sensitization on laboratory animals. There are no reports of human respiratory sensitization.
Repeated dose toxicity	:	Inhalation rat No toxicologically significant effects were found.
Carcinogenicity	:	Overall weight of evidence indicates that the substance is not carcinogenic.
Mutagenicity	:	Did not cause genetic damage in animals. Did not cause genetic damage in cultured mammalian cells. Did not cause genetic damage in cultured bacterial cells.
Reproductive toxicity	:	Animal testing showed no reproductive toxicity. Information given is based on data obtained from similar substances.
Teratogenicity	:	Animal testing showed no developmental toxicity.
Further information	:	Cardiac sensitisation threshold limit : 730190 mg/m3

SECTION 12. ECOLOGICAL INFORMATION

Aquatic Toxicity FM-200® 96 h LC50	:	Danio rerio (zebra fish) > 200 mg/l Information given is based on data obtained from similar substances.
96 h LC50	:	Oncorhynchus mykiss (rainbow trout) > 81.8 mg/l

Information given is based on data obtained from similar substances.

72 h EC50	:	Pseudokirchneriella subcapitata > 114 mg/l Information given is based on data obtained from similar substances.
72 h EC50	:	Pseudokirchneriella subcapitata > 118 mg/l Information given is based on data obtained from similar substances.
48 h EC50	:	Daphnia magna (Water flea) > 200 mg/l Information given is based on data obtained from similar substances.
48 h EC50	:	Daphnia magna (Water flea) > 97.9 mg/l Information given is based on data obtained from similar substances.

Environmental Fate
FM-200®

Biodegradability aerobic	:	1 % OECD Test Guideline 301 Not readily biodegradable.
Biodegradability aerobic	:	5 % OECD Test Guideline 301 Not readily biodegradable.

SECTION 13. DISPOSAL CONSIDERATIONS

Waste Disposal	:	Can be used after re-conditioning. Recover by distillation or remove to a permitted waste disposal facility. Comply with applicable Federal, State/Provincial and Local Regulations.
Environmental Hazards	:	Empty pressure vessels should be returned to the supplier.

SECTION 14. TRANSPORT INFORMATION

DOT	UN number	: 3296
	Proper shipping name	: Heptafluoropropane
	Class	: 2.2
	Labelling No.	: 2.2
IATA_C	UN number	: 3296

	Proper shipping name	: Heptafluoropropane
	Class	: 2.2
	Labelling No.	: 2.2
IMDG	UN number	: 3296
	Proper shipping name	: Heptafluoropropane
	Class	: 2.2
	Labelling No.	: 2.2

SECTION 15. REGULATORY INFORMATION

SARA 313 Regulated Chemical(s)	: SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
California Prop. 65	: Chemicals known to the State of California to cause cancer, birth defects or any other harm: none known

SECTION 16. OTHER INFORMATION

		HMIS
Health	:	1
Flammability	:	0
Reactivity/Physical hazard	:	0
PPE	:	Personal Protection rating to be supplied by user depending on use conditions.

FM-200 is a registered trademark of E. I. du Pont de Nemours and Company
Before use read DuPont's safety information.
For further information contact the local DuPont office or DuPont's nominated distributors.
® DuPont's registered trademark

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing.

storage, transportation. disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Significant change from previous version is denoted with a double bar.

DYNAPOWER BATTERY ENERGY STORAGE SYSTEM

FIRST RESPONDER QUICK REFERENCE GUIDE

System Summary

The Dynapower Battery Energy Storage System is a grid-connected battery energy storage system containing lithium nickel manganese cobalt oxide batteries (NMC). This power conversion system includes two hazardous energy sources: **(1)** the 3-phase electrical grid connection and **(2)** a 1000V battery bank with an energy capacity of ~1,000kWh.

Installed Fire Suppression

The battery enclosure contains a NOVEC 1230 fire suppression system. The fire suppression system requires that the battery enclosure remain closed in order to maintain an effective concentration of the fire suppression agent.

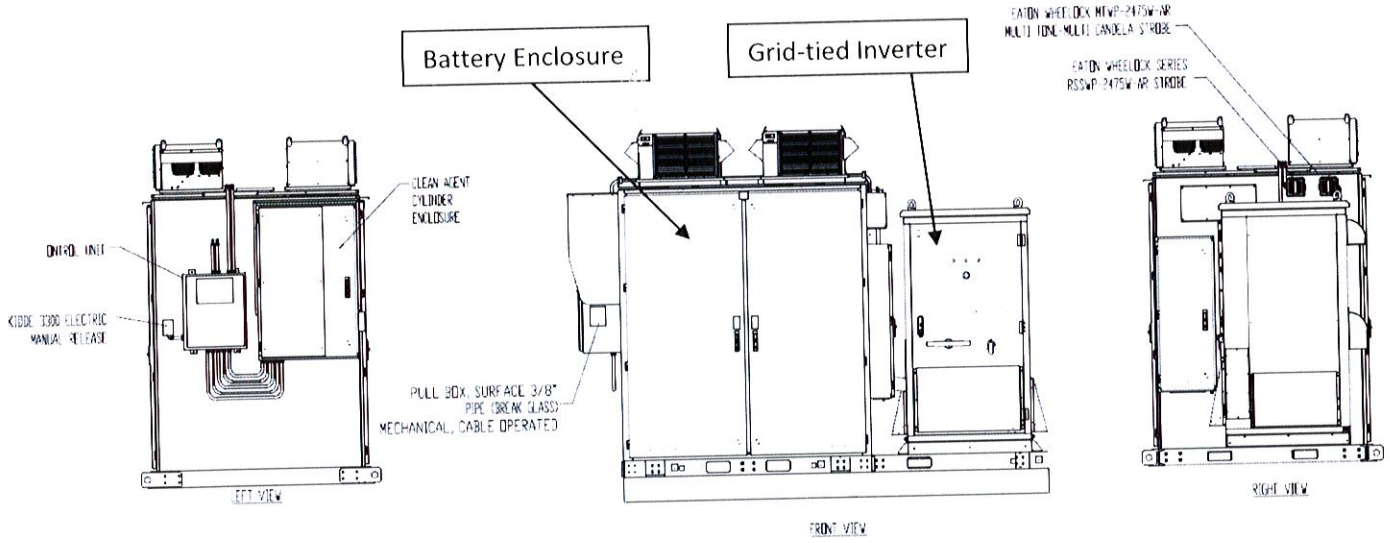
Recommended Action in the Case of Fire

1. Do not open any enclosures. Batteries cannot be de-energized and they create electric shock hazards within both the battery enclosure and the grid-tied inverter.

2. The fire suppression system requires the battery enclosure to remain CLOSED.

3. Use thermal imaging to identify and monitor any fire hazards within the battery enclosure(s).

4. Observe the perimeter of the system to ensure that fire does not breach the enclosure.



DANGER
ELECTRICAL HAZARD

Batteries remain energized at all times and pose risk of electric shock and death! In the case of a fire alarm, do not open any enclosure. After thermal scans indicate no fire/heat hazard, the enclosure may be opened with the assistance of a qualified technician.

DYNAPOWER

BLUESOL-01 JHOGAN

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 4/2/2021

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Roblin Insurance, a division of EPIC
144 Gould Street Suite 100
Needham, MA 02494

CONTACT NAME:
PHONE (A/C, No, Ext): (781) 455-0700 FAX (A/C, No): (781) 449-8976
E-MAIL ADDRESS: certificates@roblininsurance.com

INSURER(S) AFFORDING COVERAGE — NAIC #
INSURER A : AXIS Specialty Insurance Company — 15610
INSURER B : Hartford Casualty Insurance Company — 29424
INSURER C : RLI
INSURER D :
INSURER E :
INSURER F :

INSURED
BWC Camp Brook, LLC
111 Huntington Avenue, Suite 650
Boston, MA 02199

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS		
A	X COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	$	1,000,000
	CLAIMS-MADE X OCCUR			3386420	12/14/2020	12/14/2021	DAMAGE TO RENTED PREMISES (Ea occurrence)	$	1,000,000
							MED EXP (Any one person)	$	10,000
							PERSONAL & ADV INJURY	$	1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$	2,000,000
	X POLICY PRO-JECT LOC						PRODUCTS - COMP/OP AGG	$	1,000,000
	OTHER							$	
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$	
	ANY AUTO						BODILY INJURY (Per person)	$	
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$	
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$	
								$	
A	X UMBRELLA LIAB X OCCUR						EACH OCCURRENCE	$	10,000,000
	EXCESS LIAB CLAIMS-MADE			3386420	12/14/2020	12/14/2021	AGGREGATE	$	10,000,000
	DED RETENTION $							$	
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						X PER STATUTE OTH-ER		
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) N / A			08 WE AJ3LAN	12/14/2020	12/14/2021	E.L. EACH ACCIDENT	$	1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$	1,000,000
							E.L. DISEASE - POLICY LIMIT	$	1,000,000
C	Professional Liabili			RTP0021084	12/14/2020	12/14/2021	E&O		3,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
Issued as Evidence of Insurance

CERTIFICATE HOLDER

Issued as Evidence of Insurance

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
Peter Roblin

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Exhibit G – Interconnection Service Agreement

1. **Parties.** This Interconnection Service Agreement ("Agreement"), dated as of 05/11/2020 ("Effective Date") is for application number "**MA-26699252**", Case **#00191116**, and is entered into, by and between **Massachusetts Electric Company (doing business as National Grid)**, a **Massachusetts Corporation** with a principal place of business at **40 Sylvan Rd, Waltham, MA 02451** (hereinafter referred to as the "Company"), and **BlueWave MA, LLC** a **Limited Liability Company** with a principal place of business (or residence) at **137 Newbury Street, Floor 4, Boston, MA 02116** ("Interconnecting Customer"). (The Company and Interconnecting Customer are collectively referred to as the "Parties"). Terms used herein without definition shall have the meanings set forth in Section 1.2 of the Interconnection Tariff which is hereby incorporated by reference.

2. **Basic Understandings.** This Agreement provides for parallel operation of an Interconnecting Customer's Facility with the Company EPS to be installed and operated by the Interconnecting Customer at **1050 Hilldale Avenue, Haverhill, MA 01832**. A description of the Facility is located in Attachment 1. If the Interconnecting Customer is not the Customer, an Agreement between the Company and the Company's Retail Customer, attached as Exhibit H to the Interconnection Tariff, must be signed and included as an Attachment to this Agreement. If neither the Interconnecting Customer nor the Landowner of the property where the Facility is sited, a Landowner Consent Agreement, attached as Exhibit I to the Interconnection Tariff, must be signed and included as an Attachment to this Agreement, unless the Company, in its sole discretion, waives this requirement.

   The Interconnecting Customer has the right to operate its Facility in parallel with the Company EPS immediately upon successful completion of the protective relays testing as witnessed by the Company and receipt of written notice from the Company that interconnection with the Company EPS is authorized ("Authorization Date").

3. **Term.** This Agreement shall become effective as of the Effective Date. The Agreement shall continue in full force and effect until terminated pursuant to Section 4 of this Agreement.

4. **Termination.**

   4.1. This Agreement may be terminated under the following conditions.

   4.1.(a) The Parties agree in writing to terminate the Agreement.

   4.1.(b) The Interconnecting Customer may terminate this agreement at any time by providing sixty (60) days written notice to Company.

   4.1.(c) The Company may terminate this Agreement upon the occurrence of an Event of Default by the Interconnecting Customer as provided in Section 18 of this Agreement.

   4.1.(d) The Company may terminate this Agreement if the Interconnecting Customer either: (1) fails to energize the Facility within 12 months of the Authorization Date; or, (2) permanently abandons the Facility. Failure to operate the Facility for any consecutive 12 month period after the Authorization Date shall constitute permanent abandonment unless otherwise agreed to in writing between the Parties.

   4.1.(e) The Company, upon 30 days' notice, may terminate this Agreement if there are any changes in Department regulations or state law that have a material adverse effect on the Company's ability to perform its obligations under the terms of this Agreement.

   4.2. Survival of Obligations. The termination of this Agreement shall not relieve either Party of its liabilities and obligations, owed or continuing at the time of termination. Sections 5, 10, 12, 13, and 25 as it relates to disputes pending or for wrongful termination of this Agreement shall survive the termination of this Agreement.

   4.3. Related Agreements. Any agreement attached to and incorporated into this Agreement shall terminate concurrently with this Agreement unless the Parties have agreed otherwise in writing. The System Modifications construction schedule from the Detailed Study shall be deemed a part of the signed Interconnection Service Agreement. If the Interconnection Service Agreement is signed prior to a Detailed Study, the Interconnection Service Agreement shall apply the construction schedule once it is signed.

5. **General Payment Terms**. The Interconnecting Customer shall be responsible for the System Modification costs and payment terms identified in Attachment 3of this Agreement and any approved cost increases pursuant to the terms of the Interconnection Tariff. Interconnecting Customers shall not be required to pay any costs related to Company infrastructure upgrades or System Modifications upon execution of the Interconnection Service Agreement (or once the Interconnecting Customer receives the construction schedule). Interconnecting Customers shall have 120 Business Days from the date of execution of an

Interconnection Service Agreement to pay 25 percent of those costs; if an Interconnecting Customer pays such cost within the 120 Business Day Time Frame, the Interconnecting Customer shall have an additional 120 Business Days from the date of first payment to pay the remainder of the costs. If the system modifications exceed $25,000, the Interconnecting Customer is eligible for a payment plan, including a payment and construction schedule with milestones for both parties, and any such payment plan shall be set forth in Attachment 3. The payment plan may include a payment schedule different than the 120 Business Day payment schedule requirements set forth in this paragraph above.

Construction estimates are valid for 60 Business Days from when they are delivered to the Interconnecting Customer. If an Interconnecting Customer payment is not received within 60 Business Days of receiving the Interconnection Service Agreement in the Expedited Process, or the Impact Study in the Standard Process, the Company has the right to reassess construction costs and Time Frames. In the event that the Interconnecting Customer fails to pay the Company within the Time Frame required by this provision, the Company will require the Interconnecting Customer to reapply for interconnection. Further, any fees paid will not be refunded. The construction schedule will commence once the Interconnecting Customer's financial payment has been made in full or as otherwise provided in Attachment 3. The Company's obligation to the construction schedule (as it appears in either the Interconnection Service Agreement or the Detailed Study, if the Interconnecting Customer has opted to sign the Interconnection Service Agreement without a Detailed Study) begins on the next Business Day after the Company receives full payment for such construction or as otherwise provided in Attachment 3.

5.1. **Cost or Fee Adjustment Procedures**. The Company will, in writing, advise the Interconnecting Customer in advance of any cost increase for work to be performed up to a total amount of increase of 10% only. All costs that exceed the 10% increase cap will be borne solely by the Company. Interconnecting Customers who elected to execute an Interconnection Services Agreement following the completion of the Impact Study but prior to the commencement of any Design Studies, pursuant to Section 3.4(e) of the Interconnection Tariff, shall be responsible for any System Modifications costs, ±25%, as identified by the Company in the Impact Study. Any such changes to the Company's costs for the work shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) Business Days of the Company's notice of increase, authorize such increase and make payment in the amount up to the 10% increase cap, or the Company will suspend the work and the corresponding agreement will terminate.

5.2. **Final Accounting**. An Interconnecting Customer may request a final accounting report of any difference between (a) Interconnecting Customer's cost responsibility under this Agreement for the actual cost of the System Modifications, and (b) Interconnecting Customer's previous aggregate payments to the Company under the Interconnection Service Agreement for such System Modifications within 120 Business days after completion of the construction and installation of the System Modifications described in an attached exhibit to the Interconnection Service Agreement. Upon receipt of such a request from an Interconnecting Customer, the Company shall have 120 Business days to provide the requested final accounting report to the Interconnecting Customer. To the extent that Interconnecting Customer's cost responsibility in the Interconnection Service Agreement exceeds Interconnecting Customer's previous aggregate payments, the Company shall invoice Interconnecting Customer and Interconnecting Customer shall make payment to the Company within 45 Business Days. To the extent that Interconnecting Customer's previous aggregate payments exceed Interconnecting Customer's cost responsibility under this agreement, the Company shall refund to Interconnecting Customer an amount equal to the difference within forty five (45) Business Days of the provision of such final accounting report.

6. **Operating Requirements**.

6.1. **General Operating Requirements**. Interconnecting Customer shall operate and maintain the Facility in accordance with the applicable manufacturer's recommended maintenance schedule, in compliance with all aspects of the Company's Interconnection Tariff. The Interconnecting Customer will continue to comply with all applicable laws and requirements after interconnection has occurred. In the event the Company has reason to believe that the Interconnecting Customer's installation may be the source of problems on the Company EPS, the Company has the right to install monitoring equipment at a mutually agreed upon location to determine the source of the problems. If the Facility is determined to be the source of the problems, the Company may require disconnection as outlined in Section 7.0 of this Interconnection Tariff. The cost of this testing will be borne by the Company unless the Company demonstrates that the problem or problems are caused by the Facility or if the test was performed at the request of the Interconnecting Customer.

6.2. **No Adverse Effects; Non-interference**. Company shall notify Interconnecting Customer if there is evidence that the operation of the Facility could cause disruption or deterioration of service to other Customers served from the same Company EPS or if operation of the Facility could cause damage to Company EPS or Affected Systems. The deterioration of service could be, but is not limited to, harmonic injection in excess of IEEE Standard 1547-2003, as well as voltage

fluctuations caused by large step changes in loading at the Facility. Each Party will notify the other of any emergency or hazardous condition or occurrence with its equipment or facilities which could affect safe operation of the other Party's equipment or facilities. Each Party shall use reasonable efforts to provide the other Party with advance notice of such conditions.

The Company will operate the EPS in such a manner so as to not unreasonably interfere with the operation of the Facility. The Interconnecting Customer will protect itself from normal disturbances propagating through the Company EPS, and such normal disturbances shall not constitute unreasonable interference unless the Company has deviated from Good Utility Practice. Examples of such disturbances could be, but are not limited to, single-phasing events, voltage sags from remote faults on the Company EPS, and outages on the Company EPS. If the Interconnecting Customer demonstrates that the Company EPS is adversely affecting the operation of the Facility and if the adverse effect is a result of a Company deviation from Good Utility Practice, the Company shall take appropriate action to eliminate the adverse effect.

6.3. **Safe Operations and Maintenance**. Each Party shall operate, maintain, repair, and inspect, and shall be fully responsible for, the facility or facilities that it now or hereafter may own unless otherwise specified in this Agreement. Each Party shall be responsible for the maintenance, repair and condition of its respective lines and appurtenances on their respective side of the PCC. The Company and the Interconnecting Customer shall each provide equipment on its respective side of the PCC that adequately protects the Company's EPS, personnel, and other persons from damage and injury.

6.4. **Access**. The Company shall have access to the disconnect switch of the Facility at all times.

6.4.(a) **Company and Interconnecting Customer Representatives**. Each Party shall provide and update as necessary the telephone number that can be used at all times to allow either Party to report an emergency.

6.4. (b) **Company Right to Access Company-Owned Facilities and Equipment**. If necessary for the purposes of the Interconnection Tariff and in the manner it describes, the Interconnecting Customer shall allow the Company access to the Company's equipment and the Company's facilities located on the Interconnecting Customer's or Customer's premises. To the extent that the Interconnecting Customer does not own all or any part of the property on which the Company is required to locate its equipment or facilities to serve the Interconnecting Customer under the Interconnection Tariff, the Interconnecting Customer shall secure and provide in favor of the Company the necessary rights to obtain access to such equipment or facilities, including easements if the circumstances so require. In addition to any rights and easements required by the Company in accordance with the above provision, the Interconnecting Customer shall obtain an executed Landowner Consent Agreement (Exhibit I) from the Landowner, unless the Company, in its sole discretion, waives this requirement.

6.4. (c) **Right to Review Information**. The Company shall have the right to review and obtain copies of Interconnecting Customer's operations and maintenance records, logs, or other information such as, unit availability, maintenance outages, circuit breaker operation requiring manual reset, relay targets and unusual events pertaining to Interconnecting Customer's Facility or its interconnection with the Company EPS. This information will be treated as customer-confidential and only used for the purposes of meeting the requirements of Section 4.2.4 in the Interconnection Tariff.

7. **Disconnection**.

7.1. **Temporary Disconnection**.

7.1.(a) **Emergency Conditions**. Company shall have the right to immediately and temporarily disconnect the Facility without prior notification in cases where, in the reasonable judgment of Company, continuance of such service to Interconnecting Customer is imminently likely to (i) endanger persons or damage property or (ii) cause a material adverse effect on the integrity or security of, or damage to, Company EPS or to the electric systems of others to which the Company EPS is directly connected. Company shall notify Interconnecting Customer promptly of the emergency condition. Interconnecting Customer shall notify Company promptly when it becomes aware of an emergency condition that affects the Facility that may reasonably be expected to affect the Company EPS. To the extent information is known, the notification shall describe the emergency condition, the extent of the damage or deficiency, or the expected effect on the operation of both Parties' facilities and operations, its anticipated duration and the necessary corrective action.

7.1.(b) **Routine Maintenance, Construction and Repair**. Company shall have the right to disconnect the Facility from the Company EPS when necessary for routine maintenance, construction and repairs on the Company EPS. The Company

shall provide the Interconnecting Customer with a minimum of seven calendar days planned outage notification consistent with the Company's planned outage notification protocols. If the Interconnecting Customer requests disconnection by the Company at the PCC, the Interconnecting Customer will provide a minimum of seven days' notice to the Company. Any additional notification requirements will be specified by mutual agreement in the Interconnection Service Agreement. Company shall make an effort to schedule such curtailment or temporary disconnection with Interconnecting Customer.

7.1.(c) Forced Outages. During any forced outage, Company shall have the right to suspend interconnection service to effect immediate repairs on the Company EPS; provided, however, Company shall use reasonable efforts to provide the Interconnecting Customer with prior notice. Where circumstances do not permit such prior notice to Interconnecting Customer, Company may interrupt Interconnection Service and disconnect the Facility from the Company EPS without such notice.

7.1.(d) Non-Emergency Adverse Operating Effects. The Company may disconnect the Facility if the Facility is having an adverse operating effect on the Company EPS or other Customers that is not an emergency, and the Interconnecting Customer fails to correct such adverse operating effect after written notice has been provided and a maximum of 45 days to correct such adverse operating effect has elapsed.

7.1.(e) Modification of the Facility. Company shall notify Interconnecting Customer if there is evidence of a material modification to the Facility and shall have the right to immediately suspend interconnection service in cases where such material modification has been implemented without prior written authorization from the Company.

7.1.(f) Re-connection. Any curtailment, reduction or disconnection shall continue only for so long as reasonably necessary. The Interconnecting Customer and the Company shall cooperate with each other to restore the Facility and the Company EPS, respectively, to their normal operating state as soon as reasonably practicable following the cessation or remedy of the event that led to the temporary disconnection.

7.2. Permanent Disconnection.

7.2.(a) The Interconnecting Customer has the right to permanently disconnect at any time with 30 days written notice to the Company.

8. Metering. Metering of the output from the Facility shall be conducted pursuant to the terms of the Interconnection Tariff.

9. Assignment. Except as provided herein, Interconnecting Customer shall not voluntarily assign its rights or obligations, in whole or in part, under this Agreement without Company's written consent. Any assignment Interconnecting Customer purports to make without Company's written consent shall not be valid. Company shall not unreasonably withhold or delay its consent to Interconnecting Customer's assignment of this Agreement. Notwithstanding the above, Company's consent will not be required for any assignment made by Interconnecting Customer to an Affiliate or as collateral security in connection with a financing transaction. In all events, the Interconnecting Customer will not be relieved of its obligations under this Agreement unless, and until the assignee assumes in writing all obligations of this Agreement and notifies the Company of such assumption.

10. Confidentiality. Company shall maintain confidentiality of all Interconnecting Customer confidential and proprietary information except as otherwise required by applicable laws and regulations, the Interconnection Tariff, or as approved by the Interconnecting Customer in the Simplified or Expedited/Standard Application form or otherwise.

11. Insurance Requirements.

11.1. General Liability.

11.1.(a) In connection with Interconnecting Customer's performance of its duties and obligations under the Interconnection Service Agreement, Interconnecting Customer shall maintain, during the term of the Agreement, general liability insurance with a combined single limit of not less than:

11.1.(a)(i) Five million dollars ($5,000,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than five (5) MW.

11.1.(a)(ii) Two million dollars ($2,000,000) for each occurrence and five million dollars ($5,000,000) in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than one (1) MW and less than or equal to five (5) MW;

Exhibit G – Interconnection Service Agreement

11.1.(a)(iii) One million dollars ($1,000,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than one hundred (100) kW and less than or equal to one (1) MW;

11.1.(a)(iv) Five hundred thousand dollars ($500,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than ten (10) kW and less than or equal to one hundred (100) kW, except for as provide below in subsection 11.1(b).

11.1.(b) Pursuant to 220 CMR §18.03(2), no insurance is required for Interconnecting Customers with facilities eligible for Class 1 Net Metering (facilities less than or equal to sixty (60) kW). However, the Company recommends that the Interconnecting Customer obtain adequate insurance to cover potential liabilities.

11.1.(c) Any combination of General Liability and Umbrella/Excess Liability policy limits can be used to satisfy the limit requirements stated above.

11.1.(d) The general liability insurance required to be purchased in this Section 11 may be purchased for the direct benefit of the Company and shall respond to third party claims asserted against the Company (hereinafter known as "Owners Protective Liability"). Should this option be chosen, the requirement of Section 11.2(a) will not apply but the Owners Protective Liability policy will be purchased for the direct benefit of the Company and the Company will be designated as the primary and "Named Insured" under the policy.

11.1.(e) The insurance hereunder is intended to provide coverage for the Company solely with respect to claims made by third parties against the Company.

11.1.(f) In the event the Commonwealth of Massachusetts, or any other governmental subdivision thereof subject to the claims limits of the Massachusetts Tort Claims Act, G.L. c. 258 (hereinafter referred to as the "Governmental Entity") is the Interconnecting Customer, any insurance maintained by the Governmental Entity shall contain an endorsement that strictly prohibits the applicable insurance company from interposing the claims limits of G.L. c. 258 as a defense in either the adjustment of any claim, or in the defense of any lawsuit directly asserted against the insurer by the Company. Nothing herein is intended to constitute a waiver or indication of an intent to waive the protections of G.L. c. 258 by the Governmental Entity.

11.1.(g) Notwithstanding the requirements of section 11.1(a) through (f), insurance for certain Governmental Entity facilities may be provided as set forth in section 11.1(g)(i) and (ii) below. Nothing herein changes the provision in subsection 11.1(a)(iv) that exempts Class I Net Metering facilities (less than or equal to 60 kW) from the requirement to obtain insurance. In addition, nothing shall prevent the Governmental Entity from obtaining insurance consistent with the provisions of subsection 11.1(a) through (f), if it is able and chooses to do so.

11.1.(g)(i) For solar photovoltaic (PV) facilities with a Gross Nameplate Rating in excess of 60 kW up to 500 kW, the Governmental Entity is not required to obtain liability insurance. Any liability costs borne by the Company associated with a third-party claim for damages in excess of the claims limit of the Massachusetts Tort Claims Act, M.G.L. c. 258, and market-based premium-related costs, if any, borne by the Company associated with insurance for such third-party claims shall be recovered annually on a reconciling basis in Company rates in a manner that shall be reviewed and approved by the Department.

11.1.(g)(ii) For (a) PV facilities with a Gross Nameplate Rating in excess of 500 kW up to 5 MW, (b) wind facilities with a Gross Nameplate Rating in excess of 60 kW up to 5 MW, and (c) highly efficient combined heat and power facilities with a Gross Nameplate Rating of in excess of 60 kW up to 5 MW, the Governmental Entity is not required to obtain liability insurance, subject to the requirements of the following paragraph.

The Company shall either self-insure for any risk associated with possible third-party claims for damages in excess of the Massachusetts Tort Claims Act limit, or obtain liability insurance for such third-party claims, and the Company is authorized to charge and collect from the Governmental Entity its pro-rata allocable share of the cost of so doing, plus all reasonable administrative costs. The coverage and cost may vary with the size and type of facility, and may change (increase or decrease) over time, based on insurance market conditions, and such cost shall be added to, and paid for as part of the Governmental Entity's electric bill.

11.2. Insurer Requirements and Endorsements. All required insurance shall be carried by reputable insurers qualified to underwrite insurance in Massachusetts having a Best Rating of "A-". In addition, all insurance shall:

11.2.(a) Include Company as an additional insured;

11.2.(b) Contain a severability of interest clause or cross-liability clause;

11.2.(c) Provide that Company shall not incur liability to the insurance carrier for payment of premium for such insurance; and

11.2.(d) Provide for thirty (30) calendar days' written notice to Company prior to cancellation, termination, or material change of such –insurance;

11.2.(e) Provided that to the extent the Interconnecting Customer is satisfying the requirements of subpart (d) of this paragraph by means of a presently existing insurance policy, the Interconnecting Customer shall only be required to make good faith efforts to satisfy that requirement and will assume the responsibility for notifying the Company as required above.

11.2.(f) If the requirement of clause (a) in the paragraph above prevents Interconnecting Customer from obtaining the insurance required without added cost or due to written refusal by the insurance carrier, then upon Interconnecting Customer's written Notice to Company, the requirements of clause (a) shall be waived.

11.3. Evidence of Insurance. Evidence of the insurance required shall state that coverage provided is primary and is not in excess to or contributing with any insurance or self-insurance maintained by Interconnecting Customer.

The Interconnecting Customer is responsible for providing the Company with evidence of insurance in compliance with the Interconnection Tariff on an annual basis.

Prior to the Company commencing work on System Modifications, and annually thereafter, the Interconnecting Customer shall have its insurer furnish to the Company certificates of insurance evidencing the insurance coverage required above. The Interconnecting Customer shall notify and send to the Company a certificate of insurance for any policy written on a "claims-made" basis. The Interconnecting Customer will maintain extended reporting coverage for three years on all policies written on a "claims-made" basis.

In the event that an Owners Protective Liability policy is provided, the original policy shall be provided to the Company

11.4. Self Insurance. If Interconnecting Customer has a self-insurance program established in accordance with commercially acceptable risk management practices. Interconnecting Customer may comply with the following in lieu of the above requirements as reasonably approved by the Company:

11.4.(a) Interconnecting Customer shall provide to Company, at least thirty (30) calendar days prior to the Date of Initial Operation, evidence of such program to self-insure to a level of coverage equivalent to that required.

11.4.(b) If Interconnecting Customer ceases to self-insure to the standards required hereunder, or if Interconnecting Customer is unable to provide continuing evidence of Interconnecting Customer's financial ability to self-insure, Interconnecting Customer agrees to promptly obtain the coverage required under Section 11.1.

11.4.(c) This section shall not allow any Governmental Entity to self-insure where the existence of a limitation on damages payable by a Government Entity imposed by the Massachusetts Tort Claims Act, G.L. c. 258, or similar law, could effectively limit recovery (by virtue of a cap on recovery) to an amount lower than that required in Section 11.1(a).

11.5. All insurance certificates, statements of self-insurance, endorsements, cancellations, terminations, alterations, and material changes of such insurance shall be issued and submitted to the following:

National Grid
Attention: **Risk Management**
300 Erie Blvd West
Syracuse, NY 13202

12. Indemnification. Except as the Commonwealth is precluded from pledging credit by Section 1 of Article 62 of the Amendments to the Constitution of the Commonwealth of Massachusetts, and except as the Commonwealth's cities and towns are precluded by Section 7 of Article 2 of the Amendments to the Massachusetts Constitution from pledging their credit without prior legislative authority, Interconnecting Customer and Company shall each indemnify, defend and hold the other, its directors, officers, employees and agents (including, but not limited to, Affiliates and contractors and their employees),

harmless from and against all liabilities, damages, losses, penalties, claims, demands, suits and proceedings of any nature whatsoever for personal injury (including death) or property damages to unaffiliated third parties that arise out of or are in any manner connected with the performance of this Agreement by that Party except to the extent that such injury or damages to unaffiliated third parties may be attributable to the negligence or willful misconduct of the Party seeking indemnification.

13. **Limitation of Liability**. Each Party's liability to the other Party for any loss, cost, claim, injury, liability, or expense, including court costs and reasonable attorney's fees, relating to or arising from any act or omission in its performance of this Agreement, shall be limited to the amount of direct damage or liability actually incurred. In no event shall either Party be liable to the other Party for any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever.

14. **Amendments and Modifications**. No amendment or modification of this Agreement shall be binding unless in writing and duly executed by both Parties.

15. **Permits and Approvals**. Interconnecting Customer shall obtain all environmental and other permits lawfully required by governmental authorities for the construction and operation of the Facility. Prior to the construction of System Modifications the Interconnecting Customer will notify the Company that it has initiated the permitting process. Prior to the commercial operation of the Facility the Interconnecting Customer will notify the Company that it has obtained all permits necessary. Upon request the Interconnecting Customer shall provide copies of one or more of the necessary permits to the Company.

16. **Force Majeure**. For purposes of this Agreement, "Force Majeure Event" means any event:

16.1. That is beyond the reasonable control of the affected Party; and

16.2. That the affected Party is unable to prevent or provide against by exercising commercially reasonable efforts, including the following events or circumstances, but only to the extent they satisfy the preceding requirements: acts of war or terrorism, public disorder, insurrection, or rebellion; floods, hurricanes, earthquakes, lightning, storms, and other natural calamities; explosions or fire; strikes, work stoppages, or labor disputes; embargoes; and sabotage. If a Force Majeure Event prevents a Party from fulfilling any obligations under this Agreement, such Party will promptly notify the other Party in writing, and will keep the other Party informed on a continuing basis of the scope and duration of the Force Majeure Event. The affected Party will specify in reasonable detail the circumstances of the Force Majeure Event, its expected duration, and the steps that the affected Party is taking to mitigate the effects of the event on its performance. The affected Party will be entitled to suspend or modify its performance of obligations under this Agreement, other than the obligation to make payments then due or becoming due under this Agreement, but only to the extent that the effect of the Force Majeure Event cannot be mitigated by the use of reasonable efforts. The affected Party will use reasonable efforts to resume its performance as soon as possible. In no event will the unavailability or inability to obtain funds constitute a Force Majeure Event.

17. **Notices**.

17.1. Any written notice, demand, or request required or authorized in connection with this Agreement ("Notice") shall be deemed properly given on the date actually delivered in person or five (5) Business Days after being sent by certified mail, e-mail or fax with confirmation of receipt and original follow-up by mail, or any nationally-recognized delivery service with proof of delivery, postage prepaid, to the person specified below:

If to Company:
National Grid
Attn: **Distributed Generation**
40 Sylvan Rd
Waltham, MA 02451
E-mail: **Distributed.Generation@nationalgrid.com**

If to Interconnecting Customer:
BlueWave MA, LLC
Attn: **Eric Graber-Lopez**
137 Newbury Street, Floor 4
Boston, MA
02116
E-mail: **interconnection@bluewavesolar.com**
Phone: **(617) 209-3122**

17.2. A Party may change its address for Notices at any time by providing the other Party Notice of the change in accordance with Section 17.1.

17.3. The Parties may also designate operating representatives to conduct the daily communications, which may be necessary or convenient for the administration of this Agreement. Such designations, including names, addresses, email addresses, and phone numbers may be communicated or revised by one Party's Notice to the other.

18. Default and Remedies.

18.1. Defaults. Any one of the following shall constitute "An Event of Default."

18.1.(a) One of the Parties shall fail to pay any undisputed bill for charges incurred under this Agreement or other amounts which one Party owes the other Party as and when due, any such failure shall continue for a period of thirty (30) days after written notice of nonpayment from the affected Party to the defaulting Party, or

18.1.(b) One of the Parties fails to comply with any other provision of this Agreement or breaches any representation or warranty in any material respect and fails to cure or remedy that default or breach within sixty (60) days after notice and written demand by the affected Party to cure the same or such longer period reasonably required to cure (not to exceed an additional 90 days unless otherwise mutually agreed upon), provided that the defaulting Party diligently continues to cure until such failure is fully cured.

18.2. **Remedies**. Upon the occurrence of an Event of Default, the affected Party may at its option, in addition to any remedies available under any other provision herein, do any, or any combination, as appropriate, of the following:

18.2.(a) Continue to perform and enforce this Agreement;

18.2.(b) Recover damages from the defaulting Party except as limited by this Agreement;

18.2.(c) By written notice to the defaulting Party terminate this Agreement;

18.2.(d) Pursue any other remedies it may have under this Agreement or under applicable law or in equity.

19. **Entire Agreement**. This Agreement, including any attachments or appendices, is entered into pursuant to the Interconnection Tariff. Together the Agreement and the Interconnection Tariff represent the entire understanding between the Parties, their agents, and employees as to the subject matter of this Agreement. Each Party also represents that in entering into this Agreement, it has not relied on any promise, inducement, representation, warranty, agreement or other statement not set forth in this Agreement or in the Company's Interconnection Tariff.

20. **Supersedence**. In the event of a conflict between this Agreement, the Interconnection Tariff, or the terms of any other tariff, Exhibit or Attachment incorporated by reference, the terms of the Interconnection Tariff, as the same may be amended from time to time, shall control. In the event that the Company files a revised tariff related to interconnection for Department approval after the effective date of this Agreement, the Company shall, not later than the date of such filing, notify the signatories of this Agreement and provide them a copy of said filing.

21. **Governing Law**. This Agreement shall be interpreted, governed, and construed under the laws of the Commonwealth of Massachusetts without giving effect to choice of law provisions that might apply to the law of a different jurisdiction.

22. **Non-waiver**. None of the provisions of this Agreement shall be considered waived by a Party unless such waiver is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any of the provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or the relinquishment of any such rights for the future, but the same shall continue and remain in full force and effect.

23. **Counterparts**. This Agreement may be signed in counterparts.

24. **No Third Party Beneficiaries**. This Agreement is made solely for the benefit of the Parties hereto. Nothing in the Agreement shall be construed to create any rights in or duty to, or standard of care with respect to, or any liability to, any person not a party to this Agreement.

25. **Dispute Resolution**. Unless otherwise agreed by the Parties, all disputes arising under this Agreement shall be resolved pursuant to the Dispute Resolution Process set forth in the Interconnection Tariff.

26. **Severability**. If any clause, provision, or section of this Agreement is ruled invalid by any court of competent jurisdiction, the invalidity of such clause, provision, or section, shall not affect any of the remaining provisions herein.

27. **Signatures**. IN WITNESS WHEREOF, the Parties hereto have caused two (2) originals of this Agreement to be executed under seal by their duly authorized representatives.

Exhibit G – Interconnection Service Agreement

BlueWave MA, LLC:

Name: Jonathan Mancini

Title: Sr. Vice President

Date: May 7, 2020

Signature:

National Grid:

Name: Sahir Shakir

Title: Sr. Energy Integration Consultant

Date: 05/11/2020

Signature:

Exhibit G – Interconnection Service Agreement

Attachment 1: Description of Facilities, including demarcation of Point of Common Coupling

Interconnecting Customer has proposed a **4,000** kW AC photovoltaic system with a DC coupled **4,000** kW/ **8,000** kWH DC energy storage system (ESS) located at **1050 Hilldale Avenue, Haverhill, MA 01832** ("Facility"). The proposed Facility is an Independent Power Producer ("IPP"). Facilities will interconnect to the Company's electric system via the North Haverhill Substation, 13.2 kV distribution feeder 48L1, Hilldale Avenue, Pole 119-50 ("Point of Interconnection" or "POI").

a. Description of proposed design/configuration:

- The total facility is power limited to 4,000 kW/kVA of inverter based Photovoltaic and DC Coupled 4,000 kW / 8,000 kWH BESS DG
  - One (1) Customer Owned SMA Sunny Central SC 2500-EV-US 550 VAC, 2500 kW/kVA (Inverter 1) DC coupled to a photovoltaic array and 2,500 kW of BESS
  - One (1) Customer Owned SMA Sunny Central SC 2000-EV-US 550 VAC, 2,000 kW/kVA (Inverter 2), derated to 1,500 kW/kVA, DC Coupled to a photovoltaic array and a 1,500 kW BESS.
- Two (2) customer owned interface transformers with the following specifications
  - One (1) 2,500 kVA, 13.2 kV wye-grounded primary, 550 V delta secondary interface transformer, (T1). Z=5.75% X/R = 7.1 with a 8-ohm neutral grounding reactor.
  - One (1) 1,500 kVA, 13.2 kV wye-grounded primary, 550 V delta secondary interface transformer, (T2). Z=5.75% X/R = 6.3 with a 20-ohm neutral grounding reactor.
- One (1) Customer-owned 14.4 kV, 400 A S&C SM-5 Fused cutout with 100 E fuses
- One (1) Customer-owned Hubbell AR111SS gang operated load break disconnect switch, 15kV, 600A, 24/7 Utility accessible and lockable with visible break

b. Metering: Interconnecting Customer is proposing to install their system behind the Company's new **13.2** kV pole mounted primary meter. Please refer to ESB 750 Section 7.0 and ESB 756 Section 3.0 and Appendix C for service installation and primary meter installation detail.

c. **PCC**: The Point of Common Coupling ("PCC") will be designated as the Customer's side of the Company's pole-mounted primary meter at **Pole #119-53**. The Interconnecting Customer must install their Facilities up to the Company revenue meter. The Interconnecting Customer must provide sufficient conductor to allow the Company to make final connections at the meter pole. The Company will provide final connection of the Interconnecting Customer conductors to the Company meter.

The Company's Design Personnel will specify the exact location of the Company's facilities and installation details. The Interconnecting Customer shall be responsible for obtaining all easements and permits required for any line extension not on public way in accordance with the Company's requirements. The Interconnecting Customer shall provide unencumbered direct access to the Company's facilities along an accessible plowed driveway or road, where the equipment is not behind the Interconnecting Customer's locked gate. In those cases where Company equipment is required to be behind the Interconnecting Customer's locked gate, double locking, with both the Company's and Interconnecting Customer's locks shall be employed.

Attachment 2: Description of System Modifications

The Company's System Modifications required for the interconnection of Facility are as follows:

On the customer's/third-party property:

- Install approximately 200 circuit feet of 3P-477 overhead conductor line extension
- Install one (1) recloser
- Install one (1) gang operated load break disconnect switch
- Install one (1) primary revenue metering assembly
- Install four (4) poles

On the Company's distribution system:

- Implement live line reclose blocking on the recloser on Pole #100 Hilldale Avenue

- Reconductor ~690' of 1/0 and 4/0 overhead conductor to 3-phase 477 aluminum cross arm overhead conductor from Pole #69 Hilldale Avenue to Pole #73 Hilldale Avenue

At the North Haverhill Substation:

Common Substation Modifications:

- Install Ground Fault Detection (3V0) on substation transformer including control wiring to trip substation feeder breakers, CCVT's on high voltage side, and 59N relay in the existing substation control house

It will be the responsibility of the Interconnecting Customer, at its sole cost and expense, to secure and obtain in favor of itself and the Company, the following: any and all rights, consents, permits, approvals, and easements (free and clear from any encumbrances), as are required for the Company's System Modifications on any Interconnecting Customer-owned property or any third-party owned property ("Third Party Rights and Approvals"). The Interconnecting Customer shall use the Company's standard form when obtaining all Third Party Rights and Approval, as applicable. The Company will seek to obtain, at the Interconnecting Customer's sole cost and expense, any and all rights, consents, permits, approvals, and easements for the System Modifications on any Company owned property or within any public roadway as the Company determines necessary in its sole discretion ("Other Rights and Approvals"; together with Third Party Rights and Approvals referred to as "System Modification Required Approvals"). The Interconnecting Customer will fully cooperate with the Company in obtaining the Other Rights and Approvals. The Company shall not be required to accept any System Modification Required Approvals that are not in form or on terms satisfactory to the Company in its sole discretion, or that impose additional liabilities or costs on the Company. The Company shall not be required to appeal or challenge the denial of any System Modification Required Approvals or the imposition of any unsatisfactory term or condition. The Company shall not be obligated to commence the construction of the System Modifications unless and until it has received all System Modification Required Approvals in accordance with this provision, and Sections 6.4 and 15 of this Agreement, above, and the Company's Terms and Conditions for Distribution Service, tariff M.D.P.U. No.1320, as amended from time to time.

Attachment 3: Costs of System Modifications and Payment Terms

At present, the estimated costs for the System Modification detailed in Attachment 2 for this Facility ("Facility System Modification Costs") are **$390,459** which is itemized as:

- Cost of facility specific system modifications on private property as mentioned in Attachment 2 above is **$118,431** (includes capital, removal, and O&M costs).
- Cost of facility specific system modifications on the Company's distribution system as mentioned in Attachment 2 above is **$80,530** (includes capital, removal, and O&M costs).
- Cost of common system modifications **(MECO)** at the distribution side of the North Haverhill Substation as mentioned in Attachment 2 above is $269,637 (includes capital, removal, O&M costs, and taxes). The cost for this modification will be shared on a pro-rata basis with MA-15443993. MA-26699252 will be responsible for 57.1% or **$154,078**
- Cost of witness testing, engineering review, EMS Integration and implementation of protective device settings: **$7,500**.
- Tax gross-up adder: **$29,095** (*A 2020 tax rate of 16.47% is expected to apply to contributions in aid of construction ("CIAC") payments received by Massachusetts Electric Company from the Interconnecting Customer for interconnections placed in service prior to 2020. The calculation of the tax gross-up adder is included in this cost estimate on the basis of tax guidance published by the Internal Revenue Service, but tax rates and decisions are ultimately subject to IRS discretion. By signing this agreement, the Interconnecting Customer understands and agrees that the tax has been estimated for convenience and that the Interconnecting Customer remains liable for all tax due on CIAC payments, payable upon the Company's demand.*)

The Facility System Modification Costs were developed by the Company with a general understanding of the project and based upon information provided by the Interconnecting Customer in writing and/or collected in the field. The cost estimates were prepared using historical cost data, data from similar projects, and other assumptions, and while they are presumed valid for 60 business days from the date of the Impact Study, the Company reserves the right to adjust those estimated costs as authorized under this Agreement, the Tariff, or by law and to require the Interconnecting Customer to pay any such additional costs.

Payment Terms:

Facility System Modification Costs may be paid in full, or in two scheduled payments:

- The first payment of 25% of the estimated cost or **$97,615** is due within 120 business days from the day of execution of this agreement. Upon receipt of the first payment, the Company will initiate the detailed design.

- The last payment of 75% of total cost or **$292,844** is due no later than 120 business days after the first payment is due or received, whichever is earlier.

- SMART Equipment Costs (defined in Attachment 4), if applicable, paid on demand.
- The Company is not required to begin construction until all payments are processed.

Nothing herein shall prevent the Interconnecting Customer from making any payment, or the full payment, due to the Company earlier than the dates provided above. Funds received may be immediately expended or committed as determined by the Company in its sole discretion.

Attachment 4: Special Operating Requirements

The reactive contribution of the PV at the PCC operates between unity power factor (100 % PF) and -99% power factor (Importing VARS).

The Interconnecting Customer shall charge the ESS solely from the on-site solar that is behind the PCC and the Company's primary revenue meter, however, the maximum capacity for charging will be limited to the maximum amount of capacity of the solar facility on site.

Consistent with the operational profile provided by the Interconnecting Customer and approved by the Company (attached) with the interconnection application, discharge of the ESS will occur primarily between 5am to 9pm for the months of October through April, and between 5am and 9pm for the months of May through September. As system conditions warrant, the Company or Interconnecting Customer may propose modifications to this schedule. Any proposed modifications to this schedule are subject to the Company's review and approval, and may necessitate technical evaluation or a revised System Impact Study with a mutually accepted timeline:

1. Interconnecting Customer shall adhere to the following standards which are incorporated in their entirety by reference:

   a. National Grid's Standards for Interconnecting Distributed Generation (M.D.P.U. 1320), available at: https://www.nationalgridus.com/non_html/shared_interconnectStds.pdf

   b. Electric System Bulletin 750 "Specifications for Electrical Installations". ESB 750, available at: http://www.nationalgridus.com/non_html/shared_constr_esb750.pdf

   c. Electric System Bulletin 756 "Requirements for Parallel Generation Connected to a National Grid-Owned EPS". ESB756C, available at: www.nationalgridus.com/non_html/shared_constr_esb756.pdf

2. Interconnecting Customer shall adhere to the requirements identified in the Impact Study dated 04/12/2020 unless such requirements are in direct conflict with a requirement set forth in this Agreement, in which case this Agreement shall control (provided that in all such instances the Interconnecting Customer shall not be relieved of its obligations until it has notified the Company of such conflict, and the Company has made a written determination that a conflict exists).

3. Interconnecting Customer shall provide Compliance Documentation, including photographs, as requested by, and to the satisfaction of, the Company.

4. Interconnecting Customer may not be allowed to operate with the local EPS in an abnormal state. To ensure the safe and reliable operation of National Grid's EPS, National Grid may disconnect the Interconnecting Customer at the PCC when abnormal system conditions develop and/or circuit reconfiguration takes place on the EPS.

5. Interconnecting Customer may only generate onto the feeder referenced in Attachment 1. For systems with redundant relaying, National Grid's Regional Control Center must first give permission to the customer to allow the operation of their system.

6. Per section 6.4 of this agreement, Interconnecting Customer shall provide an external AC UTILITY DISCONNECT, accessible at all times by National Grid personnel.

7. Interconnecting Customer's AC UTILITY DISCONNECT switch shall be labeled "AC UTILITY DISCONNECT".

Exhibit G – Interconnection Service Agreement

8. The AC UTILITY DISCONNECT shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The visible break requirement can be met by opening the enclosure to observe the contact separation. The Company shall have the right to open this disconnect switch in accordance with the Interconnection Tariff. The switch has to be installed at the DR output on the current carrying lines. Shunt mechanisms are not permitted.

9. If the AC UTILITY DISCONNECT switch is not adjacent to the meter and/or PCC, Interconnecting Customer shall provide a permanent plaque locating the switch.

10. All plaques as described in NEC 705.10, 705.12 (7), 690.56, 692.4 and 705.70 shall be installed, as applicable.

11. All Interconnecting Customer-Owned meters shall be labeled "CUSTOMER-OWNED METER"

12. Interconnecting Customer shall install a permanent plaque or directory at the revenue meter and at the PCC with a warning about the generator(s) installed.

13. Interconnecting Customer shall be responsible for providing necessary easements and/or environmental and/or municipal permits, as requested by Company.

14. For systems greater than 60kW, Interconnecting Customer shall provide a means of communication to the National Grid revenue meter. This may be accomplished with an analog POTS (Plain Old Telephone Service) phone line (capable of direct inward dial without human intervention or interference from other devices such as fax machines, etc.), or - in locations with suitable wireless service, a wireless meter. Feasibility of wireless service must be demonstrated by Interconnecting Customer, to the satisfaction of National Grid. If approved, a wireless-enabled meter will be installed, at the customer's expense. If and when National Grid's retail tariff provides a mechanism for monthly billing for this service, the customer agrees to the addition of this charge to their monthly electric bill. Interconnecting Customer shall have the option to have this charge removed, if and when a POTS phone line to National Grid's revenue meter is provided.

15. For systems with redundant relaying, Company witness testing will be required. Customer shall develop, and provide for approval, a functional test procedure, including settings for relaying scheme. Witness test plan must be approved by Company prior to scheduling Company personnel for witness test.

16. Interconnecting Customer's protection scheme submitted for review must meet National Grid's specific protection requirements. Interconnecting Customer shall submit a PE stamped one-line, including relay settings, that meets the requirements specified within this document to National Grid for review and approval, before a Witness Test plan can be reviewed. Please refer to "Standard Process Completion Documentation Checklist", per Company's website for additional required documentation.

17. For photovoltaic (PV) interconnections, and in order to minimize the impact on the EPS and area customers, Interconnecting Customer shall maintain the reactive contribution of the Facility between a 99% leading and lagging power factor at the PCC.

18. Interconnecting Customer shall not contribute to greater than a 3.0% change in voltage on the Company's EPS under any conditions.

19. Interconnecting Customer shall provide a large scale site one-line, to be installed near the PCC, identifying locations of all electrical equipment and their disconnecting means.

20. Interconnecting Customer shall provide and maintain suitable 24-hour access to Company equipment. Access to Company equipment shall be free from vegetation, at level grade, and to Company satisfaction.

21. For customers interested in the SMART program:

    Interconnecting Customer has expressed an interest in the Facility participating in the Solar Massachusetts Renewable Target ("SMART") program when that program is fully in effect. This ISA does not include any meters, associated equipment, installation work or costs that are likely to be required for the Facility to participate in the SMART program. If the Facility is ultimately determined to be eligible by the SMART Program Administrator, the Interconnecting Customer shall be responsible for the costs of any required equipment (including the meters) and installation and costs related thereto, necessary to participate

in SMART (collectively "SMART Equipment Costs"). In collecting and accepting payment for SMART Equipment Costs, the Company makes no representation about a Facility's eligibility for the SMART Program. If such SMART Equipment Costs are installed and the Facility does not enroll in the SMART Program for any reason, these costs are non-refundable.

Attachment 5: Agreement between the Company and the Company's Retail Customer

If the Company's Retail Customer (account holder) is not the owner (and/or operator) of the Facility, then Exhibit H - Agreement Between the Company and the Company's Retail Customer - shall be signed by the Company's Retail Customer and executed by the Company, and shall be considered part of this Interconnection Service Agreement. It shall be the responsibility of the Interconnecting Customer to notify the Company if the Exhibit H associated with this application changes and, to provide an updated executed Exhibit H if the Interconnecting Customer is not the Retail Customer as a condition to continued interconnection to the Company's electric power system ("EPS").

Attachment 6: Landowner Consent Agreement

The Landowner Consent Agreement ("Exhibit I") must be executed when the Facility will be located on property owned by a party other than the Customer or Interconnecting Customer ("Landowner"). The Interconnecting Customer shall obtain and deliver to the Company Exhibit I, executed by the Landowner, and shall provide any additional title documentation requested by the Company. Exhibit I is incorporated herein by reference, and shall be considered an attachment to this Agreement. Exhibit I is in addition to any other System Modification Required Approvals required by the Company in accordance with this Agreement. It is the Interconnecting Customer's responsibility to notify the Company if the Landowner changes, and, if determined necessary by the Company, as a condition to continued interconnection to the Company's EPS, to provide an updated executed Exhibit I.

Attachment 7 - Appendix A: System Modifications Construction Schedule

Below is an estimated construction schedule. This schedule is conceptual, and shows the duration of the construction milestones from a "start-date" to an "in-service" date, in weeks. This conceptual schedule is based upon assumptions and knowledge regarding the project, the site, and activities as of the date of the Impact Study. These estimations of construction time frames and total duration do not include any time that the Company's performance is on hold, delayed, or interrupted, including, without limitation, while waiting on information or on the performance of obligations by the Interconnecting Customer and/or third parties (including, without limitation, ISO-NE and/or railroad), as a result of unknown environmental and/or permitting issues, events of force majeure, and/or as a result of required transmission outages.

The start-date for this construction schedule is deemed to have occurred once : (1) the Interconnection Service Agreement ("ISA") has been executed (i.e., signed) by both the Company and the Interconnecting Customer; and (2) the first payment has been submitted by the Interconnecting Customer to the Company, provided , however, that the Company shall not be required to provide any services or order any equipment without receiving adequate payment therefore from the Interconnecting Customer nor will it be required to initiate any construction before it has received full payment from the Interconnecting Customer.

Total Duration: **69** weeks
The duration represents the estimated-total number of weeks the Company will work on this project.

Milestone	Estimated Duration	Responsible Party
First Payment	Start	Customer
Distribution System Modification Design	Twenty Seven (27) weeks	Company
Secure Required Permits/Easements and Petition for National Grid Work	Twenty Four (24*) weeks (Before Construction Begins)	Interconnecting Customer & Company
Submit Final Payment	As per ISA (Before Construction Begins)	Interconnecting Customer
Distribution System Schedule Coordination and Construction	Seven (13) weeks	Company
Witness Test Scheduled and Approved and Completion Documentation Approved	Three (3) weeks	Company
Meter Installation and Authority to Interconnect	Two (2) week	Company

Exhibit G – Interconnection Service Agreement

*DOT permit/traffic management plans are assumed to be needed to complete construction over Route 495 and expected to take 6 months to obtain.

Section 4.0
Stormwater Management Information

Stormwater Management Report

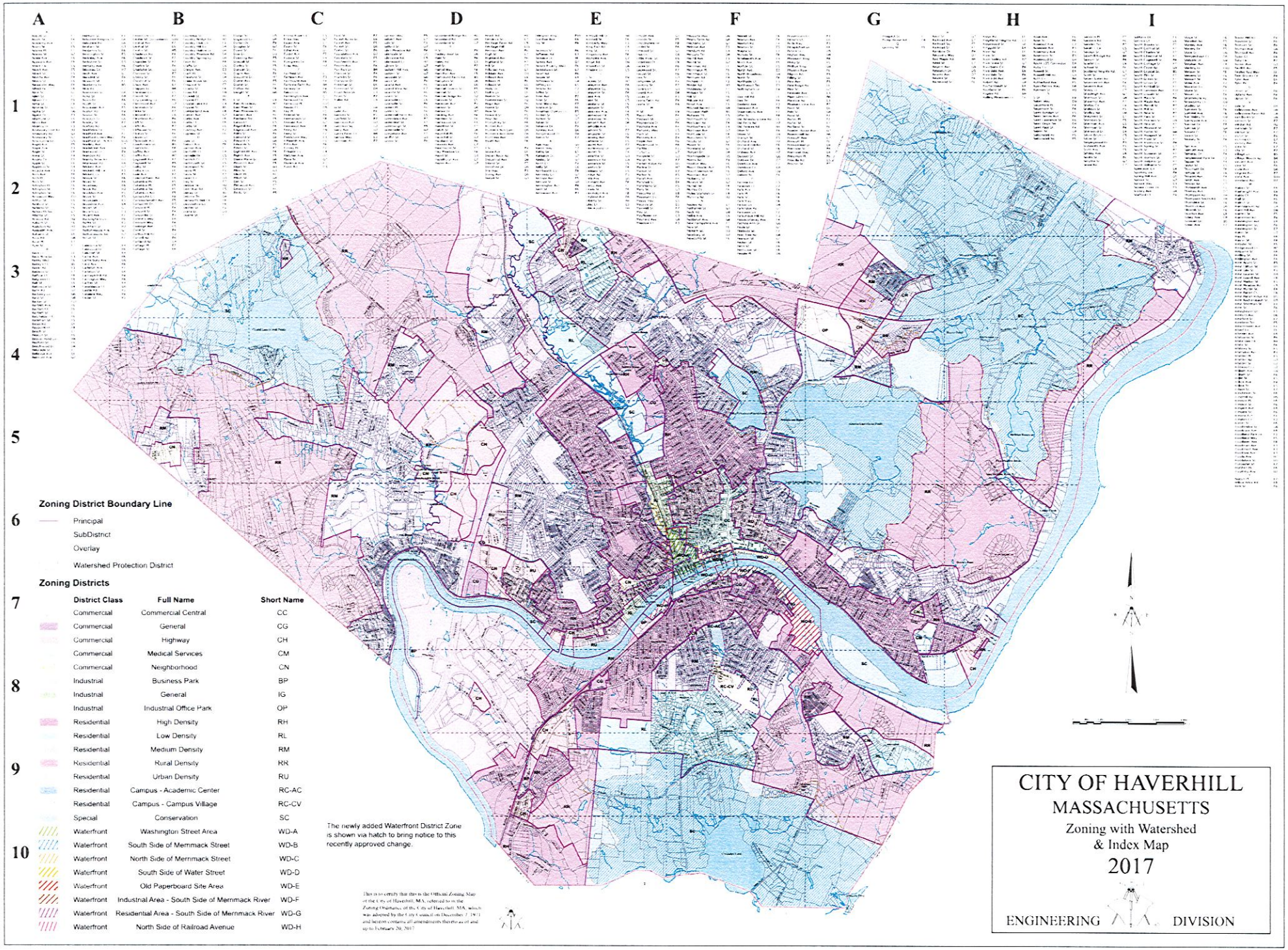
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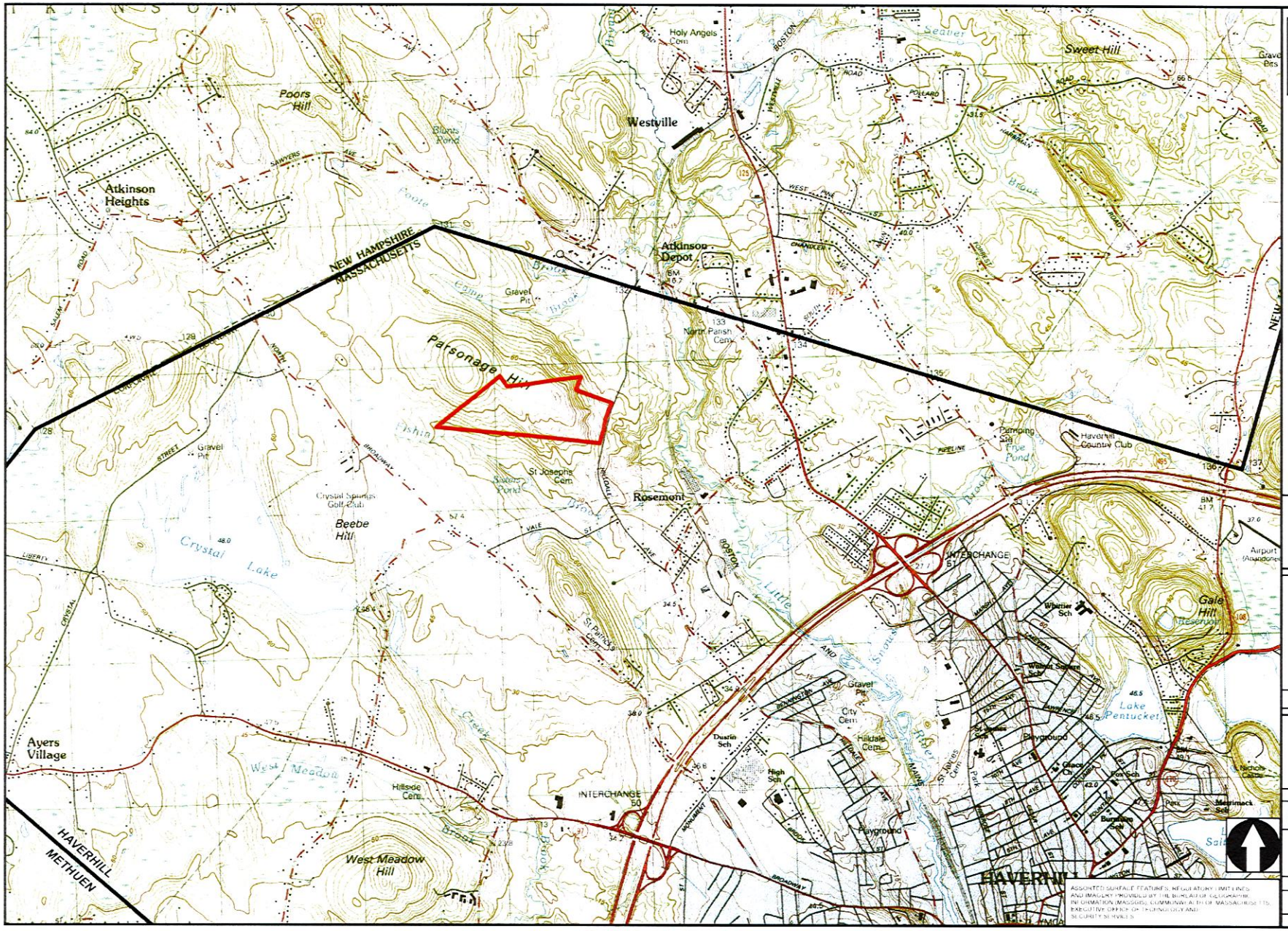
Section 5.0
Plans and Exhibits

City Zoning Map
Locus Map
Aerial Map

One-line Electrical Diagram
Prepared by LIG Consultant, PC
In 1 Sheet
Dated June 28, 2018

Entitled Hilldale Avenue Solar 2
Prepared by Beals and Thomas, Inc.
In 17 Sheets
Dated May 24, 2021
(under separate cover)


A
B
C
D
E
F
G
H
I
1
2
3
4
5
6
7
8
9
10
Zoning District Boundary Line
Principal
SubDistrict
Overlay
Watershed Protection District
Zoning Districts
District Class | Full Name | Short Name
Commercial | Commercial Central | CC
Commercial | General | CG
Commercial | Highway | CH
Commercial | Medical Services | CM
Commercial | Neighborhood | CN
Industrial | Business Park | BP
Industrial | General | IG
Industrial | Industrial Office Park | OP
Residential | High Density | RH
Residential | Low Density | RL
Residential | Medium Density | RM
Residential | Rural Density | RR
Residential | Urban Density | RU
Residential | Campus - Academic Center | RC-AC
Residential | Campus - Campus Village | RC-CV
Special | Conservation | SC
Waterfront | Washington Street Area | WD-A
Waterfront | South Side of Merrimack Street | WD-B
Waterfront | North Side of Merrimack Street | WD-C
Waterfront | South Side of Water Street | WD-D
Waterfront | Old Paperboard Site Area | WD-E
Waterfront | Industrial Area - South Side of Merrimack River | WD-F
Waterfront | Residential Area - South Side of Merrimack River | WD-G
Waterfront | North Side of Railroad Avenue | WD-H
The newly added Waterfront District Zone is shown via hatch to bring notice to this recently approved change.
This is to certify that this is the Official Zoning Map of the City of Haverhill, MA, referred to in the Zoning Ordinance of the City of Haverhill, MA, which was adopted by the City Council on December 7, 1961 and hereon contains all amendments thereto as of and up to February 28, 2017.
CITY OF HAVERHILL
MASSACHUSETTS
Zoning with Watershed
& Index Map
2017
ENGINEERING DIVISION



PREPARED FOR:

BWC Camp Brook, LLC

P.O. BOX 171881

BOSTON, MASSACHUSETTS

PREPARED BY:

BEALS+THOMAS

Civil Engineers | Landscape Architects | Land Surveyors | Planners | Environmental Specialists

PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL, MASSACHUSETTS

SCALE: 1" = 2,000' DATE: FEBRUARY 3, 2021

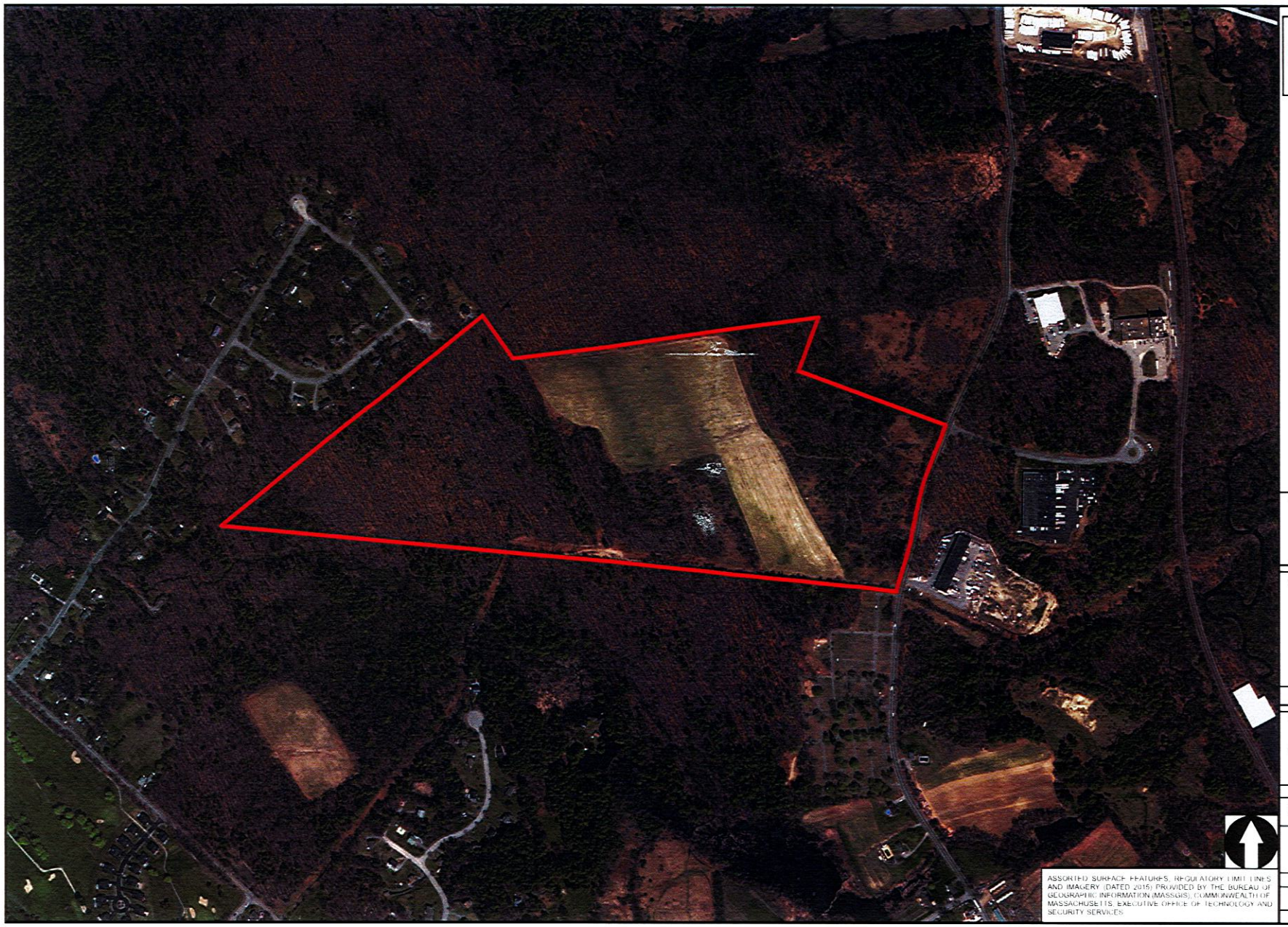
FEET

USGS Map

B+T JOB NO.: 3274.00

B+T PLAN NO.: 3274USGS01A

FIGURE 1



Legend

Subject Property

Town Line

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BWC Camp Brook, LLC

P.O. BOX 171381

BOSTON, MASSACHUSETTS

PREPARED BY:

BEALS+THOMAS

Civil Engineers | Landscape Architects | Land Surveyors | Planners | Environmental Specialists

BEALS AND THOMAS, INC.
144 Turnpike Road
Southborough, Massachusetts 01772
T 508.366.0560 | www.bealsandthomas.com

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PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL, MASSACHUSETTS

SCALE: 1" = 500' DATE: FEBRUARY 3, 2021

0 250 500 750

FEET

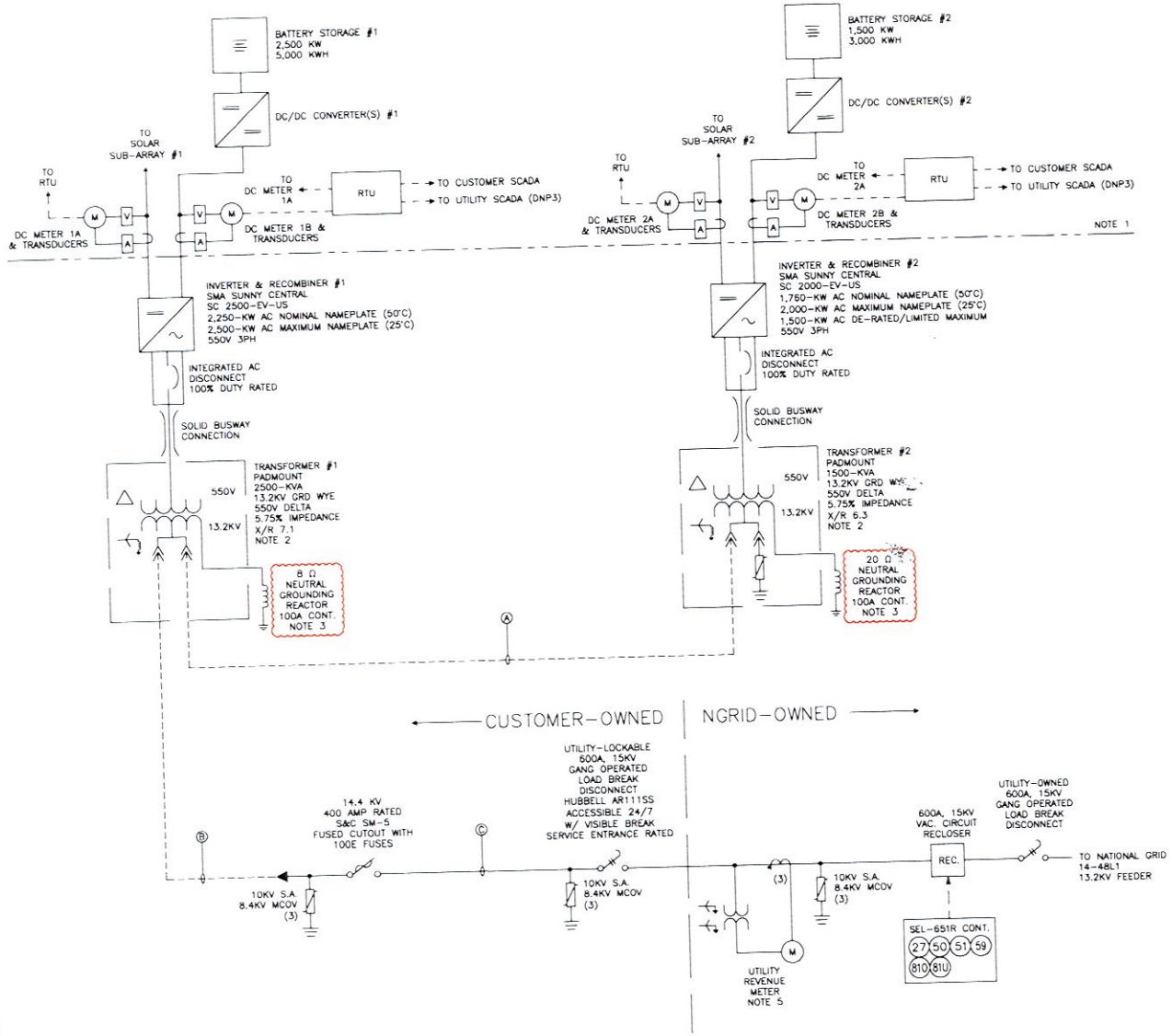
AERIAL PHOTO

B+T JOB NO: 4274.00

B+T PLAN NO: 4274.00\PHOTO\4274-002

FIGURE 2

ASSORTED SURFACE FEATURES, REGULATORY LIMIT LINES AND IMAGERY (DATED 2015) PROVIDED BY THE BUREAU OF GEOGRAPHIC INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS, EXECUTIVE OFFICE OF TECHNOLOGY AND SECURITY SERVICES.



INVERTER PROTECTIVE SETTINGS			
INVERTER PROTECTIVE FUNCTIONS	PICKUP SETTING		OPERATING TIME CYC. (SEC.)
	PERCENT	VALUE	
27P1 – UNDERVOLTAGE	50%	275.0V	66 (1.10)
27P2 – UNDERVOLTAGE	88%	484.0V	120 (2.00)
59P1 – OVERVOLTAGE	110%	605.0V	120 (2.00)
59P2 – OVERVOLTAGE	120%	660.0V	9.6 (0.16)
81U1 – UNDERFREQUENCY	–	56.5 Hz	9.6 (0.16)
81U2 – UNDERFREQUENCY	–	58.5 Hz	18000 (300)
81O1 – OVERFREQUENCY	–	61.2 Hz	18000 (300)
81O2 – OVERFREQUENCY	–	62.0 Hz	9.6 (0.16)
INVERTER RECONNECT TIME	–	–	18000 (300)

* SETTINGS ARE BASED ON NGRID ESB 756C
* VOLTAGE SETTINGS ARE BASED ON LINE TO LINE VOLTAGES.
* INVERTER WILL SHUTDOWN WITHIN 2 SECONDS OF A LOSS OF VOLTAGE. INVERTER WILL NOT RECONNECT UNTIL IT SENSES 5 MINUTES OF GOOD VOLTAGE.

WIRE AND CONDUIT SCHEDULE				
ID	VOLTAGE	SETS	WIRE	CONDUIT
A	15KV	1	(3) #2 AWG AL, FULL NEUTRAL, XLPE-133%, MV-105	(1) 4"
B	15KV	1	(3) 4/0 AWG AL, FULL NEUTRAL, XLPE-133%, MV-105	(1) 4"
C	15KV	1	(3) 2/0 AWG ACSR COVERED OVERHEAD WIRE	N/A

AGGREGATE AC SYSTEM RATING	
INV #	INVERTER RATING
1	2500-KW MAXIMUM
2	1500-KW DE-RATED/LIMITED MAXIMUM
TOTAL	4,000-KW DE-RATED/LIMITED MAXIMUM

NOTES:
1. DC DESIGN (ARRAY, CONVERTERS, BATTERY STORAGE, ETC) BY OTHERS.
2. PROVIDE TRANSFORMER WITH BAY-O-NET FUSES, ELBOW TYPE S.A. (8.4KV MCOV), AND FULLY RATED NEUTRAL.
3. NEUTRAL GROUNDING REACTORS SIZED PER IMPACT STUDY.
4. EQUIPMENT HAS BEEN SIZED FOR PRELIMINARY DESIGN PURPOSES. ALL EQUIPMENT TO BE SIZED AND LISTED ON FINAL DESIGN DRAWINGS.
5. TELECOMMUNICATION LINE TO BE PROVIDED TO UTILITY REVENUE METERING.

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRW	APR'D
3	12/17/18	REVISED PER NGRID 20-DC REVIEW COMMENTS	LJG	LJG
2	10/8/18	REVISED FEEDER NUMBER	LJG	LJG
1	7/12/18	REVISED ENTITY NAME	LJG	LJG
0	7/2/18	ISSUED STAMPED DRELINE	DRW	APR'D
6	2/20/20	REVISED NEUTRAL GROUNDING REACTOR SIZES PER NGRID SIS	LJG	LJG
5	10/8/19	REVISED INVERTER TYPE AND DESIGN, AND TRANSFORMER SIZES	LJG	LJG
4	1/11/19	REVISED INVERTER DESIGN & REMOVED CUSTOMER RECLOSER	LJG	LJG

DES DRW CHK

LIG Consultants, PC

BLUEWAVE MA, LLC
HILLDALE AVE, HAVERHILL MA – 4.0 MW AC PV & STORAGE SYSTEM
INTERCONNECTION ONE-LINE

SIZE B
SHEET 1of1
DWG NO. E-001
REVISED NTS
DATE 08/28/2018

FIRM NAME: LIG CONSULTANTS, PC
FIRM REG #: N/A
PROF. ENGINEER: ANTHONY M. MORREALE, P.E.
ENGINEER LICENSE #: 50880

HILLDALE AVENUE SOLAR 2

IN

HAVERHILL, MASSACHUSETTS

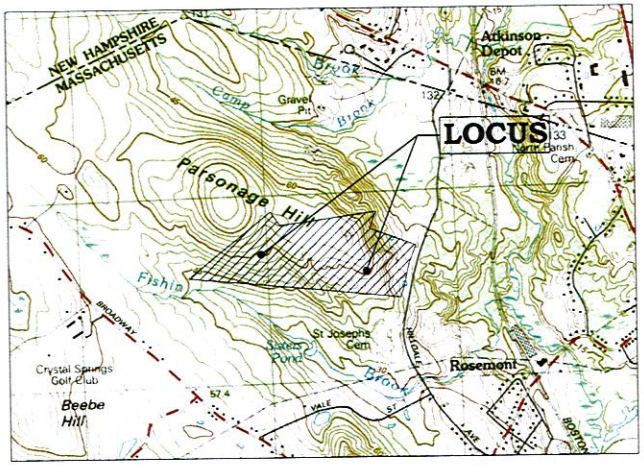
(Essex County)

OWNER/APPLICANT

BWC Camp Brook, LLC
P.O. Box 171381
Boston, Massachusetts 02117

CIVIL ENGINEER/SURVEYOR AND LANDSCAPE ARCHITECT

Beals and Thomas, Inc.
Reservoir Corporate Center
144 Turnpike Road
Southborough, Massachusetts 01772



Locus Map
Scale: 1" = 1000'

NORTH

Issued For Permitting - JUNE 3, 2021

SHEET INDEX

	Cover Sheet
TP-1-TP-6	Topographic Plan
C1.1	Notes, References and Legend Sheet
C2.1	Index Plan
C3.1-3.2	Site Preparation Plan
C4.1-4.2	Site Plan
C5.1	Stream Crossing Plan
C6.1	Wetland Replication Plan
C7.1-7.2	Site Details

Jeffrey R. Murphy No. 51860 Registered Professional Engineer
6/3/2021

Job No.: 3274.00
Plan No.: 327400P002A-001
Sheet 1 of 17

NOTES

1) UNDERGROUND UTILITIES WERE COMPILED FROM AVAILABLE RECORD PLANS OF UTILITY COMPANIES AND PUBLIC AGENCIES AND ARE APPROXIMATE ONLY. BEFORE CONSTRUCTION CALL "DIG SAFE" 1-888-344-7233.

2) THIS PLAN WAS PREPARED FROM AN ACTUAL SURVEY MADE ON THE GROUND USING TOTAL STATION METHODS ON OR BETWEEN FEBRUARY 17, 2021 AND MARCH 22, 2021.

3) THE PRESUMED CENTER OF GAS LINE IS BASED ON THE LOCATION OF THE RECORD DOCUMENTS AND FITTING TO THE LOCATION OF GAS MARKERS FOUND IN THE FIELD. THE EDGES OF THE EASEMENT ARE OFFSET 20' TO THE NORTH AND 30' TO THE SOUTH BASED ON THE RECORD DOCUMENTS.

4) TOPOGRAPHIC AND DETAIL INFORMATION PROVIDED BY BLUESKY GEOSPATIAL LTD. BASED ON PHOTOGRAPHY FLOWN ON DECEMBER 15, 2020. AERIAL CONTROL FOR THE SURVEY WAS PERFORMED BY BEALS AND THOMAS, INC. ON JANUARY 31, 2021.

5) THE PARCEL SHOWN IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN), AS SHOWN ON "FLOOD INSURANCE RATE MAPS, ESSEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS) PANELS 67 AND 86 OF 600", MAP NUMBERS 25009C0067F AND 25009C0086F RESPECTIVELY, EFFECTIVE DATE JULY 3, 2012.

6) WETLAND RESOURCE AREAS DELINEATED BY BEALS AND THOMAS, INC. ON FEBRUARY 11-12 AND MARCH 11, 2021.

7) WETLAND RESOURCE AREA FLAGS LOCATED BY TOTAL STATION METHODS BY BEALS AND THOMAS, INC. ON OR BETWEEN FEBRUARY 22 AND MARCH 22, 2021.

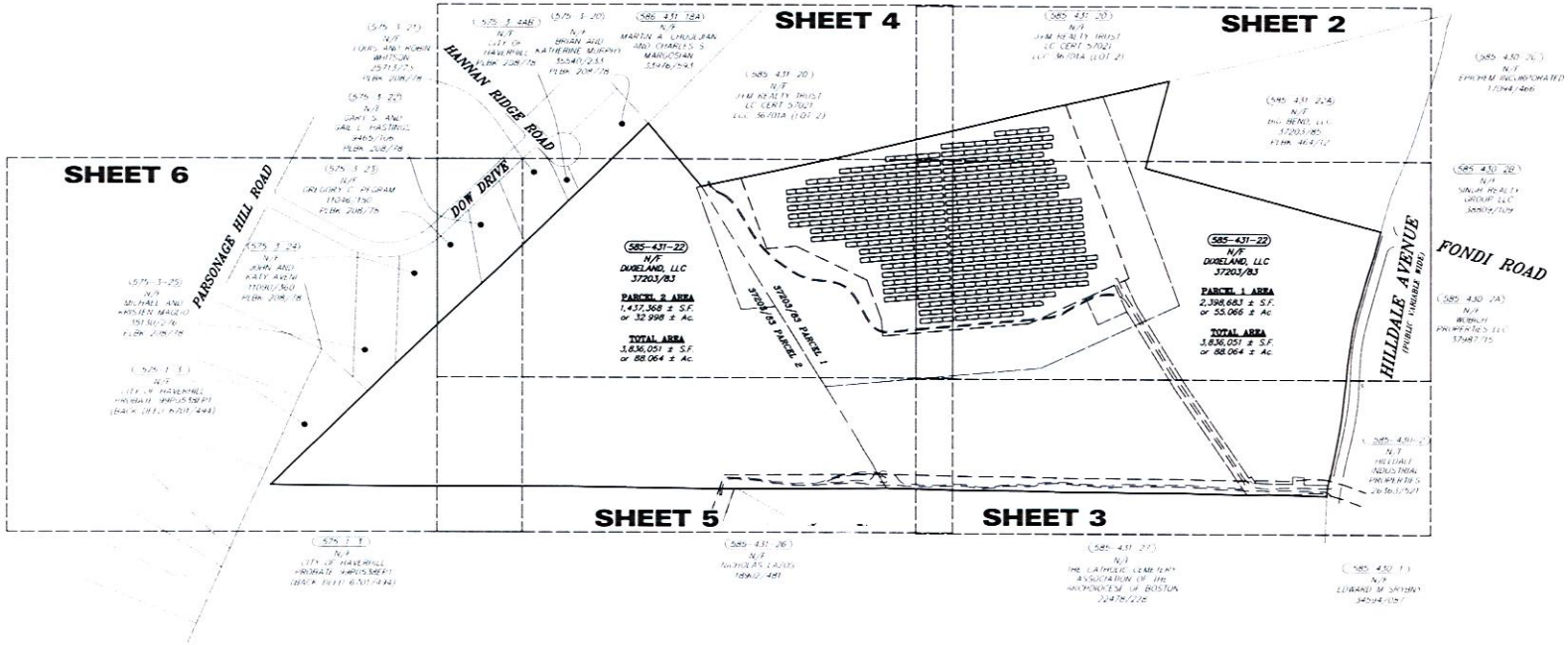
8) ALL ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

9) NAD83 HORIZONTAL COORDINATE SYSTEM ESTABLISHED BY GPS-VRS METHODS, NAD_83(2011)(EPOCH:2010).

10) THE POSITIONAL ACCURACY OF THE DATA AND PHYSICAL IMPROVEMENTS ON THIS PLAN MAY BE APPROXIMATE. ANY USE OF ELECTRONIC DATA CONTAINED IN AUTOCAD VERSIONS OF THIS PLAN TO GENERATE COORDINATES OR DIMENSIONS NOT SHOWN ON THE PLAN IS NOT AUTHORIZED.

LEGEND

	LOCUS PROPERTY LINE		100' BUFFER ZONE
	ABUTTER PROPERTY LINE		50' NO-BUILD ZONE
	GRAVEL ACCESS ROAD		25' NO-BUILD NO-DISTURBANCE ZONE
	GAS LINE/GATE		MINOR CONTOUR
OHE	OVERHEAD ELECTRIC	730	MAJOR CONTOUR
	UTILITY POLE	+123.4	SPOT ELEVATION
	UTILITY POLE w/LIGHT		EDGE OF WATER
	UTILITY POLE w/TRANSFORMER		BITUMINOUS CONCRETE
	GUY WIRE	BM/S	BENCHMARK/SET
	SIGN		CAPE COD BERM
	POST		POLYVINYL CHLORIDE
	CHAIN LINK FENCE		ELECTRIC METER
	GRANITE CURB		BOULDER
	TREE		DRAIN MANHOLE
	TREE LINE		DRILL HOLE
	EDGE OF BRUSH	FND	FOUND
	STONE WALL	100.00'	DISTANCE (BY RECORD)
	BOUNDARY OF BORDERING VEGETATED WETLAND	100.00's	DISTANCE (BY SURVEY)
	BANK/BANK FLAG	(25-13-2)	ASSESSOR ID MAP/LOT



PREPARED FOR:

BWC CAMP BROOK, LLC

P.O. BOX 171381
BOSTON, MASSACHUSETTS 02117

RECORD OWNER:

DIXIELAND, LLC

BOOK 37203 PAGE 83

ASSESSOR'S MAP 585
BLOCK 431 LOT 22

5			
4			
3			
2			
1	05/27/2021	REVISE BUFFER ZONES	
0	05/11/2021	INITIAL ISSUE	
ISSUE DATE		DESCRIPTION	
JMC	MEB	MPM	MEB
FLD	CALC	DWN	CHK'D

COMMONWEALTH OF MASSACHUSETTS
MARK E. BENSON
No. 49416
REGISTERED PROFESSIONAL LAND SURVEYOR

Mark E. Benson
5/27/2021

INDEX PLAN

HILLDALE AVENUE SOLAR 2
HAVERHILL, MA
(ESSEX COUNTY)

PREPARED BY:

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

BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, Massachusetts 01772-2104
T 508.366.0560 | www.bealsandthomas.com

DATE: MAY 11, 2021

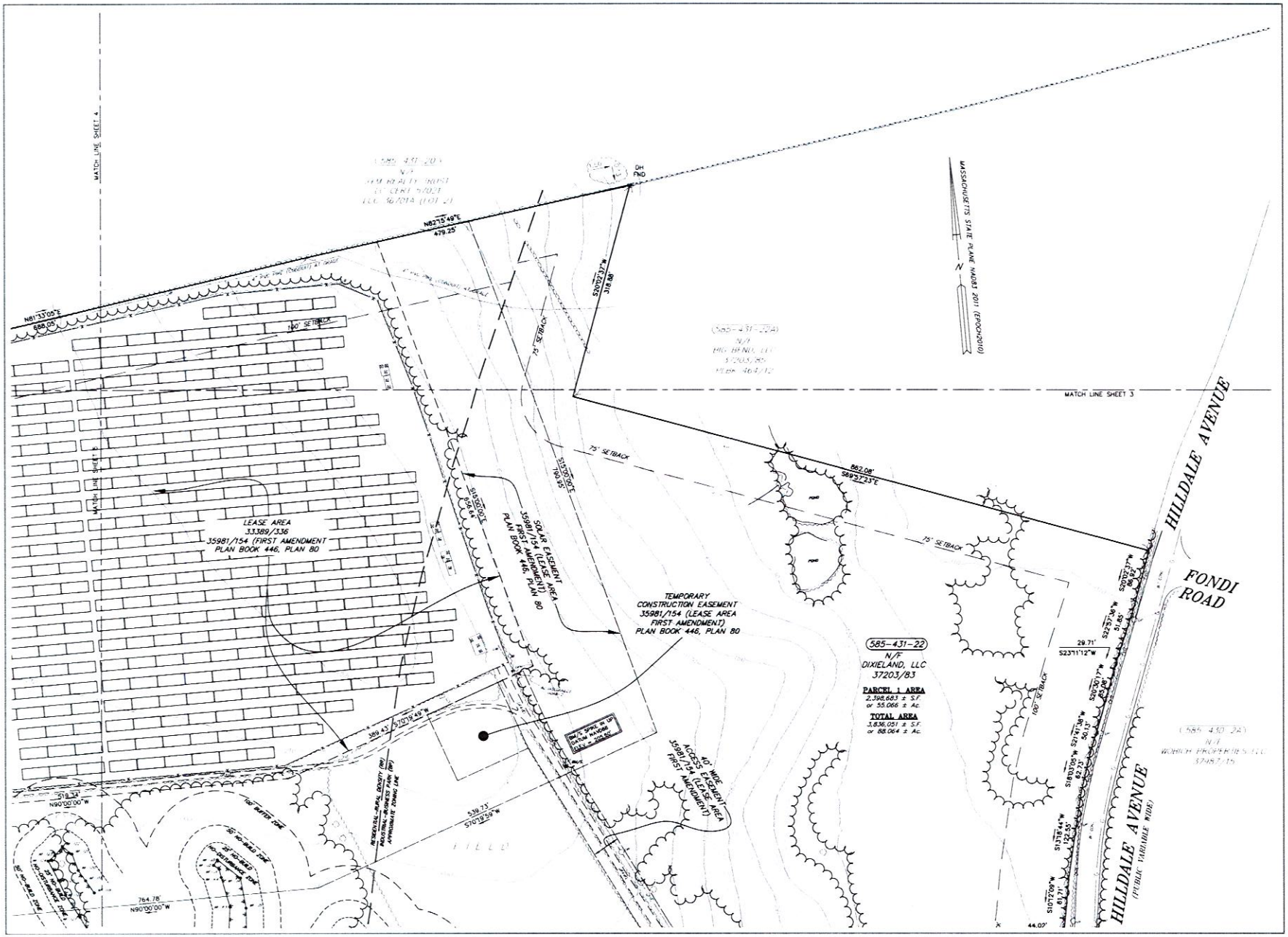
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B+T JOB NO. 3274.00

B+T PLAN NO. 327400P0058-001

SHEET No. 1 OF 6

TP-1



PREPARED FOR:

BWC CAMP BROOK, LLC

P.O. BOX 171381
BOSTON, MASSACHUSETTS 02117

RECORD OWNER:

DIXIELAND, LLC

BOOK 37203 PAGE 83

ASSESSOR'S MAP 585
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ISSUE	DATE	DESCRIPTION	
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FLD	CALC	DWN	CHK'D

COMMONWEALTH OF MASSACHUSETTS
MARK E. BENSON
No. 48416
REGISTERED PROFESSIONAL ENGINEER

Mark E. Benson
5/27/2021

BOUNDARY AND TOPOGRAPHIC PLAN

HILLDALE AVENUE SOLAR 2
HAVERHILL, MA
(ESSEX COUNTY)

PREPARED BY:

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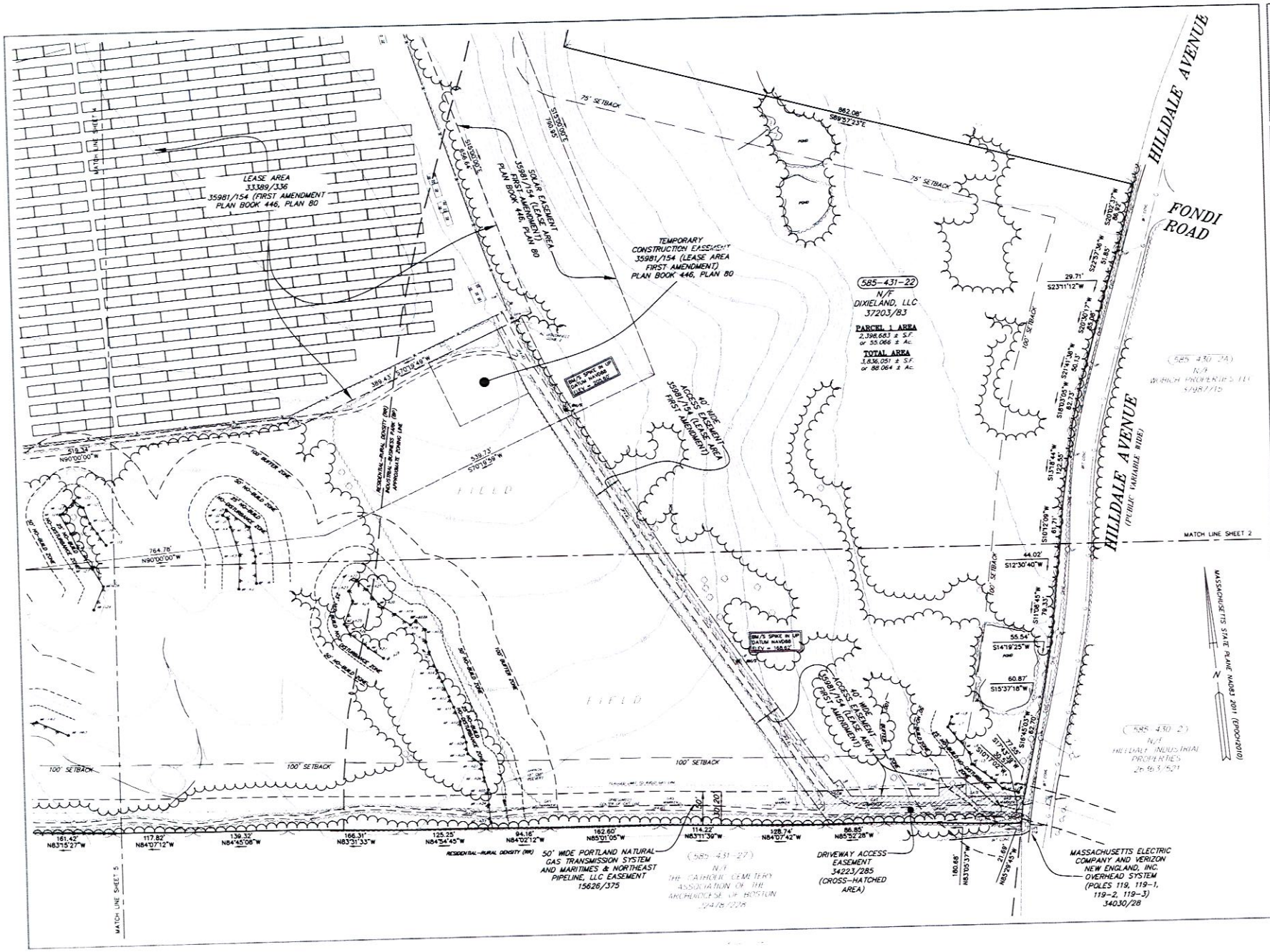
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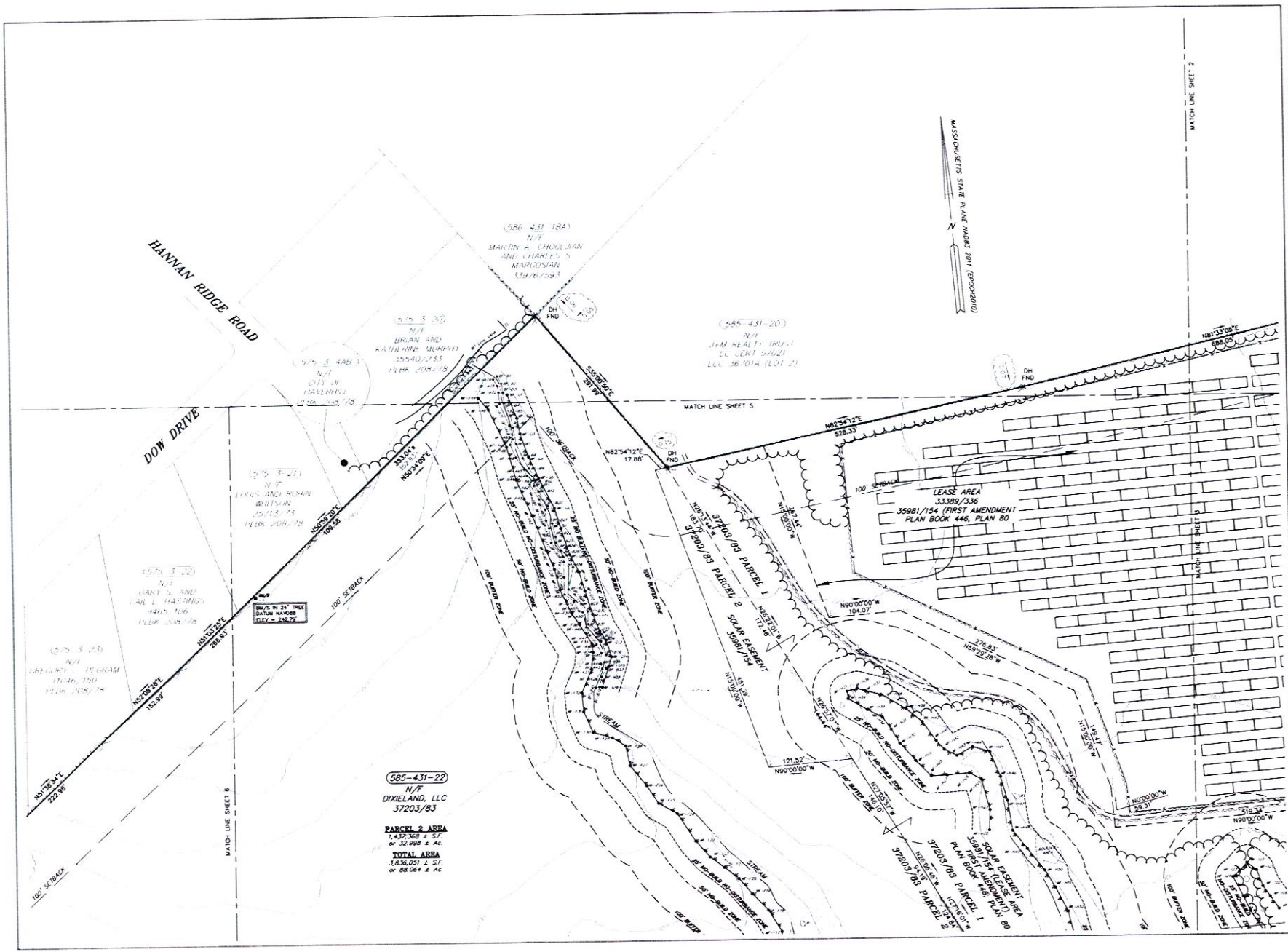
B+T JOB NO. 3274.00

B+T PLAN NO. 3274OOPG058-002

SHEET No. 2 OF 6

TP-2


HILLDALE AVENUE
FONDI ROAD
HILLDALE AVENUE
(PUBLIC VARIABLE WIDE)
LEASE AREA
33389/336
35981/154 (FIRST AMENDMENT
PLAN BOOK 446, PLAN 80
SOLAR EASEMENT
35981/154 (LEASE AREA
FIRST AMENDMENT)
PLAN BOOK 446, PLAN 80
TEMPORARY
CONSTRUCTION EASEMENT
35981/154 (LEASE AREA
FIRST AMENDMENT)
PLAN BOOK 446, PLAN 80
40' WIDE EASEMENT
ACCESS (LEASE AREA
35981/154 FIRST AMENDMENT)
585-431-22
N/F
DIXIELAND, LLC
37203/83
PARCEL 1 AREA
2,398,683 ± S.F.
or 55.066 ± Ac.
TOTAL AREA
3,836,051 ± S.F.
or 88.064 ± Ac.
(585-430-2A)
N/F
WORCH PROPERTIES, LLC
37087/75
(585-430-2)
N/F
HILLDALE INDUSTRIAL
PROPERTIES
26963/521
MATCH LINE SHEET 2
MATCH LINE SHEET 5
100' SETBACK
75' SETBACK
50' BUFFER ZONE
FIELD
862.08'
S89°57'23"E
764.76'
N90°00'00"W
519.33'
N90°00'00"W
539.73'
S70°19'59"W
389.43'
S70°19'49"W
RESIDENTIAL-RURAL DENSITY (RR)
INDUSTRIAL-BUSINESS PARK (IBP)
APPROXIMATE ZONING LINE
50' WIDE PORTLAND NATURAL GAS TRANSMISSION SYSTEM AND MARITIMES & NORTHEAST PIPELINE, LLC EASEMENT 15626/375
(585-431-27)
N/F
THE CATHOLIC CEMETERY ASSOCIATION OF THE ARCHDIOCESE OF BOSTON
32478/226
DRIVEWAY ACCESS EASEMENT 34223/285 (CROSS-HATCHED AREA)
MASSACHUSETTS ELECTRIC COMPANY AND VERIZON NEW ENGLAND, INC. OVERHEAD SYSTEM (POLES 119, 119-1, 119-2, 119-3) 34030/28
MASSACHUSETTS STATE PLANE NAD83 2011 (EPOCH2010)
N
161.42' N83°15'27"W
117.82' N84°07'12"W
139.32' N84°45'08"W
166.31' N83°21'33"W
125.25' N84°24'45"W
94.18' N84°02'12"W
162.60' N85°01'05"W
114.22' N83°11'39"W
128.74' N84°07'42"W
86.85' N85°52'28"W
160.68' N83°05'37"W
21.69' N85°29'45"W
29.71' S23°11'12"W
44.02' S12°30'40"W
55.54' S14°19'25"W
60.87' S15°37'18"W
82.20' S16°45'51"W
S27°57'36"W 51.45'
S20°00'17"W 85.92'
S18°03'09"W 82.73'
S27°41'38"W 56.13'
S13°16'44"W 122.58'
S10°17'09"W 67.21'
S11°06'45"W 79.35'
S17°07'22"W 30.53'
S17°43'38"W 27.15'
S20°00'17"W 85.92'
100' SETBACK
50' BUFFER ZONE
50' NO-BUILD ZONE
25' NO-BUILD ZONE
50' NO-BUILD ZONE
25' NO-BUILD ZONE
50' NO-BUILD ZONE
25' NO-BUILD



PREPARED FOR:

BWC CAMP BROOK, LLC

P O BOX 171381
BOSTON, MASSACHUSETTS 02117

RECORD OWNER

DIXIELAND, LLC

BOOK 37203 PAGE 83

ASSESSOR'S MAP 585
BLOCK 431 LOT 22

5			
4			
3			
2			
1	05/27/2021	REVISE BUFFER ZONES	
0	05/11/2021	INITIAL ISSUE	
ISSUE	DATE	DESCRIPTION	
JMC	MEB	MPM	MEB
FLD	CALC	DWN	CHK'D

MARK E. BENSON No. 48416 REGISTERED LAND SURVEYOR

Mark E. Benson
5/27/2021

BOUNDARY AND TOPOGRAPHIC PLAN

HILLDALE AVENUE SOLAR 2
HAVERHILL, MA
(ESSEX COUNTY)

PREPARED BY:

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DATE: MAY 11, 2021

SCALE: 1"=60'

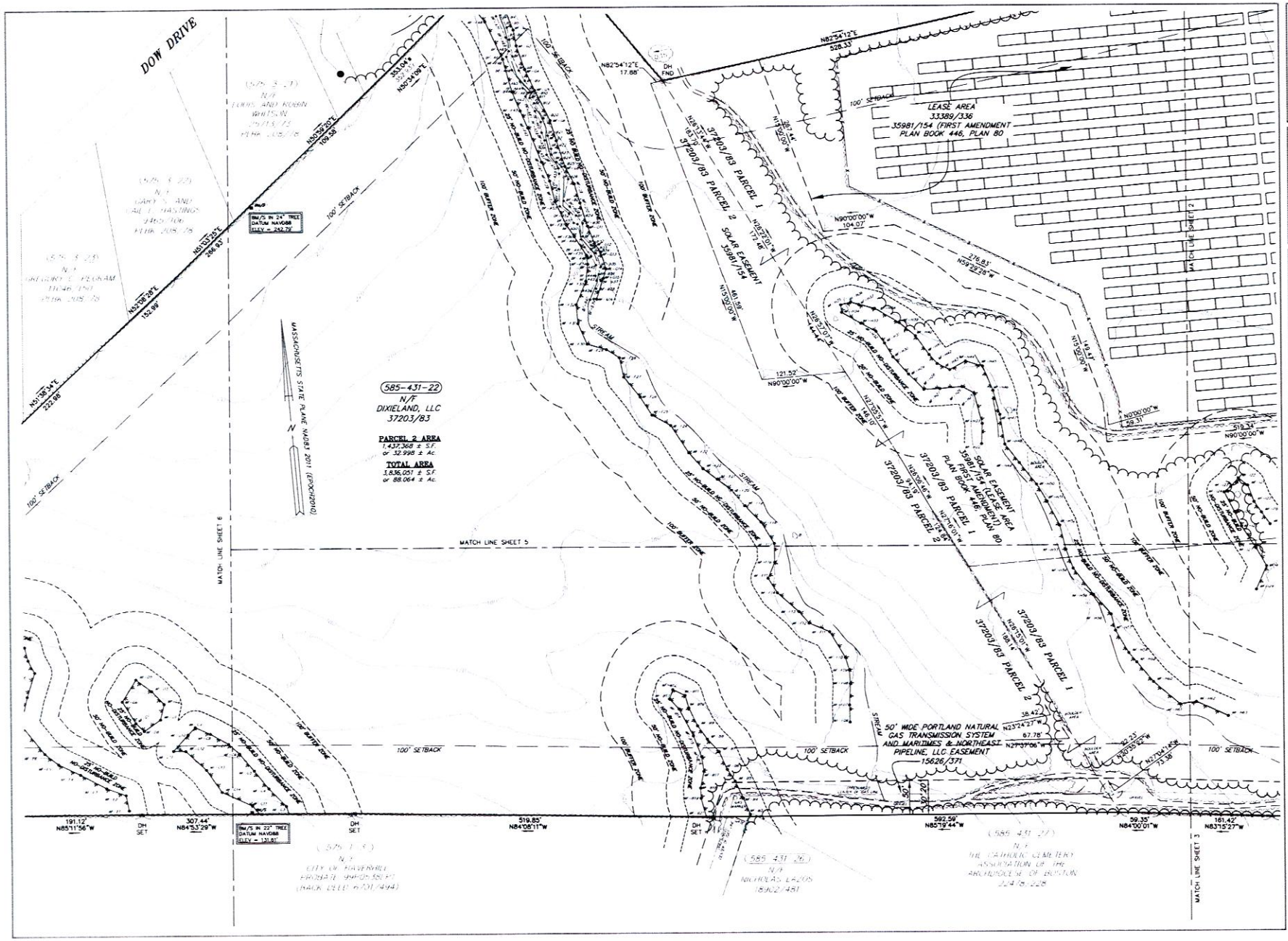
METERS 0 10 20 30 FEET 0 30 60 120 180

B+T JOB NO. 3274.00

B+T PLAN NO. 3274.00PO0058-004

SHEET No. 4 OF 6

TP-4



PREPARED FOR:

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P.O. BOX 171381
BOSTON, MASSACHUSETTS 02117

RECORD OWNER:

DIXIELAND, LLC

BOOK 37203 PAGE 83

ASSESSOR'S MAP 585
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5			
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MARK E. BENSON No. 48416 REGISTERED PROFESSIONAL LAND SURVEYOR

Mark E. Benson
5/27/2021

BOUNDARY AND TOPOGRAPHIC PLAN

HILLDALE AVENUE SOLAR 2
HAVERHILL, MA
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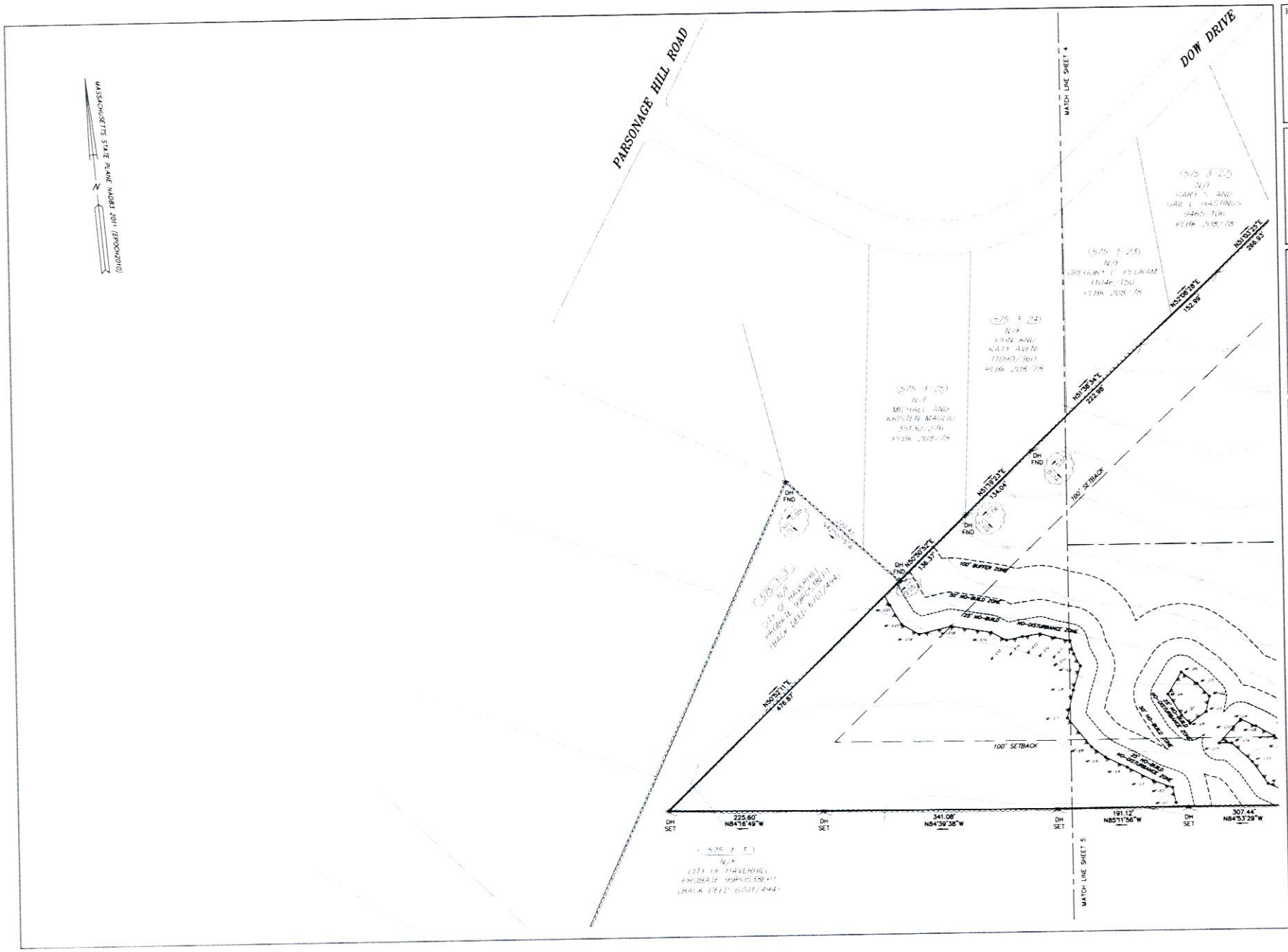
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SCALE: 1"=60'
METERS 0 10 20 30
FEET 0 30 60 120 180

B+T JOB NO. 3274.00

B+T PLAN NO. 3274.00P0058-005

SHEET No. 5 OF 6

TP-5



PREPARED FOR:

BWC CAMP BROOK, LLC

P O BOX 171381
BOSTON, MASSACHUSETTS 02117

RECORD OWNER

DIXIELAND, LLC

BOOK 37203 PAGE 83

ASSESSOR'S MAP 585
BLOCK 431 LOT 22

5			
4			
3			
2			
1	05/27/2021	REVISE BUFFER ZONES	
0	05/11/2021	INITIAL ISSUE	
ISSUE	DATE	DESCRIPTION	
JMC	MEB	MPM	MEB
FLD	CALC	DWN	CHK'D

COMMONWEALTH OF MASSACHUSETTS
MARK E. BENSON
No. 48416
REGISTERED LAND SURVEYOR

Mark E. Benson
5/27/2021

BOUNDARY AND TOPOGRAPHIC PLAN

HILLDALE AVENUE SOLAR 2
HAVERHILL, MA
(ESSEX COUNTY)

PREPARED BY:

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

BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, Massachusetts 01772-2104
T 508 366 0560 | www.bealsandthomas.com

DATE: MAY 11, 2021

SCALE: 1" = 60'

METERS: 0, 10, 20, 30, 60, 120, 180
FEET: 0, 30, 60, 120, 180

B+T JOB NO. 3274.00

B+T PLAN NO. 32740OP0058-006

SHEET No. 6 OF 6

TP-6

GENERAL NOTES

1. THE CONTRACTOR SHALL MAKE ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY PERMITS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL ALSO PAY ALL FEES AND POST ALL BONDS ASSOCIATED WITH THE SAME AND COORDINATE WITH THE ENGINEER AND ARCHITECT AS REQUIRED.
2. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR JOB SITE SAFETY AND ALL CONSTRUCTION MEANS AND METHODS.
3. LIMIT OF WORK SHALL BE EROSION CONTROL BARRIERS, LIMIT OF GRADING AND SITE PROPERTY LINES AND/OR AS INDICATED ON DRAWINGS.
4. ANY ALTERATION TO THESE DRAWINGS MADE IN THE FIELD DURING CONSTRUCTION SHALL BE RECORDED BY THE CONTRACTOR ON RECORD DOCUMENTS.
5. ANY AREA OUTSIDE THE LIMIT OF WORK THAT IS DISTURBED SHALL BE RESTORED TO ITS ORIGINAL CONDITION AT NO COST TO OWNER.
6. EXISTING TREES AND SHRUBS OUTSIDE THE LIMITS OF GRADING SHALL BE REMOVED ONLY UPON PRIOR APPROVAL OF THE OWNER.
7. FOR DRAWING LEGIBILITY, ALL EXISTING TOPOGRAPHIC FEATURES, EXISTING UTILITIES, PROPERTY BOUNDARIES, EASEMENTS, ETC MAY NOT BE SHOWN ON ALL DRAWINGS. REFER TO ALL REFERENCED DRAWINGS AND OTHER DRAWINGS IN THIS SET FOR ADDITIONAL INFORMATION.
8. ZONING DISTRICT: RURAL AGRICULTURAL DISTRICT, WATER RESOURCE PROTECTION OVERLAY DISTRICT, AQUIFER OVERLAY - TERTIARY RECHARGE AREA
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLIANCE WITH CONDITIONS THAT MAY BE PROMULGATED BY THE DOUGLAS PLANNING BOARD, CONSERVATION COMMISSION AND MUNICIPAL AGENCIES.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING, SECURING AND COMPLIANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) CONSTRUCTION GENERAL PERMIT, AS ADMINISTERED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

EROSION CONTROL AND SEDIMENTATION NOTES (DRAWING FILE NO. 142-UW00, NOI FILE NO. 142-0000)

11. AN EROSION CONTROL BARRIER SHALL BE INSTALLED ALONG THE EDGE OF PROPOSED DEVELOPMENT AS INDICATED IN THE PLAN PRIOR TO THE COMMENCEMENT OF DEMOLITION OR CONSTRUCTION OPERATIONS.
12. CONTRACTOR SHALL MAINTAIN ALL EROSION CONTROL MEASURES DURING ENTIRE CONSTRUCTION PERIOD.
13. ANY SEDIMENT TRACKED ONTO PUBLIC RIGHT OF WAYS SHALL BE SWEPT AT THE END OF EACH WORKING DAY.
14. ALL DEBRIS GENERATED DURING SITE PREPARATION ACTIVITIES SHALL BE LEGALLY DISPOSED OF OFF SITE.
15. PROVIDE DIKEING AS NECESSARY TO PROTECT EXISTING UTILITY LINES DURING CONSTRUCTION.
16. SITE ELEMENTS TO REMAIN MUST BE PROTECTED FOR DURATION OF PROJECT.
17. ALL TOPSOIL ENCOUNTERED WITHIN THE LIMITS OF THE PROPOSED PERMANENT AND TEMPORARY GRAVEL ROADS, EQUIPMENT HAU AREA, AREAS OF CUT AND FILL AND STORMWATER BASINS SHALL BE STRIPPED TO ITS FULL DEPTH AND STOCKPILED FOR REUSE. EXCESS TOPSOIL SHALL BE DISPOSED OF ON SITE AS DIRECTED BY OWNER. TOPSOIL PILES SHALL REMAIN SEGREGATED FROM EXCAVATED SUBSURFACE SOIL MATERIALS.
18. EXCESS TOPSOIL SHALL BE DISPOSED OF ON SITE AS DIRECTED BY OWNER. TOPSOIL PILES SHALL REMAIN SEGREGATED FROM EXCAVATED SUBSURFACE SOIL MATERIALS.
19. ADDITIONAL EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.
20. ALL POINTS OF CONSTRUCTION EGRESS OR INGRESS SHALL BE MAINTAINED TO PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADS.
21. TEMPORARY DIVERSION DITCHES, PERMANENT DITCHES, CHANNELS, EMBANKMENTS AND ANY DENUDED SURFACE WHICH WILL BE EXPOSED FOR AN EXTENDED PERIOD OF TIME SHALL BE CONSIDERED CRITICAL VEGETATION AREAS. THESE AREAS SHALL BE STABILIZED AS REQUIRED.
22. SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED ON A DAILY BASIS DURING CONSTRUCTION TO INSURE THAT CHANNELS, DITCHES AND PIPES ARE CLEAR OF DEBRIS AND THAT THE EROSION CONTROL BARRIERS ARE INTACT.
23. EXTREME CARE SHALL BE EXERCISED SO AS TO PREVENT ANY UNSUITABLE MATERIAL FROM ENTERING THE WETLANDS.
24. ADDITIONAL EROSION CONTROL SHALL BE LOCATED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR HIS REPRESENTATIVE.
25. CLEAN AND MAINTAIN EROSION CONTROL BARRIER AS REQUIRED DURING CONSTRUCTION OPERATIONS TO ENSURE ITS CONTINUED FUNCTIONALITY.

LAYOUT AND MATERIALS NOTES

26. ALL LINES AND DIMENSIONS ARE PARALLEL OR PERPENDICULAR TO THE LINES FROM WHICH THEY ARE MEASURED UNLESS OTHERWISE INDICATED.
27. CONTRACTOR SHALL REPORT SIGNIFICANT CONFLICTS TO THE OWNER AND THE ENGINEER FOR RESOLUTION.
28. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN SITE PLAN DIMENSIONS AND BUILDING PLANS BEFORE PROCEEDING WITH ANY PORTION OF SITE WORK WHICH MAY BE AFFECTED SO THAT PROPER ADJUSTMENTS TO THE SITE LAYOUT CAN BE MADE IF NECESSARY.
29. PROTECT EXISTING PROPERTY MONUMENTS AND ABUTTING PROPERTIES DURING CONSTRUCTION ACTIVITIES.

GRADING, DRAINAGE AND UTILITY NOTES

30. UNDERGROUND UTILITIES WERE COMPILED FROM AVAILABLE RECORD PLANS OF UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE AND ASSUMED. BEFORE COMMENCING SITE WORK IN ANY AREA, CONTACT "DIG SAFE" AT 1-888-344-7233 AND THE OWNER TO ACCURATELY LOCATE UNDERGROUND UTILITIES. ANY DAMAGE TO EXISTING UTILITIES OR STRUCTURES SHALL BE THE CONTRACTOR'S RESPONSIBILITY. NO EXCAVATION SHALL BE DONE UNTIL UTILITY COMPANIES AND THE OWNER ARE PROPERLY NOTIFIED IN ADVANCE.
31. ALL SITE WORK SHALL MEET OR EXCEED THE SITE WORK SPECIFICATIONS TO BE PREPARED FOR THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, THE CONTRACTOR SHALL NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLATION OF ANY PORTION OF THE SITE WORK WHICH WOULD BE AFFECTED.
32. ALL WORK PERFORMED AND ALL MATERIALS FURNISHED SHALL CONFORM WITH THE LINES, GRADES AND OTHER SPECIFIC REQUIREMENTS OR SPECIFICATIONS FOR THE PROJECT AS SHOWN ON THE PLANS.
33. GRADE ALL AREAS TO DRAIN.
34. THE CONTRACTOR SHALL VERIFY EXISTING GRADES IN THE FIELD AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES, AS REQUIRED. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE OWNER AND ENGINEER FOR RESOLUTION.
35. ALL UTILITY COVERS, GRATES, ETC. SHALL BE ADJUSTED TO BE FLUSH WITH THE FINISH GRADE UNLESS OTHERWISE NOTED.
36. INSTALL ALL UTILITIES (INCLUDING CONCRETE PADS) PER UTILITY COMPANY OR DPW STANDARDS, AS APPLICABLE.
37. CONTRACTOR SHALL PROTECT ALL UNDERGROUND DRAINAGE, SEWER AND UTILITY FACILITIES FROM EXCESSIVE VEHICULAR LOADS DURING CONSTRUCTION. ANY DAMAGE TO THESE FACILITIES RESULTING FROM CONSTRUCTION LOADS WILL BE RESTORED TO ORIGINAL CONDITION.
38. THE CONTRACTOR SHALL REMOVE ALL EROSION CONTROL BARRIERS AFTER REVEGETATION OF DISTURBED AREAS AND AFTER APPROVAL OF THE CONSERVATION COMMISSION AND WETLAND SPECIALIST.
39. WETLANDS ARE TO REMAIN UNDISTURBED. NO ENCROACHMENT PERMITTED.
40. PITCH EVENLY BETWEEN SPOT GRADES.
41. THE CONTRACTOR SHALL SCHEDULE HIS WORK TO ALLOW THE FINISHED SUBGRADE ELEVATIONS TO DRAIN PROPERLY WITHOUT PUDDLING. SPECIFICALLY ALLOW WATER TO ESCAPE WHERE PROPOSED CURB MAY RETAIN RUNOFF PRIOR TO APPLICATION OF THE FINISH SUBGRADE AND/OR SURFACE PAVING. PROVIDE TEMPORARY POSITIVE DRAINAGE AS REQUIRED.
42. ALL STORMWATER SHALL BE TREATED PRIOR TO DISCHARGE IN ACCORDANCE WITH THE MASSDEP STORMWATER HANDBOOK AND USEPA CONSTRUCTION GENERAL PERMIT DURING CONSTRUCTION.

PLANTING NOTES

43. LOAM AND SEED ALL DISTURBED AREAS INCLUDING LAYDOWN AREAS PER LOAM AND SEED DETAIL ON C7.1
44. PLANTING SEED SHALL BE SOWN IN SEASONAL CONDITIONS AS APPROPRIATE FOR GOOD SEED SURVIVAL, OR AT SUCH TIMES AS APPROVED BY THE OWNER.
45. REMOVE ALL ROCKS AND DEBRIS FROM SOIL SURFACE AND GRADE TO AN EVEN SURFACE.
46. REPAIR AND REESTABLISH GRADES IN SETTLED, ERODED AND MUTTED AREAS TO THE SPECIFIED GRADE AND TOLERANCES.
47. IF CERTAIN AREAS OF THE LAWN DO NOT SHOW A PROPER "CATCH", THESE AREAS SHALL BE RESEEDED AT THE SAME RATE AND IN THE SAME MANNER AS BEFORE. THIS PROCESS SHALL CONTINUE UNTIL GRASS IS ESTABLISHED OVER THE ENTIRE AREA.
48. PROTECT NEWLY TOPSOILED, GRADED AND/OR SEEDED AREAS FROM TRAFFIC AND EROSION. KEEP AREAS FREE OF TRASH AND DEBRIS RESULTING FROM LANDSCAPE CONTRACTOR OPERATIONS.
49. TOPSOIL SHALL BE SPREAD TO A MINIMUM DEPTH OF FOUR (4) INCHES AFTER SETTING ON ALL STRIPPED PLANTED AREAS INCLUDING PLANTING BEDS, AFTER FILLS ARE PROPERLY SETTLED AND SUBGRADE HAS BEEN APPROVED BY THE OWNER. THE SETTLED TOPSOIL SHALL BE UP TO THE FINISHED GRADE AS CALLED FOR ON THE DRAWINGS.
50. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
51. THE LANDSCAPE CONTRACTOR IS TO CLEAN UP AND REMOVE ANY DEBRIS FROM THE SITE CAUSED BY THE LANDSCAPE CONTRACTOR.

SURVEY NOTES

1) UNDERGROUND UTILITIES WERE COMPILED FROM AVAILABLE RECORD PLANS OF UTILITY COMPANIES AND PUBLIC AGENCIES AND ARE APPROXIMATE ONLY. BEFORE CONSTRUCTION CALL "DIG SAFE" 1-888-344-7233.
2) THIS PLAN WAS PREPARED FROM AN ACTUAL SURVEY MADE ON THE GROUND USING TOTAL STATION METHODS ON OR BETWEEN FEBRUARY 17, 2021 AND MARCH 22, 2021.
3) THE PRESUMED CENTER OF GAS LINE IS BASED ON THE LOCATION OF THE RECORD DOCUMENTS AND FITTING TO THE LOCATION OF GAS MARKERS FOUND IN THE FIELD. THE EDGES OF THE EASEMENT ARE OFFSET 20' TO THE NORTH AND 30' TO THE SOUTH BASED ON THE RECORD DOCUMENTS.
4) TOPOGRAPHIC AND DETAIL INFORMATION PROVIDED BY BLUESKY GEOSPATIAL LTD. BASED ON PHOTOGRAPHY FLOWN ON DECEMBER 15, 2020. AERIAL CONTROL FOR THE SURVEY WAS PERFORMED BY BEALS AND THOMAS, INC. ON JANUARY 31, 2021.
5) THE PARCEL SHOWN IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN), AS SHOWN ON "FLOOD INSURANCE RATE MAPS, ESSEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS) PANELS 67 AND 86 OF 600", MAP NUMBERS 25009C0067F AND 25009C0086F RESPECTIVELY, EFFECTIVE DATE JULY 3, 2012.
6) WETLAND RESOURCE AREAS DELINEATED BY BEALS AND THOMAS, INC. ON FEBRUARY 11-12 AND MARCH 11, 2021.
7) WETLAND RESOURCE AREA FLAGS LOCATED BY TOTAL STATION METHODS BY BEALS AND THOMAS, INC. ON OR BETWEEN FEBRUARY 22 AND MARCH 22, 2021.
8) ALL ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
9) NAD83 HORIZONTAL COORDINATE SYSTEM ESTABLISHED BY GPS-VRS METHODS. NAD_83(2011)(EPOCH:2010).
10) THE POSITIONAL ACCURACY OF THE DATA AND PHYSICAL IMPROVEMENTS ON THIS PLAN MAY BE APPROXIMATE. ANY USE OF ELECTRONIC DATA CONTAINED IN AUTOCAD VERSIONS OF THIS PLAN TO GENERATE COORDINATES OR DIMENSIONS NOT SHOWN ON THE PLAN IS NOT AUTHORIZED.

ZONING TABLE

Zoning District	Rural Density (RR) District		Business Park (BP) District		Large-Scale Ground-Mount Solar Energy Use	
	Required	Proposed	Required	Proposed	Required	Proposed
Minimum Lot Area (SF)	40,000	No Change	40,000	No Change	--	--
Minimum Lot Depth (ft)	125	No Change	150	No Change	--	--
Minimum Lot Frontage (ft)	200	No Change	150	No Change	--	--
Minimum Front Yard Setback (ft)	40	100+	10	100+	100+	100+
Minimum Side Yard Setback (ft)	25	100+	15	100+	75*	100+
Minimum Rear Yard Setback (ft)	40	100+	25	100+	75*	100+
Maximum Building Coverage (%)	35	N/A	50	N/A	--	--
Maximum Structure Height (ft)	35	N/A	85	N/A	--	--

Zoning requirements have been extracted from the City of Haverhill Zoning Code

*In accordance with the Haverhill Zoning Ordinance, the side yard and rear yard setbacks for large scale ground-mounted solar energy facilities shall be 75-feet unless the Property abuts a Residential district, then the setback shall not be less than 100-feet.

LEGEND AND ABBREVIATIONS

EXISTING	PROPOSED	
		LOCUS PROPERTY LINE
		ABUTTER PROPERTY LINE
		GRAVEL ACCESS ROAD
		GAS LINE/GATE
		OVERHEAD ELECTRIC
		UTILITY POLE
		UTILITY POLE w/LIGHT
		UTILITY POLE w/TRANSFORMER
		GUY WIRE
		SIGN
		POST
		CHAIN LINK FENCE
		GRANITE CURB
		TREE
		TREE LINE
		EDGE OF BRUSH
		STONE WALL
		BOUNDARY OF BORDERING VEGETATED WETLAND
		BANK/BANK FLAG
		100' BUFFER ZONE
		50' NO-BUILD ZONE
		25' NO-BUILD NO-DISTURBANCE ZONE
		MINOR CONTOUR
		MAJOR CONTOUR
		SPOT ELEVATION
		EDGE OF WATER
		BITUMINOUS CONCRETE
		BENCHMARK/SET
		CAPE COD BERM
		POLYVINYL CHLORIDE
		ELECTRIC METER
		BOULDER
		DRAIN MANHOLE
		DRILL HOLE
FND		FOUND
100.00'		DISTANCE (BY RECORD)
100.00's		DISTANCE (BY SURVEY)
25-13-2		ASSESSOR ID MAP/LOT
		DRAIN LINE/FLARED END
		UNDERGROUND MEDIUM VOLTAGE CONDUIT
		WOVEN WIRE FENCE
		OUTLET CONTROL STRUCTURE
		SEDIMENT CONTROL BARRIER
		SOLAR PANEL ARRAY

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PREPARED FOR:

BWC CAMP BROOK, LLC

P.O. BOX 171381
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JEFFREY R. MAUGHAN
No. 51800
REGISTERED PROFESSIONAL ENGINEER
CIVIL
6/3/2021

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0	06/03/2021	ISSUED FOR PERMITTING		
ISSUE	DATE	DESCRIPTION		
NBB		NBB	JRM	JRM
DES		DWN	CHK'D	APP'D

PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL, MASSACHUSETTS

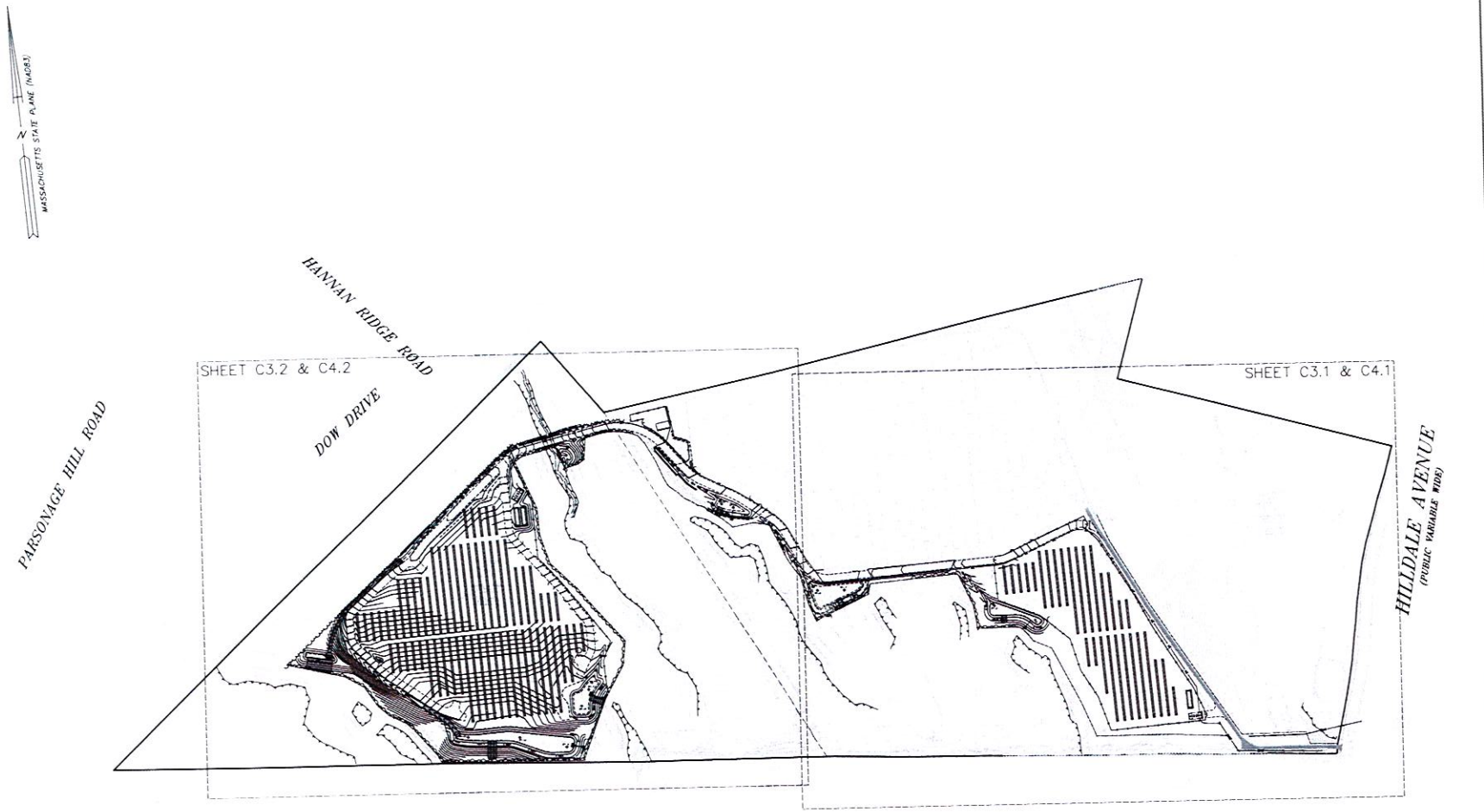
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NOTES, REFERENCES AND LEGEND

B+T JOB NO.3274.00

B+T PLAN NO. 3274.00P002A-002

C1.1



FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

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NBB	NBB	JRM	JRM
DES	DWN	CHK'D	APP'D

PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL,
MASSACHUSETTS

SCALE: 1" = 150' DATE: JUNE 3, 2021

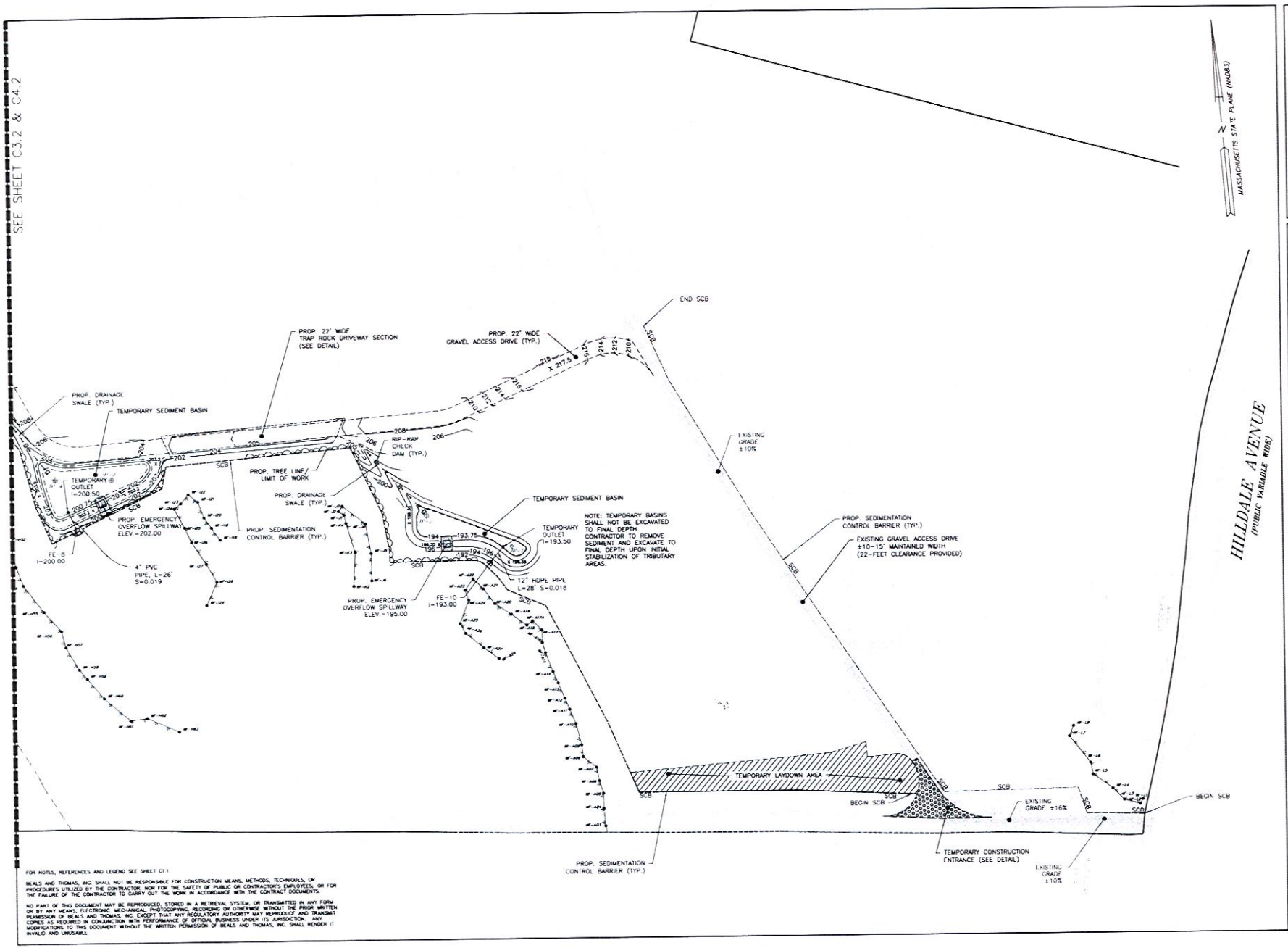
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INDEX PLAN

B+T JOB NO.3274.00

B+T PLAN NO.
3274OOP003A-001

C2.1



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6/3/2021

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PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL, MASSACHUSETTS

SCALE: 1" = 60' DATE: JUNE 3, 2021

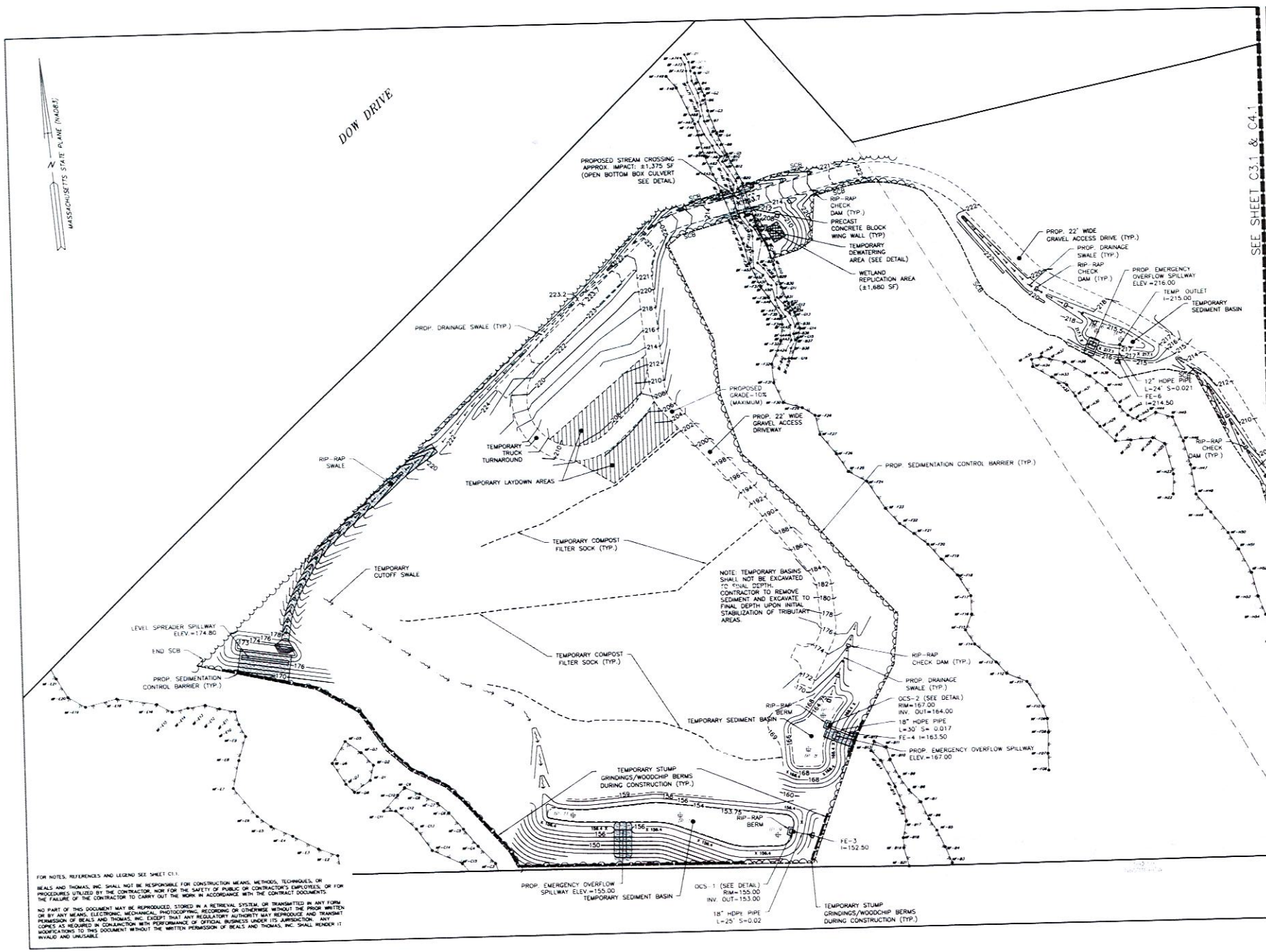
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SITE PREPARATION PLAN

B+T JOB NO.3274.00

B+T PLAN NO. 3274.00P003A-002

C3.1



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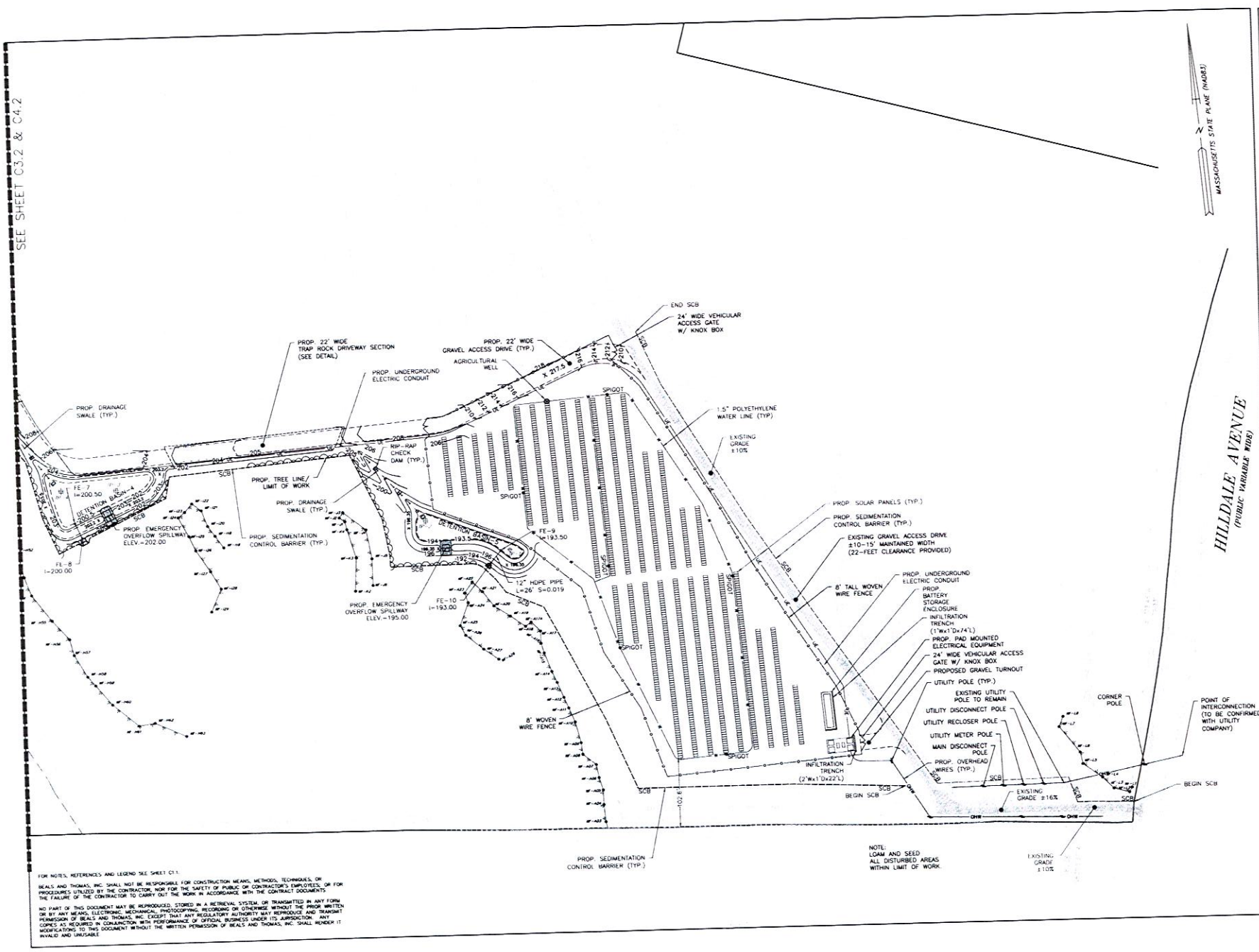
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FEET 0 30 60 120 180

SITE PREPARATION PLAN

B+T JOB NO.3274.00

B+T PLAN NO. 3274.00P003A-003

C3.2



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PREPARED FOR:

BWC CAMP BROOK, LLC

P.O. BOX 171381
BOSTON, MASSACHUSETTS 02117

JEFFREY R. MURPHY CIVIL No. 51860 REGISTERED PROFESSIONAL ENGINEER
9/3/2021

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144 Turnpike Road
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T 508.366.0560 | www.bealsandthomas.com

ISSUE	DATE	DESCRIPTION
5		
4		
3		
2		
1		
0	09/03/2021	ISSUED FOR PERMITTING

NBB	NBB	JRM	JRM
DES	DWN	CHK'D	APP'D

PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL, MASSACHUSETTS

SCALE: 1" = 60' DATE: JUNE 3, 2021

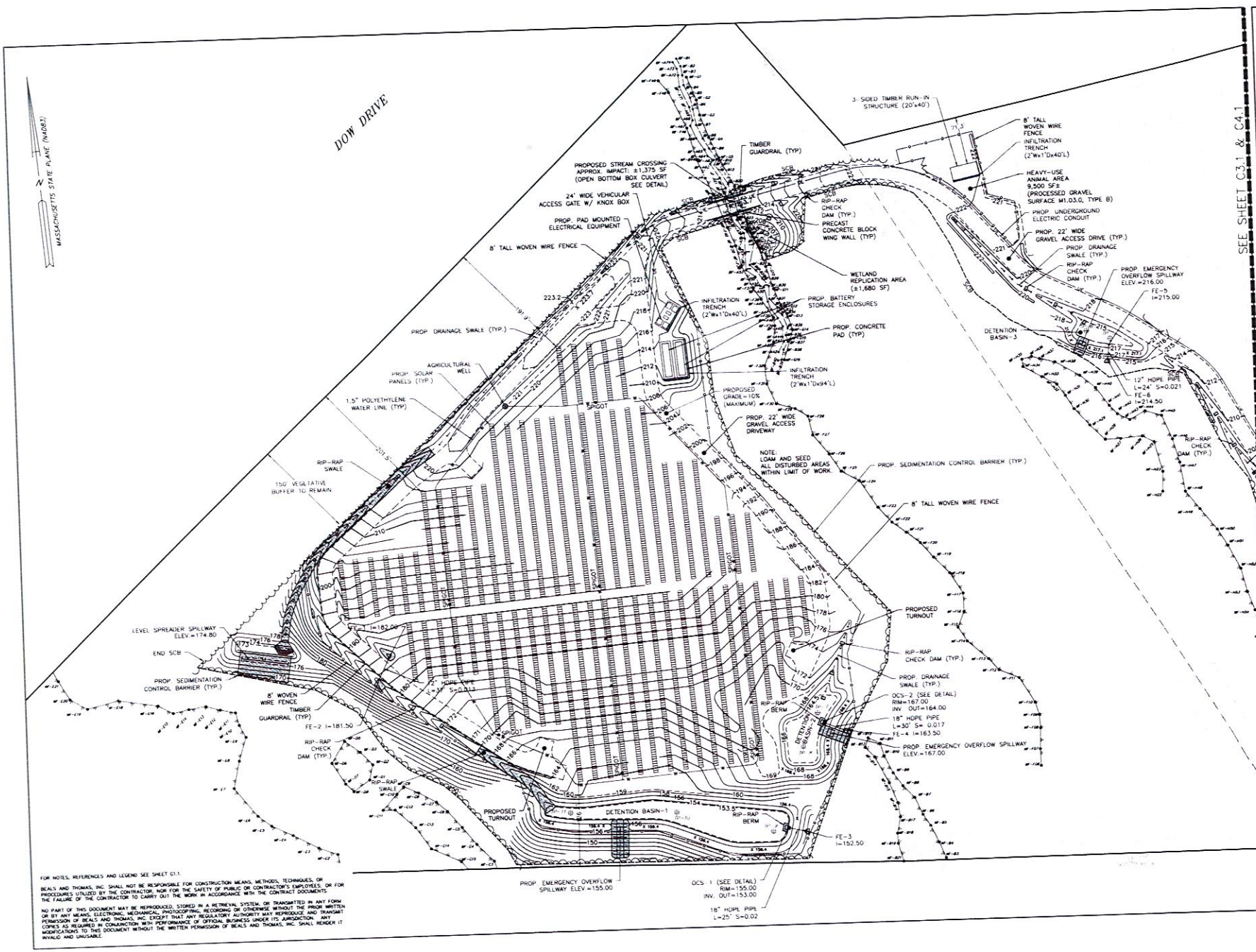
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SITE PLAN

B+T JOB NO.3274.00

B+T PLAN NO. 3274.00P003A-004

C4.1



FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

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JEFFREY R. MAYNARD
CIVIL
No. 51800
REGISTERED PROFESSIONAL ENGINEER
6/3/2021

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0	06/03/2021	ISSUED FOR PERMITTING		
ISSUE	DATE	DESCRIPTION		
NBB		NBB	JRM	JRM
DES		DWN	CHK'D	APP'D

PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL, MASSACHUSETTS

SCALE: 1" = 60' DATE: JUNE 3, 2021

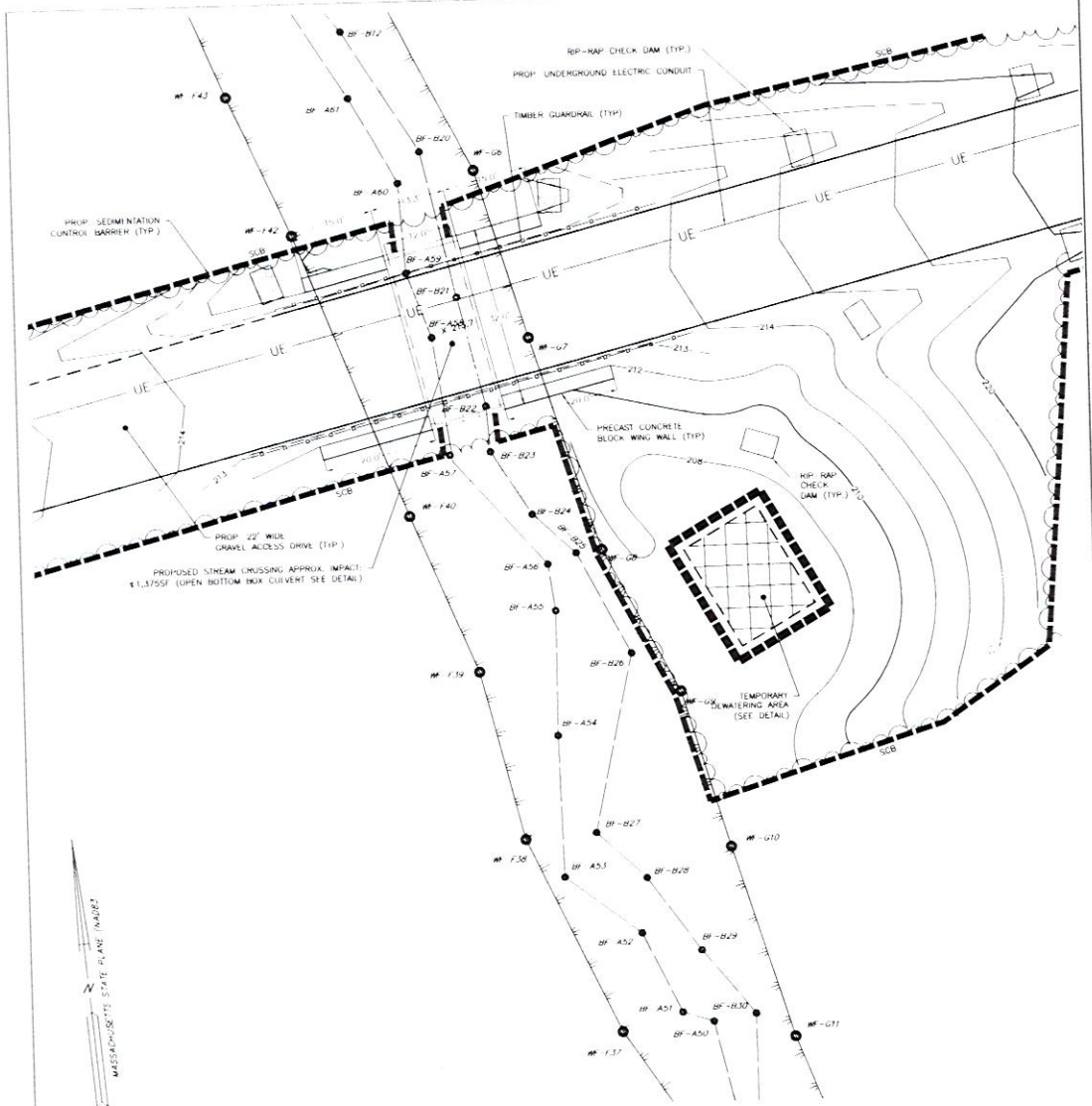
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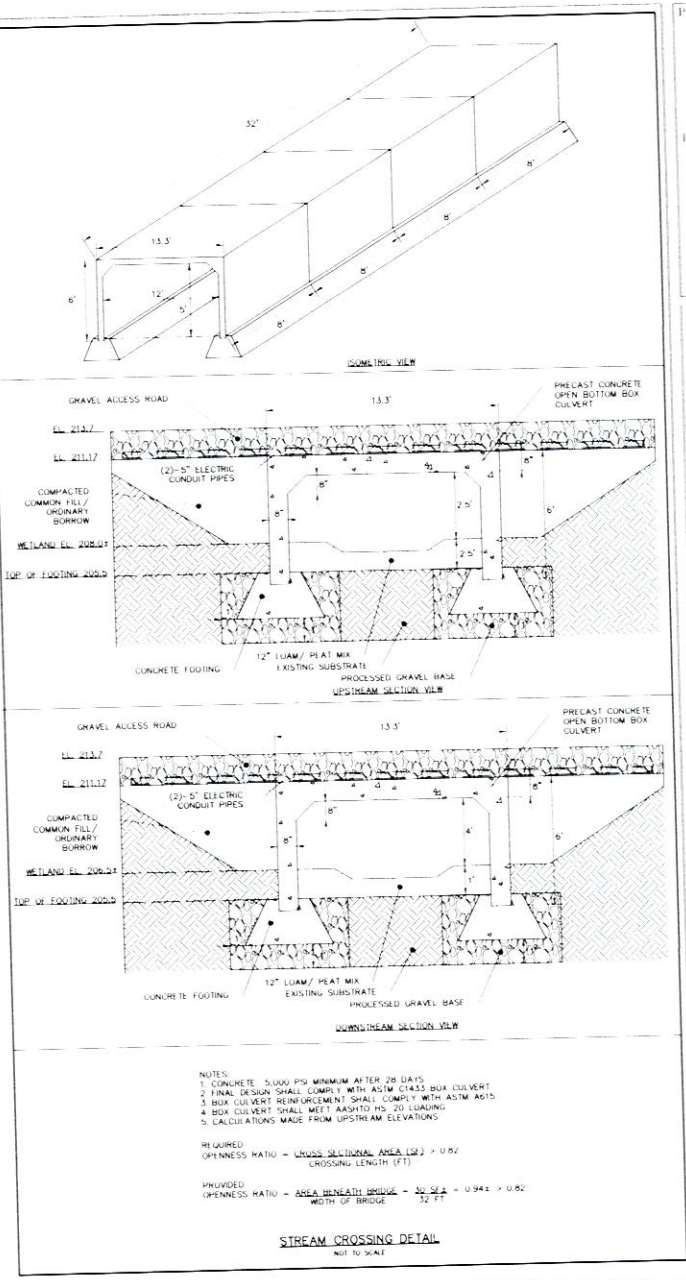
SITE PLAN

B+T JOB NO.3274.00

B+T PLAN NO. 3274.00P003A-005

C4.2





NOTES:
1. CONCRETE: 5,000 PSI MINIMUM AFTER 28 DAYS.
2. FINAL DESIGN SHALL COMPLY WITH ASTM C1433 BOX CULVERT.
3. BOX CULVERT REINFORCEMENT SHALL COMPLY WITH ASTM A615.
4. BOX CULVERT SHALL MEET AASHTO HS-20 LOADING.
5. CALCULATIONS MADE FROM UPSTREAM ELEVATIONS.

REQUIRED
OPENNESS RATIO = CROSS SECTIONAL AREA (SF) / CROSSING LENGTH (FT) > 0.82

PROVIDED
OPENNESS RATIO = AREA BENEATH BRIDGE / WIDTH OF BRIDGE = 30 SF/A / 32 FT = 0.94± > 0.82

STREAM CROSSING DETAIL
NOT TO SCALE

FOR NOTES, REFERENCES AND LEGEND SEE SHEET GT.1

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6/3/2021

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PROJECT
HILLDALE AVENUE SOLAR 2
HAVERHILL, MASSACHUSETTS

SCALE: 1" = 60' DATE: JUNE 3, 2021

METERS: 0 10 20 30
FEET: 0 30 60 120 180

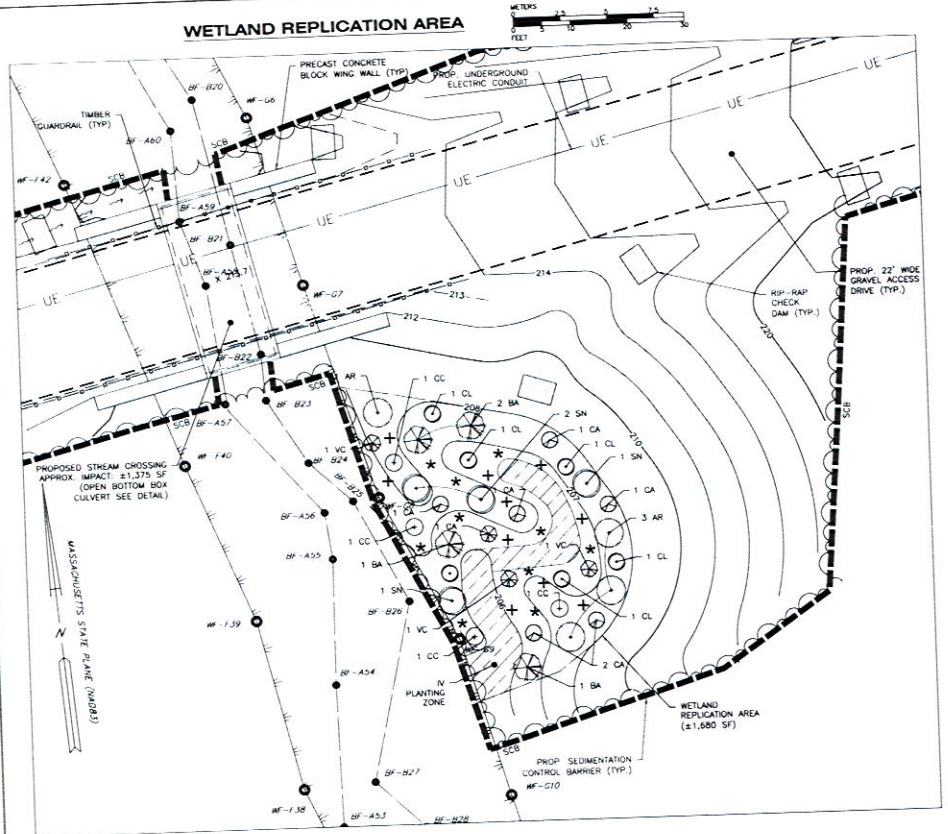
STREAM CROSSING PLAN

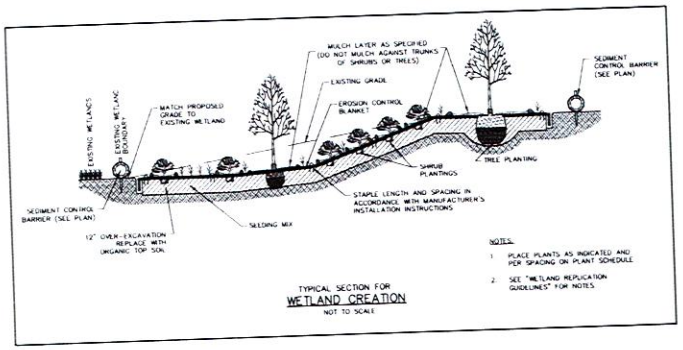
B+T JOB NO. 3274.00

B+T PLAN NO. 3274.00P003A-006

C5.1

WETLAND REPLICATION AREA





NOTES:
1. PLACE PLANTS AS INDICATED AND PER SPACING ON PLANT SCHEDULE
2. SEE "WETLAND REPLICATION GUIDELINES" FOR NOTES.

TYPICAL SECTION FOR
WETLAND CREATION
NOT TO SCALE

WETLAND REPLICATION GUIDELINES

GENERAL NOTES

1. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR JOB SITE SAFETY AND ALL CONSTRUCTION MEANS AND METHODS.
2. SOIL COMPACTION BY HEAVY MACHINERY SHOULD BE AVOIDED. WHERE SOILS HAVE BEEN COMPACTED BY HEAVY MACHINERY, DISKING WILL BE UNDERTAKEN TO LOOSEN THE SOIL SURFACE.
3. CONSTRUCTION OF THE WETLAND REPLICATION AREA SHALL OCCUR PRIOR TO THE CONSTRUCTION OF THE WETLAND CROSSING. THE WETLAND REPLICATION AREA SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF HAVERHILL WETLANDS PROTECTION ORDINANCE, AND SHALL BE CONSTRUCTED TO THE SATISFACTION OF THE HAVERHILL CONSERVATION AGENT.

WETLAND REPLICATION NOTES:

4. WETLAND SEEDING SHALL PREFERABLY OCCUR DURING THE SPRING PLANTING PERIOD. DEVIATIONS FROM THE PLANTING SCHEDULE AND/OR APPROVED PLANTING LIST MUST BE APPROVED IN ADVANCE BY THE WETLAND SPECIALIST.
5. ANY INVASIVE SPECIES ENCOUNTERED DURING SITE PREPARATION AND EXCAVATION ARE TO BE DISPOSED OF AT AN APPROVED OFF-SITE LOCATION.
6. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
7. THE TIME OF WETLAND SEEDING SHALL PREFERABLY BE BETWEEN APRIL 1ST AND MAY 15TH OR BETWEEN SEPTEMBER 1ST AND OCTOBER 15TH.
8. AT THE TIME OF SEED MIX APPLICATION, THERE SHALL BE NO PONDING.
9. CHECK WETLAND REPLICATION AREAS AFTER THE FIRST GROWING SEASON AND NOTIFY THE CONSERVATION COMMISSION OF SITE CONDITIONS AND ANY FURTHER WORK ITEMS IF NECESSARY FOR THESE SPECIAL CONDITIONS, A GROWING SEASON STARTS NO LATER THAN MAY 31 AT LEAST 75 PERCENT OVERALL COVERAGE OF THE COMPENSATED SURFACE AREA SHALL BE RE-ESTABLISHED WITH INDIGENOUS WETLAND PLANT SPECIES WITHIN TWO OR MORE GROWING SEASONS.
10. ALL PROPOSED WETLAND AREAS SHALL BE SEEDED WITH AN APPROPRIATE SEED MIX AS DETERMINED BY THE WETLAND SCIENTIST AND APPROVED BY THE CONSERVATION COMMISSION.
11. PRIOR TO COMMENCEMENT, A PRE-CONSTRUCTION MEETING SHALL BE HELD WITH THE CONTRACTOR, THE SUPERVISORY WETLAND SPECIALIST, AND THE HAVERHILL CONSERVATION COMMISSION AND/OR ITS AGENT.
12. FLAG OR STAKE LIMITS OF WETLAND REPLICATION AREAS.
13. CUT TREES, STRIP AND GRUB WETLAND REPLICATION AREAS. CONSIDERATION SHALL BE GIVEN TO RETAIN EXISTING TREES 12" DBH OR LESS, SPECIFICALLY YELLOW BIRCH (BETULA ALLEGHANIENSIS) AND RED MAPLE (ACER RUBRUM), ON HUMMOCKS WITHIN THE REPLICATION AREA AT THE DISCRETION OF THE WETLAND PROFESSIONAL OR LANDSCAPE ARCHITECT, AS THEY MAY PROVIDE SHADING TO THE PLANTINGS INSTALLED AROUND THESE HUMMOCKS.
14. MANMADE TOPSOIL SHALL CONSIST OF A MIXTURE OF EQUAL VOLUMES OF IMPORTED ORGANIC AND MINERAL MATERIALS. WELL-DECOMPOSED CLEAN LEAF COMPOST IS THE PREFERRED SOIL AMENDMENT TO ACHIEVE THESE STANDARDS, ALTHOUGH OTHER SOIL AMENDMENTS MAY ALSO BE USED.
15. EXCAVATE WETLAND REPLICATION AREA TO AT LEAST 12" BELOW PROPOSED FINAL DESIGN GRADE TO FACILITATE PLACEMENT OF ORGANIC-RICH TOPSOIL (TAKING INTO ACCOUNT SETTLING TO ACHIEVE FINAL GRADE). ALL TOPSOIL REMOVED FROM REPLICATION AREAS SHALL NOT BE REUSED AND MUST BE EXPORTED TO UPLAND PORTIONS OF THE SITE. 12% MINIMUM ORGANIC CARBON CONTENT (8 TO 21 PERCENT ORGANIC MATTER) ON A DRY WEIGHT BASIS FOR SOILS SHOULD BE USED IN WETLAND REPLICATION AREAS. BEFORE PLACEMENT OF ORGANIC-RICH TOPSOIL, THE WETLAND SPECIALIST AND THE CONSERVATION COMMISSION OR THEIR AGENT MUST APPROVE THE FINAL EXCAVATED GRADE. THE CONSISTENCY OF THE INSTALLED SOIL SHOULD BE LOOSE TO FRIABLE. TO ENSURE PROPER CONSISTENCY, ROTOTILLING OR OTHER EQUIVALENT METHOD SHOULD BE USED. LARGE PROTRUDING ROCKS ENCOUNTERED DURING EXCAVATION MAY BE LEFT IN PLACE TO PROVIDE ADDITIONAL WILDLIFE HABITAT. TO ACHIEVE FINAL GRADES, THE SOURCE OF BACKFILL SHOULD BE APPROVED ORGANIC-RICH TOPSOIL. THE TOPSOIL SHALL BE REASONABLY FREE OF STUMPS, ROOTS, HEAVY OR STIFF CLAY, STONES LARGER THAN ONE INCH IN DIAMETER, LUMPS, COARSE SAND, NOXIOUS WEEDS, STICKS, BRUSH OR OTHER LITTER. IF STOCKPILING OF SOIL IS NECESSARY, MATERIAL MUST BE KEPT WET AND COVERED TO PREVENT LEACHING AND SEDIMENT TRANSPORT. ADDITIONAL ROCKS OR DEAD FALL (LOGS AND STUMPS) MAY BE ADDED TO THE NEW WETLAND AT THE DISCRETION OF THE WETLAND SPECIALIST. ORGANIC-RICH TOPSOIL SHALL BE TRANSPORTED IN VEHICLES THAT HAVE BEEN WASHED SO THAT NO EXOTIC/INVASIVE SEEDS FROM OTHER SITES GET MIXED IN WITH THEM.
16. A QUALIFIED WETLAND SPECIALIST SHALL BE ON SITE DURING EXCAVATION, GRADING, AND PLANTING. FIELD CHANGES, IF NEEDED, SHALL BE MADE ACCORDINGLY.

EROSION CONTROL AND SEDIMENTATION NOTES:

17. INSTALL EROSION CONTROL BARRIER ALONG INTERSECTION OF BORDERING VEGETATED WETLAND AND PROPOSED WETLAND REPLICATION AREA. THE HAVERHILL CONSERVATION COMMISSION RESERVES THE RIGHT TO DIRECT THE CONTRACTOR TO ADD OR REMOVE THE EROSION CONTROL BARRIER BASED UPON SEASONAL TIMING OF THE WORK.
18. EROSION CONTROL BARRIERS ARE TO BE MAINTAINED THROUGHOUT AND FOLLOWING THE CONSTRUCTION PERIOD AND AFTER SIGNIFICANT RAINFALLS UNTIL THE WETLAND REPLICATION AREA BECOMES STABILIZED AND THEIR REMOVAL HAS BEEN AUTHORIZED IN WRITING BY THE CONSERVATION COMMISSION. DILAPIDATED EROSION CONTROL BARRIERS SHALL BE REPLACED AS REQUIRED TO MAINTAIN THE INTEGRITY OF THE BARRIER. THE DEVICE AND STRUCTURES SHALL BE DISASSEMBLED AND PROPERLY DISPOSED OF NO LATER THAN NOVEMBER 1, THREE FULL GROWING SEASONS AFTER PLANTING. SEDIMENT COLLECTED BY THESE DEVICES WILL BE REMOVED AND PLACED UPLAND IN A MANNER THAT PREVENTS ITS EROSION AND TRANSPORT TO A WATERWAY OR WETLAND.
19. ADDITIONAL EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.
20. SOIL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED ON A DAILY BASIS DURING CONSTRUCTION.
21. CLEAN AND MAINTAIN EROSION CONTROL BARRIER AS REQUIRED DURING CONSTRUCTION OPERATIONS TO ENSURE ITS CONTINUED FUNCTIONALITY.
22. THE CONTRACTOR SHALL REMOVE ALL EROSION CONTROL BARRIERS AFTER REVEGETATION OF DISTURBED AREAS AND AFTER APPROVAL OF THE CONSERVATION COMMISSION AND WETLAND SPECIALIST.

WETLAND REPLICATION AREAS PLANT SCHEDULE

KEY	QUANTITY	BOTANICAL NAME	COMMON NAME	SPACING	SIZE
AR	4	ACER RUBRUM	RED MAPLE	5-10' O.C.	2-3'
SN	4	SALIX NIGRA	BLACK WILLOW	5-10' O.C.	2-3'
BA	4	BETULA ALLEGHANIENSIS	YELLOW BIRCH	5-10' O.C.	2-3'
CC	4	CARPINUS CAROLINIANA	MUSCLEWOOD	5-6' O.C.	2-3'
CA	6	CORNUS AMOMUM	SILKY DOGWOOD	5-6' O.C.	18-24"
CL	6	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	5-6' O.C.	18-24"
VC	4	VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	5-6' O.C.	18-24"
*	10	ONOCLEA SENSIBLIS	SENSITIVE FERN	FIELD DETERMINATION (1' MIN.)	2-4" PLUG OR CONTAINER
+	10	OSUMDASTRUM CINNAMOMEUM	CINNAMON FERN	FIELD DETERMINATION (1' MIN.)	2-4" PLUG OR CONTAINER
	10	IRIS VERSICOLOR	BLUE FLAG IRIS	FIELD DETERMINATION (1' MIN.)	2-4" PLUG OR CONTAINER
SEED MIX	LOCATION: ALL DISTURBED AREAS NOT INUNDATED BY PONDING WATER	NEW ENGLAND WETMIX (OR EQUIVALENT) AVAILABLE THROUGH NEW ENGLAND WETLAND PLANTS, INC. AMHERST, MA.		APPLICATION RATE: 1 LB/2500 SF 18 LBS/AC	

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DES	DWN	CHK'D	APP'D

PROJECT:

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HAVERHILL, MASSACHUSETTS

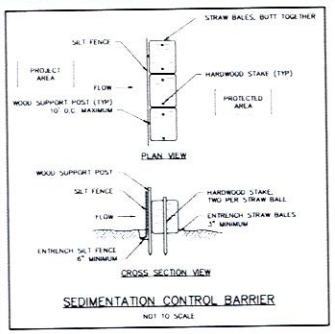
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WETLAND REPLICATION PLAN

B+T JOB NO. 3274.00

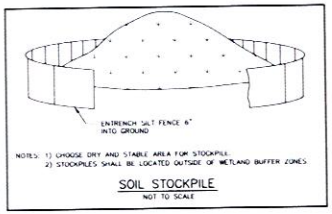
B+T PLAN NO. 3274.00P003A-007

C6.1



SEDIMENTATION CONTROL BARRIER

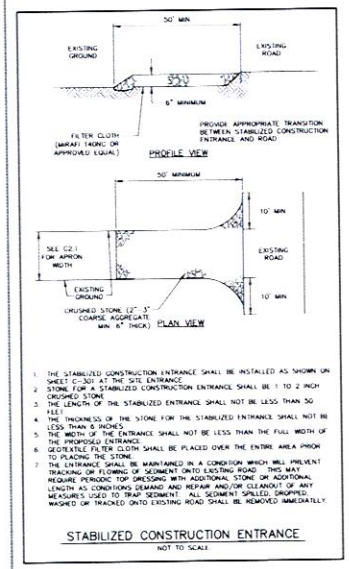
NOT TO SCALE



NOTES: 1) CHOOSE DRY AND STABLE AREA FOR STOCKPILE.
2) STOCKPILES SHALL BE LOCATED OUTSIDE OF WETLAND BUFFER ZONES

SOIL STOCKPILE

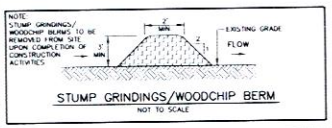
NOT TO SCALE



1. THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE INSTALLED AS SHOWN ON SHEET C-301 AT THE SITE ENTRANCE.
2. STONE FOR A STABILIZED CONSTRUCTION ENTRANCE SHALL BE 1 TO 2 INCH CRUSHED STONE.
3. THE LENGTH OF THE STABILIZED ENTRANCE SHALL NOT BE LESS THAN 50 FEET.
4. THE THICKNESS OF THE STONE FOR THE STABILIZED ENTRANCE SHALL NOT BE LESS THAN 6 INCHES.
5. THE WIDTH OF THE ENTRANCE SHALL NOT BE LESS THAN THE FULL WIDTH OF THE PROPOSED ENTRANCE.
6. GEOTEXTILE FILTER CLOTH SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING THE STONE.
7. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO EXISTING ROAD. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDITIONAL LENGTH AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO EXISTING ROAD SHALL BE REMOVED IMMEDIATELY.

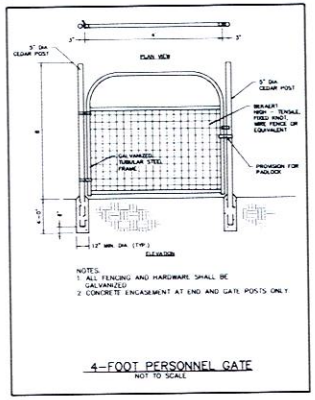
STABILIZED CONSTRUCTION ENTRANCE

NOT TO SCALE



STUMP GRINDINGS/WOODCHIP BERM

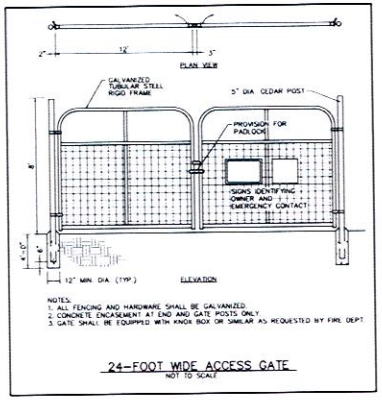
NOT TO SCALE



NOTES:
1. ALL FENCING AND HARDWARE SHALL BE GALVANIZED
2. CONCRETE ENCASEMENT AT END AND GATE POSTS ONLY.

4-FOOT PERSONNEL GATE

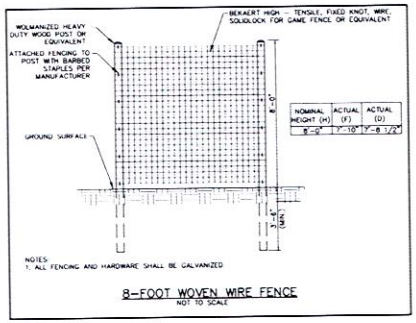
NOT TO SCALE



NOTES:
1. ALL FENCING AND HARDWARE SHALL BE GALVANIZED.
2. CONCRETE ENCASEMENT AT END AND GATE POSTS ONLY.
3. GATE SHALL BE EQUIPPED WITH KNOX BOX OR SIMILAR AS REQUESTED BY FIRE DEPT

24-FOOT WIDE ACCESS GATE

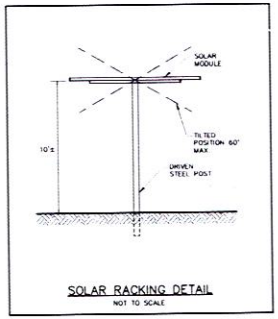
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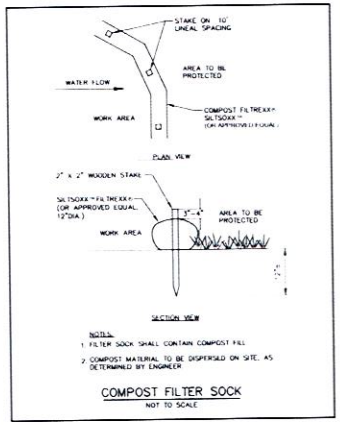
8-FOOT WOVEN WIRE FENCE

NOT TO SCALE



SOLAR RACKING DETAIL

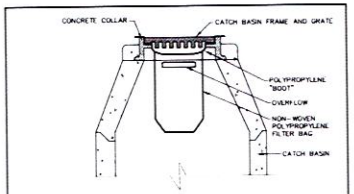
NOT TO SCALE



NOTES:
1. FILTER SOCK SHALL CONTAIN COMPOST FILL
2. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER

COMPOST FILTER SOCK

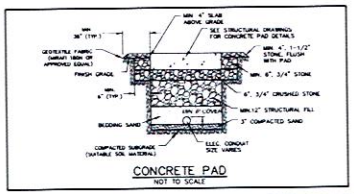
NOT TO SCALE



NOTES:
1. TO BE INSTALLED IN CATCH BASINS IN TRAFFIC AREAS.
2. BOOT ADAPTER MAY BE TRIMMED TO SIZE.

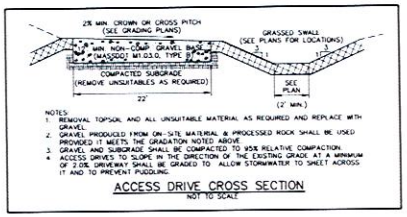
FILTER BAG

NOT TO SCALE



CONCRETE PAD

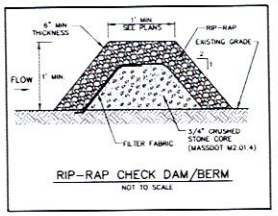
NOT TO SCALE



NOTES:
1. REMOVAL TOPSOIL AND ALL UNSUITABLE MATERIAL AS REQUIRED AND REPLACE WITH GRAVEL.
2. GRAVEL PRODUCED FROM ON-SITE MATERIAL & PROCESSED ROCK SHALL BE USED PROVIDED IT MEETS THE GRADATION NOTED ABOVE.
3. GRAVEL AND SUBGRADE SHALL BE COMPACTED TO 95% RELATIVE COMPACTION.
4. ACCESS DRIVES TO SLOPE IN THE DIRECTION OF THE EXISTING GRADE AT A MINIMUM OF 2.0%. DRIVEWAY SHALL BE GRADED TO ALLOW STORMWATER TO SHEET ACROSS IT AND TO PREVENT PUDDLING.

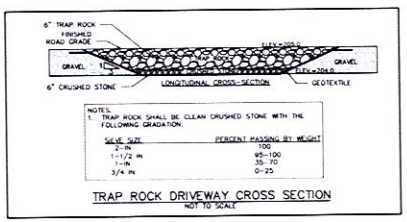
ACCESS DRIVE CROSS SECTION

NOT TO SCALE



RIP-RAP CHECK DAM/BERM

NOT TO SCALE

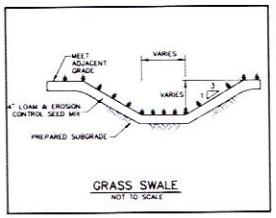


NOTES:
1. TRAP ROCK SHALL BE CLEAN CRUSHED STONE WITH THE FOLLOWING GRADATION:

SIEVE SIZE	PERCENT PASSING BY WEIGHT
2" IN	100
1-1/2 IN	95-100
1-IN	35-70
3/4 IN	0-25

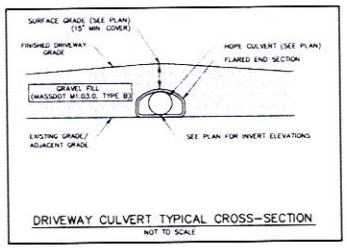
TRAP ROCK DRIVEWAY CROSS SECTION

NOT TO SCALE



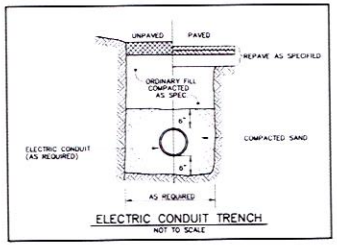
GRASS SWALE

NOT TO SCALE



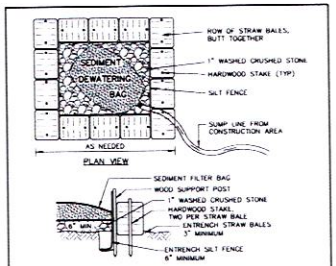
DRIVEWAY CULVERT TYPICAL CROSS-SECTION

NOT TO SCALE



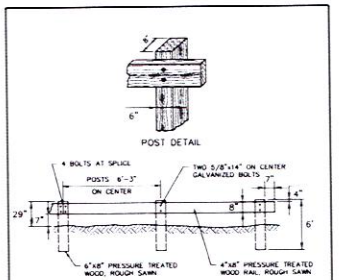
ELECTRIC CONDUIT TRENCH

NOT TO SCALE



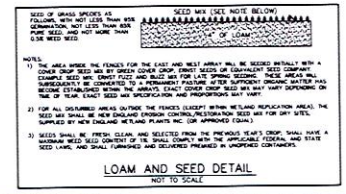
DEWATERING CONTAINMENT AREA

NOT TO SCALE



TIMBER GUARDRAIL

NOT TO SCALE



NOTES:
1) THE AREA UNDER THE FENCES FOR THE EAST AND WEST ARRAY WILL BE SEEDED INITIALLY WITH A COVER CROP SEED MIX BY GREEN COVER CROP, FIRST SEEDS OR EQUIVALENT SEED COMPARABLE EXAMPLE SEED MIX: ERNST FUZZ AND BUZZ MIX FOR LATE SPRING SEEDING. ONCE THE SOLAR ARRAY HAS BEEN INSTALLED, SEED MIX SHALL BE REVISED TO A PERMANENT COVER CROP SEED MIX. ONCE THE SOLAR ARRAY HAS BECOME ESTABLISHED SEED MIX SHALL BE MOWED. EXACT COVER CROP SEED MIX MAY VARY DEPENDING ON TIME OF YEAR. EXACT SEED MIX SPECIFICATIONS AND PROPORTIONS MAY VARY.

2) FOR ALL DISTURBED AREAS OUTSIDE THE FENCES (EXCEPT WITHIN WETLAND REPLICATION AREA), THE SEED MIX SHALL BE NEW ENGLAND EROSION CONTROL/RESTORATION SEED MIX FOR DRY SITES, SUPPLIED BY NEW ENGLAND WETLAND PLANTS INC (OR APPROVED EQUAL).

3) SEEDS SHALL BE FRESH, CLEAN, AND SELECTED FROM THE PREVIOUS YEAR'S CROP. SHALL HAVE A MAXIMUM WEED SEED CONTENT OF 1%. SHALL COMPLY WITH THE APPLICABLE FEDERAL AND STATE SEED LAWS, AND SHALL BE PURCHASED AND PROVIDED IN SEALED CONTAINERS.

LOAM AND SEED DETAIL

NOT TO SCALE

FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

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PREPARED FOR:

BWC CAMP BROOK, LLC

P.O. BOX 171381
BOSTON, MASSACHUSETTS 02117

JEFFREY R. MAYNARD
No. 39760
CIVIL
REGISTERED PROFESSIONAL ENGINEER
6/3/2021

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PREPARED BY:
BEALS+THOMAS
Civil Engineers | Landscape Architects | Land Surveyors | Planners | Environmental Specialists

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ISSUE	DATE	DESCRIPTION		
NBB	NBB	JRM	JRM	
DES	DWN	CHK'D	APP'D	

PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL,
MASSACHUSETTS

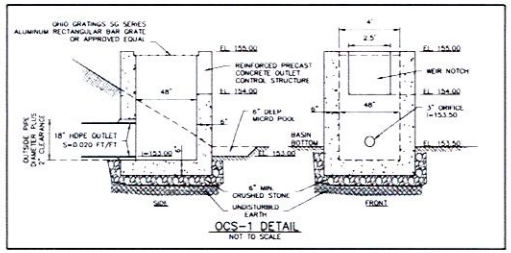
SCALE: AS NOTED DATE: JUNE 3, 2021

SITE DETAILS

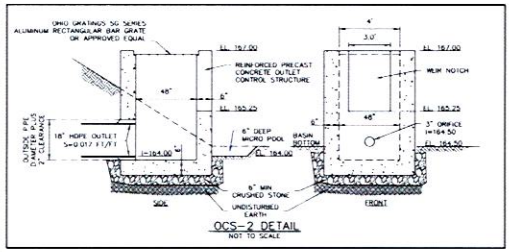
B+T JOB NO.3274.00

B+T PLAN NO. 32740P002A-003

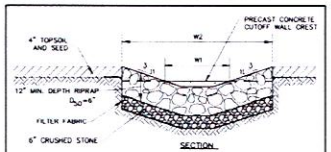
C7.1



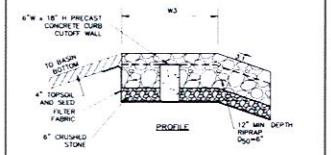
OCS-1 DETAIL
NOT TO SCALE



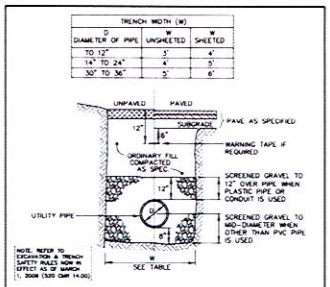
OCS-2 DETAIL
NOT TO SCALE



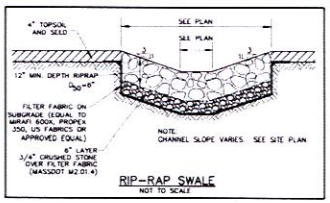
BASIN	CREST ELEV.	W1 (FT)	W2 (FT)	W3 (FT)
DET. BASIN-1	155.0	20	26	10
DET. BASIN-2	167.0	10	16	10
DET. BASIN-3	216.0	10	16	10
DET. BASIN-4	202.0	10	16	10
DET. BASIN-5	190.0	10	16	10
LEVEL SPREADER	174.80	70	76	6



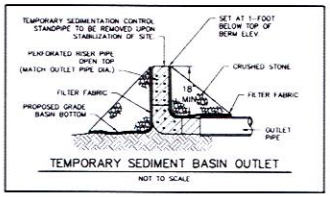
EMERGENCY OVERFLOW & LEVEL SPREADER SPILLWAY
NOT TO SCALE



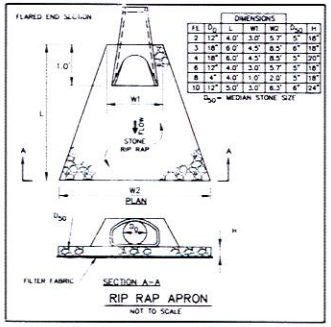
UTILITY TRENCH
NOT TO SCALE



RIP-RAP SWALE
NOT TO SCALE



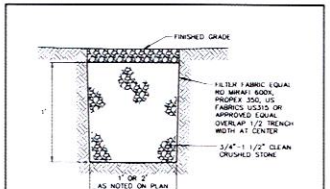
TEMPORARY SEDIMENT BASIN OUTLET
NOT TO SCALE



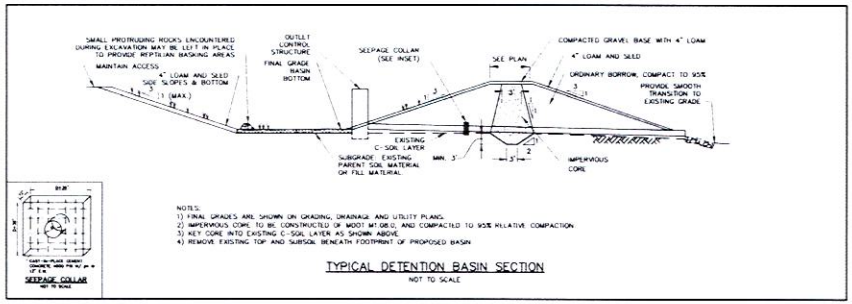
	DIMENSIONS				
FL	D_0	L	W1	W2	D_{50}	H
2	12"	4.0'	3.0'	5.7'	5"	18"
3	18"	6.0'	4.5'	8.5'	6"	18"
4	18"	8.0'	4.5'	8.5'	5"	20"
6	12"	4.0'	3.0'	5.7'	5"	18"
8	4"	4.0'	1.0'	2.0'	5"	18"
10	12"	5.0'	3.0'	8.3'	6"	24"

D_{50} = MEDIAN STONE SIZE

RIP RAP APRON
NOT TO SCALE

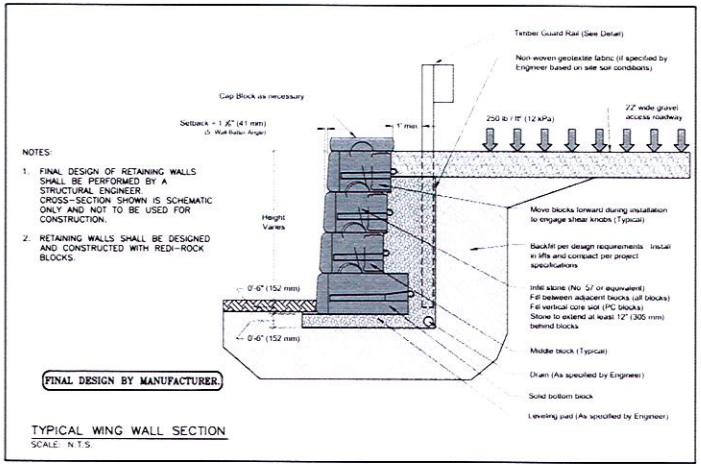


INFILTRATION TRENCH
NOT TO SCALE



NOTES:
1) FINAL GRADES ARE SHOWN ON GRADING, DRAINAGE AND UTILITY PLANS.
2) IMPERVIOUS CORE TO BE CONSTRUCTED OF MODIFIED AND COMPACTED TO 95% RELATIVE COMPACTION.
3) KEY CORE INTO EXISTING C-SOIL LAYER AS SHOWN ABOVE.
4) REMOVE EXISTING TOP AND SUBSOIL BENEATH FOOTPRINT OF PROPOSED BASIN

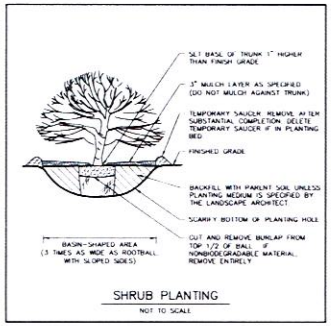
TYPICAL DETENTION BASIN SECTION
NOT TO SCALE



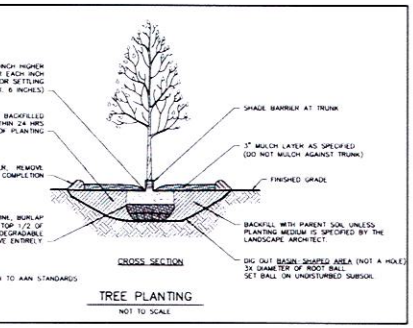
NOTES:
1. FINAL DESIGN OF RETAINING WALLS SHALL BE PERFORMED BY A STRUCTURAL ENGINEER. CROSS-SECTION SHOWN IS SCHEMATIC ONLY AND NOT TO BE USED FOR CONSTRUCTION.
2. RETAINING WALLS SHALL BE DESIGNED AND CONSTRUCTED WITH REDI-ROCK BLOCKS.

FINAL DESIGN BY MANUFACTURER.

TYPICAL WING WALL SECTION
SCALE: N.T.S.



SHRUB PLANTING
NOT TO SCALE



NOTE
ALL TREES MUST CONFORM TO AAN STANDARDS
PUBLICATION ANSI Z60.1

TREE PLANTING
NOT TO SCALE

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PREPARED FOR:

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6/3/2021

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

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ISSUE DATE	DESCRIPTION		
0 06/03/2021	ISSUED FOR PERMITTING		
NBB	NBB	JRM	JRM
DES	DWN	CHK'D	APP'D

PROJECT:

HILLDALE AVENUE SOLAR 2

HAVERHILL,
MASSACHUSETTS

SCALE: AS NOTED DATE: JUNE 3, 2021

SITE DETAILS

B+T JOB NO.3274.00

B+T PLAN NO.
32740P002A-004

C7.2

Stormwater Management Report

HILLDALE AVENUE SOLAR 2

1050 Hilldale Avenue
Haverhill, Massachusetts

Prepared for:
BWC Camp Brook, LLC
P.O. Box 171381
Boston, MA 02117

Prepared by:
BEALS + THOMAS
CIVIL ENGINEERS | LANDSCAPE ARCHITECTS |
LAND SURVEYORS | PLANNERS |
ENVIRONMENTAL SPECIALISTS

May 27, 2021

Calculated by: **Nathaniel Bautz, EIT**

Checked by: **Jeffrey R. Murphy, PE**

Approved by:

COMMONWEALTH OF MASSACHUSETTS
JEFFREY R. MURPHY
CIVIL
No. 51800
REGISTERED PROFESSIONAL ENGINEER

Jeffrey R Murphy 5/27/21
Jeffrey R. Murphy, PE

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2.0 PRE-DEVELOPMENT CONDITIONS **2**

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2.2 Soil Description 2
2.3 Hydrologic Analysis 3

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3.2 Hydrologic Analysis 4
3.3 Hydraulic Calculations 5
3.4 Compliance with DEP Stormwater Management Standards 5
3.5 Illicit Discharge Compliance Statement 9
3.7 DEP's Checklist for a Stormwater Report 10

LIST OF ATTACHMENTS

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ATTACHMENT 2: PRE-DEVELOPMENT HYDROLOGIC ANALYSIS
ATTACHMENT 3: POST-DEVELOPMENT HYDROLOGIC ANALYSIS
ATTACHMENT 4: HYDRAULIC CALCULATIONS
ATTACHMENT 5: GOUNDWATER RECHARGE, DRAWDOWN AND RIP RAP APRON SIZING CALCULATIONS
ATTACHMENT 6: SITE OWNER'S MANUAL
ATTACHMENT 7: STORMWATER POLLUTION PREVENTION PLAN

1.0 INTRODUCTION

The proposed project includes a stormwater management system designed to mitigate potential impacts the proposed project could have on the existing watershed. Stormwater controls have been proposed to control peak runoff rates, provide water quality, promote groundwater recharge and sediment removal. The proposed system has been designed to comply with:

- The 2008 Massachusetts Department of Environmental Protection (DEP) Stormwater Management Handbook,
- The Massachusetts Wetland Protection Act (310 CMR 10.00), and
- City of Haverhill Stormwater Management Ordinance

The pre- and post-development hydrologic conditions were modeled using HydroCAD™ version 10.00 to demonstrate that post-development stormwater runoff rates will be less than or equal to the pre-development rates. Watershed maps with soil types as well as detailed analysis of the model results are also included. The following table summarizes the peak runoff rates for the pre- and post-development conditions.

Table 1: Pre- & Post-development Peak Runoff Rate Comparison, units are in cubic feet per second (cfs).

Storm Event	2 Year		10 Year		100 Year	
	Pre	Post	*Pre*	Post	*Pre*	Post
Design Point 1	*17.31*	16.08	*46.29*	45.77	*99.77*	96.24
Design Point 2	*21.94*	21.17	*52.48*	50.47	*106.34*	102.74
Design Point 3	*7.90*	7.90	*24.03*	24.03	*54.60*	54.60
Design Point 4	*6.32*	6.32	*19.77*	19.77	*46.11*	46.11

2.0 PRE-DEVELOPMENT CONDITIONS

2.1 Site Conditions

The Project Site (the Site) features an agricultural field which has historically been used for farming operations, and an existing ground mounted solar array in the northeast portion of the property. Portions of the Site are comprised of a grassed farm field while the remainder of the parcel is wooded. The delineated wetlands are generally situated in the southwest, central, and southeast portions of the site. Most of the wetlands drain to the south towards the Fishin Brook, while the eastern side of the site drains to wetlands located adjacent to Hilldale Avenue.

Land uses with the Site range from agricultural fields in the easterly portion of the site to mixed forested upland and wetland communities surrounding the farm fields and in the western portion of the side. Residential development bounds the Property to the northwest, and commercial and industrial buildings are located to the east on the opposite side of Hilldale Avenue. Areas south of the site consist of Conservation Land, a residential neighborhood, and the St. Joseph's Cemetery.

The majority of the Site is situated on a hillside with slopes radiating outward to the south. Runoff from the Site drains predominantly to specific points to the south and east which have been designated as the hydrologic design points.

2.2 Soil Description

The Natural Resources Conservation Service (NRCS) lists the on-site soils as Montauk fine sandy loam and Woodbridge fine sandy loam.

Montauk fine sandy loam is lodgment till typically found along the side slope of hill landforms. The soil parent material consists of a coarse-loamy over sandy lodgment till derived from gneiss, granite, and/or schist. The typical soil profile consists of fine sandy loam over gravelly loamy sand. This soil type is considered well drained and is classified by NRCS as a Hydrologic Class "C" soil.

Woodbridge fine sandy loam is lodgment till typically found along the foot slope, summit of hill landforms. The soil parent material consists of a coarse-loamy lodgment till derived from gneiss, granite, and/or schist. The typical soil profile consists of fine sandy loam over gravelly fine sandy loam. This soil type is considered moderately well drained and is classified by NRCS as a Hydrologic Class "C/D" soil. For conservative estimation of runoff, it has been modeled as Hydrologic Soil Class "D".

An on-site soils investigation was performed by a Licensed Soil Evaluator on May 21, 2021 within the proposed stormwater BMP footprints to confirm soil textures and

determine depths to estimated seasonal high groundwater in order to inform the design of the proposed stormwater Best Management Practices. The soil logs are included in Attachment 1 and test pit locations are shown on the site plans.

2.3 Hydrologic Analysis

Sub-catchment areas were delineated based on existing runoff patterns and topographic information. This information is shown on the *Pre-Development Conditions Hydrologic Areas Map* included in Attachment 2. Summaries of each area with respect to Curve Number and Time of Concentration calculations can be found in the model results also in Attachment 2.

3.0 POST-DEVELOPMENT CONDITIONS

3.1 Design Strategy

During the design phase of the Site layout, consideration was given to conserving environmentally sensitive features and minimizing impact on the existing hydrology. The Site does not include proposed pavement or buildings, reducing the impact the Project may have on the existing watershed. The solar panels are raised above the ground; stormwater that lands on the panels will sheet down to the pervious soils below. There will be several isolated concrete pads associated with the utility equipment that will produce a negligible amount of runoff that will flow to adjacent pervious surfaces almost immediately. Small infiltration trenches are proposed adjacent to these pads to promote recharge to groundwater.

Stormwater management basins, although not required for water quality treatment were designed to address peak flow rate attenuation. The change in ground cover type will yield a change in post-construction runoff rates. Accordingly, five detention basins, a level spreader, and several conveyance swales are proposed to manage runoff from the site. These features in combination will provide a reduction in peak runoff rates from the Site. In addition, erosion control barriers will filter stormwater flows during construction and protect adjacent resource areas and properties.

The Project will also involve the construction of a gravel access driveway, which will begin in the northeast portion of the site at an existing gravel road which provides access to the existing solar array. The new gravel driveway is proposed in order to provide access for construction and long-term operation and maintenance for the proposed western array. The eastern array will be accessible from the existing gravel driveway along the east side and from the new section of driveway along the north side. Gravel access driveways are provided along the east and west sides of the western array with turnaround areas at the south end of the site to access the lower portion of the array as well as the detention basins. These driveways will also allow for emergency vehicle access.

3.2 Hydrologic Analysis

The established design points used in the pre-development conditions analysis were used in the post-development analysis for direct comparison. The tributary areas and flow paths were modified to reflect post-development conditions. See Attachment 3 for the *Post- Development Conditions Hydrologic Areas Map*. Summaries of each area with respect to Curve Number and Time of Concentration calculations can be found in the model results in Attachment 3.

3.3 Hydraulic Calculations

The proposed culvert pipe was analyzed based on the 50-year storm event using the Rational Formula. The stream crossing box culvert and outlet pipes from the outlet control structures were sized for the 100-year outflows as shown in the Post-Development Hydrology Analysis and hydraulic analysis calculations. Watershed maps and detailed hydraulic analysis are provided in Attachment 4.

3.4 Compliance with DEP Stormwater Management Standards

The proposed stormwater management system was designed in compliance with the ten (10) DEP Stormwater Management Standards. The following summary provides key information related to the proposed stormwater management system, its design elements, and mitigation measures for potential impacts.

STANDARD 1: **No new stormwater conveyance (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.**

There will be no direct discharge of untreated stormwater to nearby wetlands or waters of the Commonwealth. Stormwater basin outlet pipes and spillways have been designed with rip-rap armoring to prevent erosion and scour. Proposed conveyance swales will also include rip-rap check dams and armoring in steeper sections to minimize the potential for long term erosion issues. All disturbed areas of the Site will be permanently stabilized with grass after grading is complete.

STANDARD 2: **Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.**

The stormwater management design will control post-development peak discharge rates for the 2-year, 10-year, and 100-year, 24-hour storms. Refer to Section 1.0 Introduction for a summary of the peak runoff rates.

STANDARD 3: **Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater management practices and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil types. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.**

The project proposes minimal impervious surfaces including concrete equipment pads and battery storage areas. Groundwater recharge will be maintained for the Site, as runoff from these areas will flow into the proposed infiltration trenches adjacent to the pads, as well as to the surrounding grassed areas. Although the proposed solar panels are not considered impervious per the MassDEP Policy 17-1 regarding solar photovoltaic installations, runoff from the array area will be directed to the detention basins surrounding the project.

STANDARD 4: **Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).**

The Project includes limited impervious concrete equipment pads that do not require treatment. The proposed infiltration basins will provide long term TSS removal from the western array area. All stormwater basins will function as temporary sedimentation basins during construction and not be excavated to final depth until after upgradient tributary areas have been stabilized.

STANDARD 5: **For land uses with higher potential pollutant loads (LUHPPLs), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.**

The proposed project is not associated with stormwater discharges from land uses with higher potential pollutant loads.

STANDARD 6: **Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resource Waters, shellfish beds, swimming beaches, coldwater fisheries and recharge areas for public water supplies.**

There are no stormwater discharges to critical areas associated with this project.

STANDARD 7: **Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.**

The proposed project is new development, and therefore this standard does not apply.

STANDARD 8: **A plan to control construction-related impacts during erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion,**

sedimentation, and pollution prevention plan) shall be developed and implemented.

A Stormwater Pollution Prevention Plan (SWPPP) has been developed to comply with Section 3 of the NPDES Construction General Permit for Stormwater Discharges to address the requirements of Standard 8. Please note, the document is in draft form and will be finalized prior to construction.

STANDARD 9: **A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.**

The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards. The Manual outlines source control and pollution prevention measures and maintenance requirements of the stormwater best management practices (BMPs) associated with the proposed development.

STANDARD 10: **All illicit discharges to the stormwater management system are prohibited.**

There will be no illicit discharges to the proposed stormwater management system associated with the proposed project. An Illicit Discharge Compliance Statement is provided on the following page.

3.5 Illicit Discharge Compliance Statement

An illicit discharge is any discharge to a stormwater management system that is not comprised entirely of stormwater, discharges from fire-fighting activities, and certain non-designated non-stormwater discharges.

To the best of my knowledge, no detectable illicit discharge exists on site. The site plans included with this report detail the storm sewers that convey stormwater on the site and demonstrate that these systems do not include the entry of an illicit discharge. A Site Owner's Manual is also included, which contains the Long Term Pollution Plan that outlines measures to prevent future illicit discharges. As the Site Owner, I will ultimately be responsible for implementing the Long Term Pollution Prevention Plan.

Signature: _____

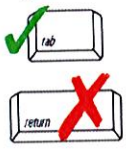
Owner's Name Mark D. Sylvia / Authorized Signatory

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Signature and Date 5/27/21

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☒ Grass Channel
- ☐ Green Roof
- ☐ Other (describe):

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas,
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☒ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

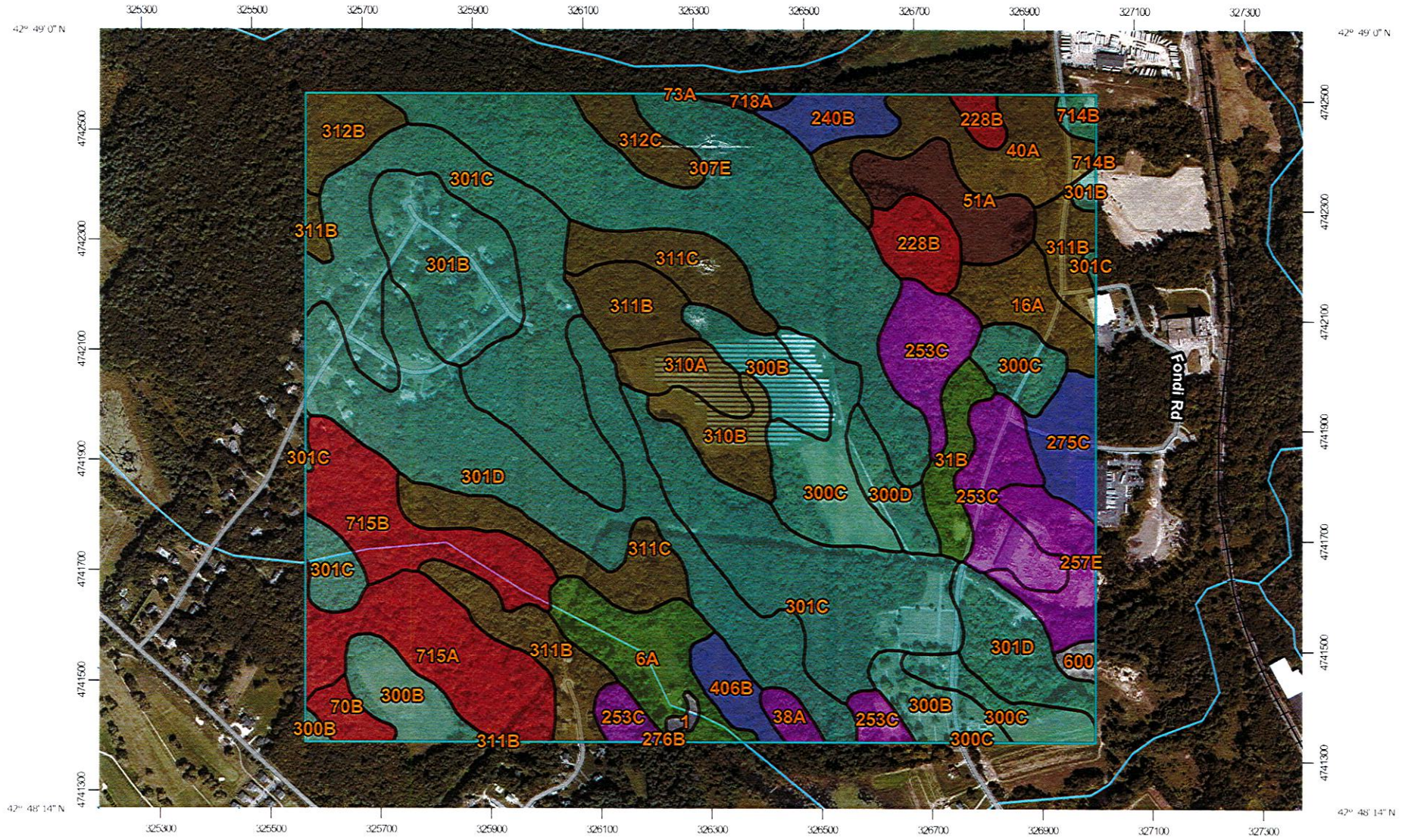
Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Attachment 1
Soil Data



Map Scale: 1:9,980 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1800 2700

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 16, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 28, 2019—Sep 20, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		0.5	0.1%
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	11.8	2.8%
16A	Scantic silt loam, 0 to 3 percent slopes	C/D	7.1	1.7%
31B	Walpole fine sandy loam, 3 to 8 percent slopes	A/D	5.5	1.3%
38A	Pipestone loamy sand, 0 to 3 percent slopes	A	1.7	0.4%
40A	Swanton fine sandy loam, 0 to 3 percent slopes	C/D	13.7	3.3%
51A	Swansea muck, 0 to 1 percent slopes	B/D	8.3	2.0%
70B	Ridgebury fine sandy loam, 3 to 8 percent slopes	D	2.6	0.6%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	0.0	0.0%
228B	Buxton silt loam, 3 to 8 percent slopes	D	6.9	1.6%
240B	Elmwood fine sandy loam, 3 to 8 percent slopes	B	4.3	1.0%
253C	Hinckley loamy sand, 8 to 15 percent slopes	A	21.2	5.1%
257E	Hinckley and Windsor soils, 25 to 35 percent slopes	A	7.6	1.8%
275C	Agawam fine sandy loam, 8 to 15 percent slopes	B	5.9	1.4%
276B	Ninigret fine sandy loam, 3 to 8 percent slopes	C	0.0	0.0%
300B	Montauk fine sandy loam, 3 to 8 percent slopes	C	18.2	4.3%
300C	Montauk fine sandy loam, 8 to 15 percent slopes	C	21.6	5.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
300D	Montauk fine sandy loam, 15 to 25 percent slopes	C	4.6	1.1%
301B	Montauk fine sandy loam, 0 to 8 percent slopes, very stony	C	16.5	3.9%
301C	Montauk fine sandy loam, 8 to 15 percent slopes, very stony	C	64.8	15.5%
301D	Montauk fine sandy loam, 15 to 35 percent slopes, very stony	C	49.3	11.8%
307E	Paxton fine sandy loam, 25 to 35 percent slopes, extremely stony	C	48.0	11.5%
310A	Woodbridge fine sandy loam, 0 to 3 percent slopes	C/D	5.2	1.2%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	6.4	1.5%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	20.2	4.8%
311C	Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony	C/D	18.0	4.3%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	5.2	1.2%
312C	Woodbridge fine sandy loam, 8 to 15 percent slopes, extremely stony	C/D	4.6	1.1%
406B	Charlton fine sandy loam, 3 to 8 percent slopes, very stony	B	3.8	0.9%
600	Pits, gravel		1.1	0.3%
714B	Melrose fine sandy loam, 3 to 8 percent slopes	C	1.3	0.3%
715A	Ridgebury and Leicester fine sandy loams, 0 to 3 percent slopes, extremely stony	D	17.1	4.1%
715B	Ridgebury and Leicester fine sandy loams, 3 to 8 percent slopes, extremely stony	D	14.8	3.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
718A	Saco variant silt loam, 0 to 3 percent slopes	B/D	0.9	0.2%
Totals for Area of Interest			**418.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Essex County, Massachusetts, Northern Part

301D—Montauk fine sandy loam, 15 to 35 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w80x
Elevation: 0 to 1,150 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Montauk, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Montauk, Very Stony

Setting

Landform: Ground moraines, recessionial moraines, drumlins, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 6 inches: fine sandy loam
Bw1 - 6 to 28 inches: fine sandy loam
Bw2 - 28 to 36 inches: sandy loam
2Cd - 36 to 74 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Scituate, very stony

Percent of map unit: 6 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Canton, very stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton, very stony

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 16, Jun 9, 2020

Essex County, Massachusetts, Northern Part

310B—Woodbridge fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t2ql
Elevation: 0 to 1,470 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodbridge, fine sandy loam, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Fine Sandy Loam

Setting

Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 18 inches: fine sandy loam
Bw2 - 18 to 30 inches: fine sandy loam
Cd - 30 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D

Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton

Percent of map unit: 10 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury

Percent of map unit: 8 percent
Landform: Drainageways, hills, ground moraines, depressions
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, base slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 16, Jun 9, 2020

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-23	A_p	10YR 3/3				Fine Sandy Loam	0-5	0-5	Granular	Friable	
23-48	B_w	10YR 5/8				Fine Sandy Loam	0-5	0-5	Massive	Friable	
48-120	C	2.5Y 6/4				Sandy Loam	0-5	0-5	Massive	Friable	

Additional Notes:

Observed roots down to 50" no redox observed

GW seeping observed @ 8'

Excavation ended @ 10' no bedrock observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-13	Ap	10 YR 3/2				Sandy Loam	0-5	0-5	Granular	Friable	
13-27	Bw	10 YR 5/4				Sandy Loam	0-5	0-5	massive	Friable	
27-120	C	2.5 Y 6/3	35"			Gravelly Sandy Loam	15-20	5-10	massive	Friable	

Additional Notes:

Roots observed down to 56"

Weeping observed @ 8'

Excavation ended @ 10' no bedrock observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-15	Ap	10YR 3/2				Sandy Loam	0-5	0-5	Granular	Friable	
15-23	Bw	10YR 5/8				Sandy Loam	0-5	5-10	Massive	Friable	
23-34	C_1	2.5Y 6/2				Sandy Loam	0-5	5-10	Massive	Friable	
34-120	C_2 Dense	2.5Y 6/2	34"			Sandy Loam	0-5	5-10	Dense	Firm on wall Friable in hand	

Additional Notes:

GW Weep @ 6'

Excavation ended @ 10' no bedrock observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	Ap	10YR 3/2				Sandy Loam	0-5	0-5	Granular	Friable	
12-25	Bw	10YR 5/8				Sandy Loam	5-10	5-10	Massive	Friable	
25-36	C_1	2.5Y 6/2				Sandy Loam	5-10	0-5	Massive	Friable	
36-120	C_2 Redox	2.5Y 6/2	36"			Sandy Loam	5-10	5-10	Massive Platy	Firm in Pit Friable in hand	

Additional Notes:

Roots down to 3'

GW seeping observed @ 9'

Excavation exited @ 10' no bedrock observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-7	Ap	10YR 3/2				Loamy Sand	0-5	0-5	Granular	Friable	
7-19	Bw	10YR 5/4				Loamy Sand	5-10	0-5	Massive	Friable	
19-33	C1	2.5Y 6/2				Loamy Sand	5-10	0-5	Massive	Friable	
33-120	C2 Dense	2.5Y 6/2	33"			Loamy Sand	5-10	5-10	Massive	Firm to friable in place	

Additional Notes:

Excavation ended @ 10' no GW or bedrock observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-9	Ap	10 YR 3/2				Sandy Loam	0-5	0-5	Granular	Friable	
9-24	Bw	10 YR 5/8				Sandy Loam	5-10	0-5	Massive	Friable	
24-36	C_1	2.5 Y 6/2				Sandy Loam	5-10	5-10	Massive	Friable	
36-120	C_2	2.5 Y 6/2	36"			Sandy Loam	5-10	5-10	Massive	Firm in pit	Friable in hand

Additional Notes:

BEALS + THOMAS

Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-7

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-5	Ap	10YR 3/2				SL	0-5	0-5	Granular	F	
5-36	Bw	10YR 5/8				SL	0-5	0-5	Massive	F	
36-120	C	2.5Y 6/2	34"			GLS	15-20	5-10	Massive	F	

Additional Notes:

GW Weeping @ 5'

Vein of gravel between B and C layer

Excavation ended @ 10' no bedrock observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-8

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-7	Ap	10 YR 3/2				Sandy Loam	0-5	0-5	Granular	F	
7-27	Bw	10YR 5/8				SL	0-5	0-5	Massive	F	
27-96	C	2.5Y 6/2	42"			LS	5-10	0-5	Massive	F	

Additional Notes:

GW weeping @ 5'

Excavation ended @ 8' no bedrock observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/2021

Deep Observation Hole Number: TP-9

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-7	A_p	10YR 3/2				SL	0-5	0-5	Granular	F	
7-26	Bw	10 YR 5/6				SL	0-5	0-5	Massive	F	
26-120	C	2.5Y 6/2	35			Gravelly LS	15-20	0-5	Massive	VF	

Additional Notes:

Excavation ended @ 10' no bedrock or GW observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-10

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	Ap	10 YR 3/2				Sandy Loam	0-5	0-5	Granular	F	
10-32	Bw	10 YR 5/6				Sandy Loam	0-5	0-5	Massive	F	
32-120	C	2.5Y 6/2	36"			Loamy Sand	5-10	5-10	Massive	VF	

Additional Notes:

Excavation ended @ 10' no bedrock or GW observed

BEALS + THOMAS
Soil Test Pit Log

3274.01 – Haverhill, MA

Date: 5/21/21

Deep Observation Hole Number: TP-11

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A_p	10YR 3/2				SL ~~Loamy Sand~~	0-5	0-5	Granular	Friable	
6-19	B_w	10YR 5/6				SL ~~Loamy Sand~~	0-5	0-5	Massive	Friable	
19-36	C_1	2.5Y 6/2				Gravelly ~~Loamy~~ Sand	10-15	0-5	Massive	Friable	
36-120	C_2	2.5Y 6/2	42"			Gravelly LS	15-20	5-10	Massive	Friable	

Additional Notes:

Excavation ended @ 10' no bedrock or GW observed

Attachment 2
Pre-Development Hydrologic Analysis

BEALS + THOMAS
CIVIL ENGINEERS | LANDSCAPE ARCHITECTS |
LAND SURVEYORS | PLANNERS | ENVIRONMENTAL SPECIALISTS

CALCULATION SUMMARY

JOB NO./LOCATION:

3274.00
Haverhill, MA

CLIENT/PROJECT:

BWC Camp Brook, LLC
Hilldale Avenue Solar 2

SUBJECT TITLE:

Pre-Development Conditions Hydrology

OBJECTIVE OF CALCULATION:

- To determine the pre-development peak rates of runoff from the site for the 2, 10, & 100-year storm events at the design points.

CALCULATION METHOD(S):

- Runoff curve numbers (CN), time-of-concentration (Tc), and runoff rates were calculated based on TR-55 methodology.
- AutoCAD 2019 computer program was utilized for digitizing ground cover areas.
- Peak runoff rates were computed using HydroCAD version 10.00.
- Design storms calculated using NOAA Atlas 14 point precipitation frequency estimates.

ASSUMPTIONS:

- The ground cover types were determined using aerial imagery. Hydrologic soil groups based on United States Department of Agriculture, NRCS Soil Survey map information.
- Stormwater runoff from offsite tributary areas was included in the calculations.
- Woodbridge soils were modeled as HSG "D" for this calculation.
- Off-site area contour information retrieved from MassGIS.

SOURCES OF DATA/EQUATIONS:

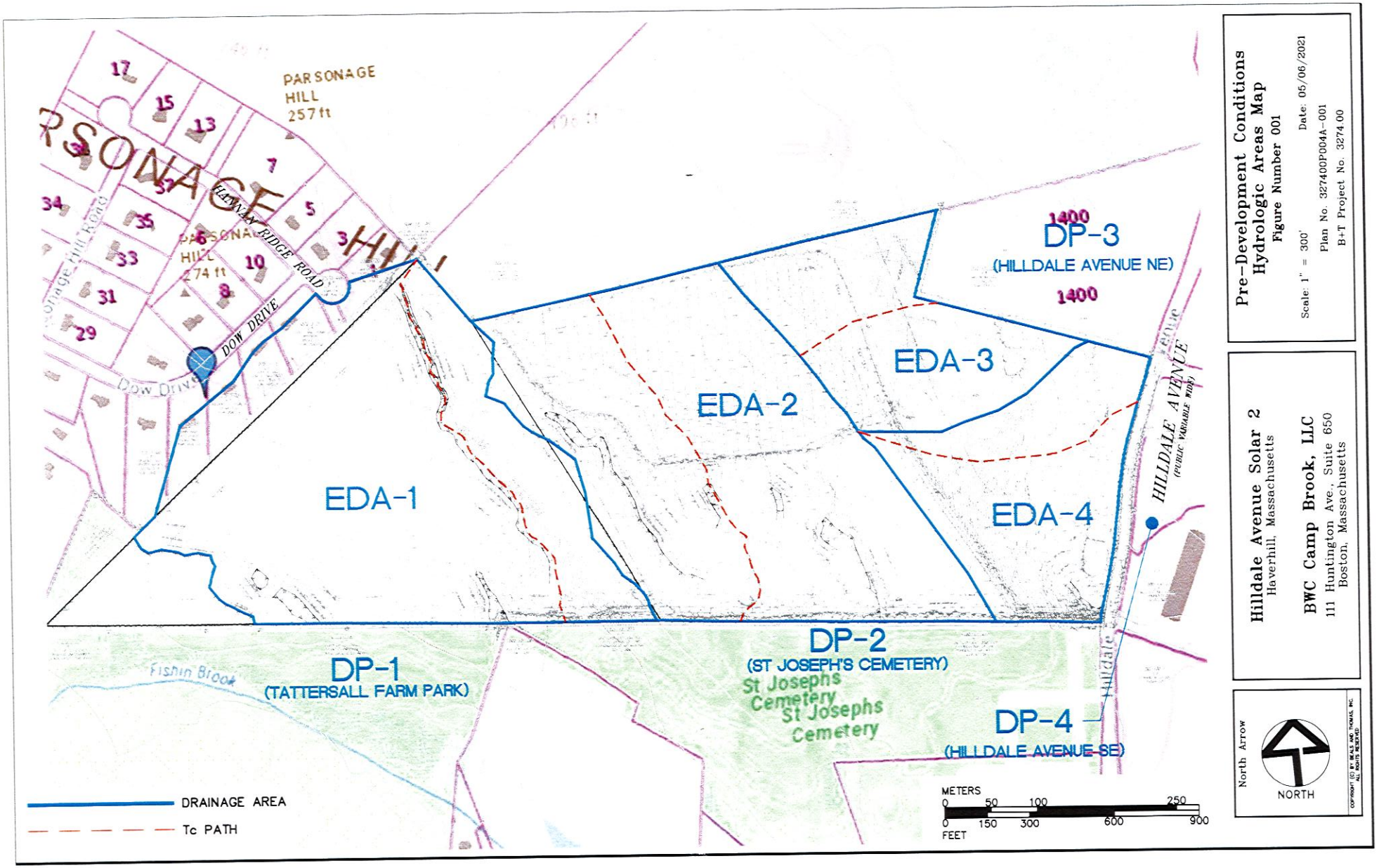
- Pre-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc. File No. 327400P004A-001.
- NRCS Soil Survey for Plymouth County, hydrologic soil group report, downloaded from Web Soil Survey on 02/26/2021.
- TR-55 urban Hydrology for Small Watersheds, SCS, 1986.
- Massachusetts DEP Stormwater Management Handbook, February 2008.

CONCLUSIONS:

Peak Runoff Rates (CFS):

Storm Event	DP-1	DP-2	DP-3	DP-4
2-Year	17.31	21.94	7.90	6.32
10-Year	46.29	52.48	24.03	19.77
100-Year	99.77	106.34	54.60	46.11

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	NBB	05/06/2021	JRM	05/07/2021	JRM	05/07/2021



Pre-Development Conditions Hydrologic Areas Map
Figure Number 001
Scale: 1" = 300' Date: 05/06/2021
Plan No. 327400P004A-001
B+T Project No. 3274.00

Hilldale Avenue Solar 2
Haverhill, Massachusetts

BWC Camp Brook, LLC
111 Huntington Ave., Suite 650
Boston, Massachusetts

BEALS AND THOMAS, INC.

NOAA Atlas 14, Volume 10, Version 3
Location name: Haverhill, Massachusetts, USA*
Latitude: 42.8101°, Longitude: -71.1237°
Elevation: 207.44 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	0.311 (0.242-0.396)	0.371 (0.288-0.472)	0.469 (0.363-0.599)	0.550 (0.423-0.706)	0.662 (0.493-0.886)	0.746 (0.545-1.02)	0.834 (0.591-1.18)	0.932 (0.627-1.35)	1.07 (0.694-1.61)	1.18 (0.749-1.81)
10-min	0.441 (0.342-0.561)	0.526 (0.408-0.669)	0.665 (0.515-0.849)	0.780 (0.600-1.00)	0.938 (0.698-1.25)	1.06 (0.771-1.45)	1.18 (0.837-1.67)	1.32 (0.889-1.91)	1.52 (0.983-2.28)	1.68 (1.06-2.57)
15-min	0.519 (0.403-0.660)	0.619 (0.480-0.787)	0.782 (0.604-0.998)	0.917 (0.705-1.18)	1.10 (0.821-1.48)	1.24 (0.906-1.70)	1.39 (0.985-1.97)	1.55 (1.05-2.25)	1.79 (1.16-2.68)	1.97 (1.25-3.02)
30-min	0.714 (0.554-0.908)	0.851 (0.660-1.08)	1.08 (0.831-1.37)	1.26 (0.970-1.62)	1.52 (1.13-2.03)	1.71 (1.25-2.34)	1.91 (1.36-2.71)	2.14 (1.44-3.10)	2.45 (1.59-3.68)	2.71 (1.72-4.15)
60-min	0.909 (0.706-1.16)	1.08 (0.841-1.38)	1.37 (1.06-1.75)	1.61 (1.24-2.06)	1.93 (1.44-2.59)	2.18 (1.59-2.98)	2.44 (1.73-3.45)	2.72 (1.83-3.94)	3.12 (2.02-4.68)	3.45 (2.19-5.28)
2-hr	1.18 (0.919-1.49)	1.41 (1.10-1.78)	1.79 (1.39-2.27)	2.11 (1.63-2.69)	2.54 (1.91-3.40)	2.87 (2.11-3.92)	3.21 (2.31-4.57)	3.63 (2.45-5.23)	4.24 (2.76-6.33)	4.77 (3.03-7.25)
3-hr	1.36 (1.07-1.71)	1.64 (1.28-2.06)	2.09 (1.63-2.64)	2.46 (1.91-3.13)	2.98 (2.25-3.97)	3.36 (2.49-4.58)	3.77 (2.73-5.37)	4.28 (2.89-6.15)	5.04 (3.28-7.50)	5.70 (3.63-8.64)
6-hr	1.74 (1.37-2.17)	2.10 (1.66-2.63)	2.70 (2.13-3.40)	3.20 (2.50-4.04)	3.88 (2.95-5.15)	4.39 (3.27-5.96)	4.94 (3.59-7.00)	5.62 (3.81-8.03)	6.67 (4.35-9.85)	7.57 (4.83-11.4)
12-hr	2.17 (1.73-2.70)	2.65 (2.11-3.31)	3.44 (2.73-4.30)	4.10 (3.23-5.15)	4.99 (3.82-6.59)	5.66 (4.24-7.65)	6.38 (4.66-8.99)	7.27 (4.96-10.3)	8.64 (5.66-12.7)	9.82 (6.28-14.7)
24-hr	2.57 (2.06-3.18)	3.19 (2.56-3.95)	4.21 (3.36-5.23)	5.06 (4.01-6.32)	6.22 (4.79-8.18)	7.08 (5.35-9.53)	8.02 (5.91-11.3)	9.19 (6.29-13.0)	11.0 (7.25-16.1)	12.7 (8.12-18.8)
2-day	2.89 (2.33-3.55)	3.66 (2.95-4.51)	4.93 (3.96-6.09)	5.98 (4.78-7.42)	7.42 (5.76-9.74)	8.48 (6.46-11.4)	9.65 (7.20-13.6)	11.2 (7.68-15.7)	13.7 (9.00-19.8)	15.9 (10.2-23.4)
3-day	3.16 (2.57-3.88)	4.00 (3.24-4.90)	5.36 (4.33-6.60)	6.49 (5.20-8.03)	8.04 (6.27-10.5)	9.17 (7.02-12.3)	10.4 (7.82-14.7)	12.1 (8.32-16.9)	14.8 (9.77-21.4)	17.2 (11.1-25.3)
4-day	3.43 (2.79-4.20)	4.29 (3.49-5.25)	5.70 (4.61-6.99)	6.86 (5.52-8.47)	8.46 (6.61-11.0)	9.63 (7.39-12.9)	10.9 (8.20-15.3)	12.6 (8.72-17.7)	15.4 (10.2-22.3)	17.9 (11.6-26.3)
7-day	4.18 (3.42-5.08)	5.07 (4.14-6.17)	6.53 (5.32-7.97)	7.74 (6.26-9.50)	9.40 (7.38-12.2)	10.6 (8.17-14.1)	12.0 (8.99-16.6)	13.7 (9.50-19.1)	16.6 (11.0-23.8)	19.1 (12.4-27.9)
10-day	4.86 (3.99-5.89)	5.77 (4.74-7.01)	7.27 (5.95-8.86)	8.52 (6.92-10.4)	10.2 (8.05-13.2)	11.5 (8.85-15.1)	12.9 (9.66-17.7)	14.6 (10.2-20.2)	17.4 (11.6-24.9)	19.9 (12.9-29.0)
20-day	6.81 (5.64-8.21)	7.82 (6.46-9.43)	9.47 (7.80-11.5)	10.8 (8.87-13.2)	12.7 (10.0-16.1)	14.1 (10.9-18.3)	15.6 (11.6-21.0)	17.4 (12.1-23.8)	19.9 (13.3-28.2)	21.9 (14.3-31.8)
30-day	8.43 (7.01-10.1)	9.52 (7.91-11.4)	11.3 (9.35-13.6)	12.8 (10.5-15.5)	14.8 (11.7-18.6)	16.4 (12.6-21.0)	17.9 (13.3-23.8)	19.6 (13.8-26.8)	21.9 (14.7-31.0)	23.7 (15.5-34.2)
45-day	10.5 (8.76-12.6)	11.7 (9.73-14.0)	13.6 (11.3-16.3)	15.2 (12.5-18.3)	17.4 (13.8-21.7)	19.1 (14.7-24.3)	20.8 (15.3-27.2)	22.4 (15.8-30.4)	24.5 (16.5-34.5)	26.1 (17.0-37.5)
60-day	12.2 (10.3-14.6)	13.5 (11.3-16.1)	15.5 (12.9-18.6)	17.2 (14.2-20.7)	19.5 (15.5-24.3)	21.3 (16.5-27.0)	23.1 (17.1-30.1)	24.7 (17.5-33.5)	26.8 (18.1-37.5)	28.2 (18.4-40.4)

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

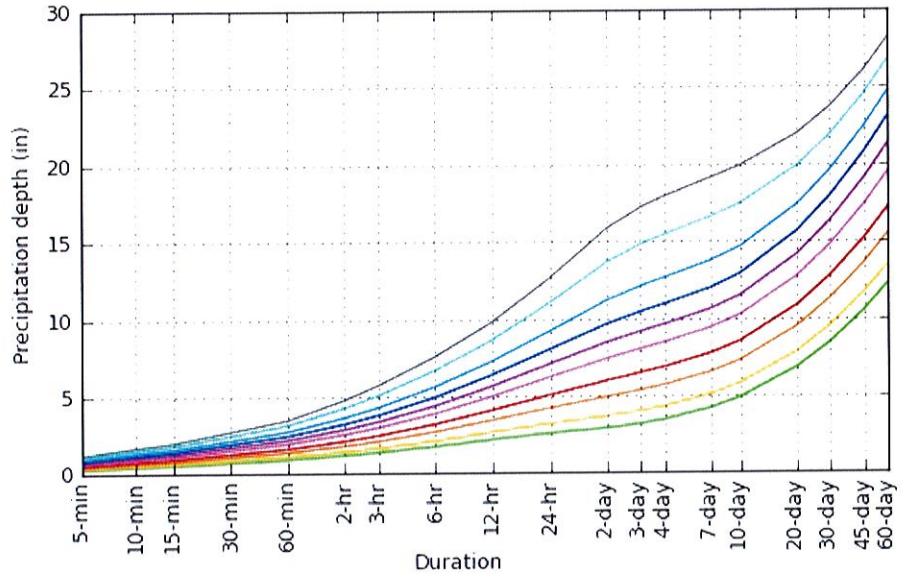
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

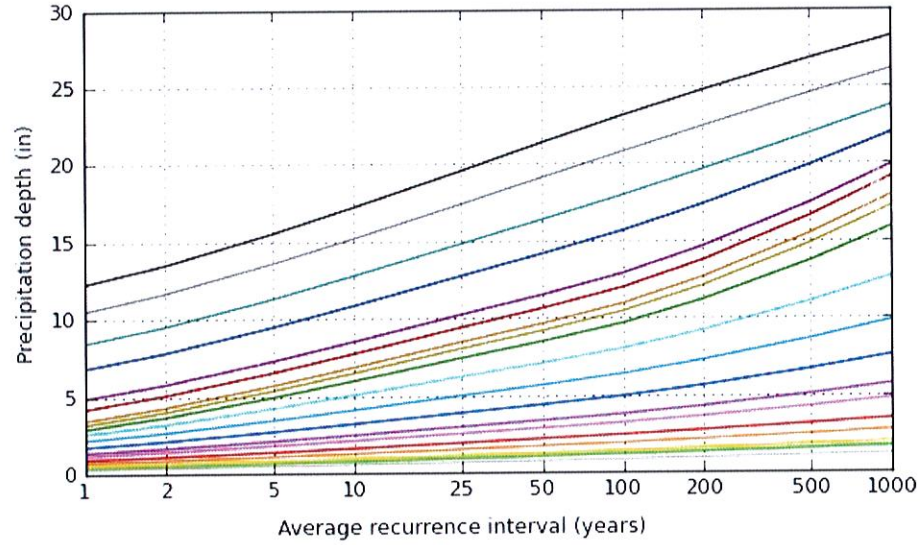
Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.8101°, Longitude: -71.1237°





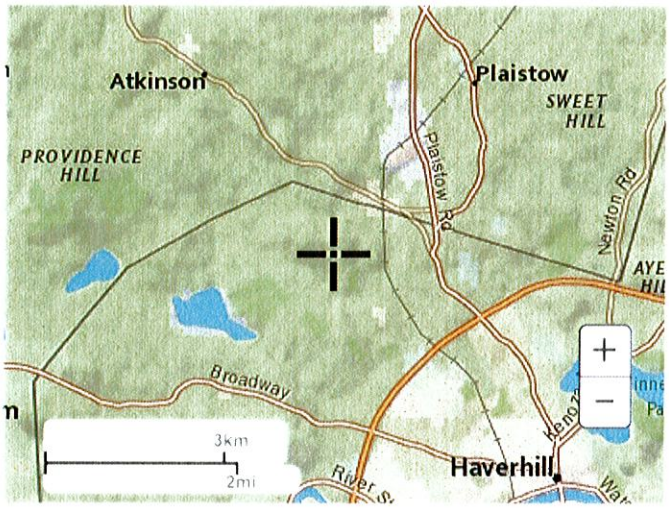
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Mon May 10 13:22:21 2021

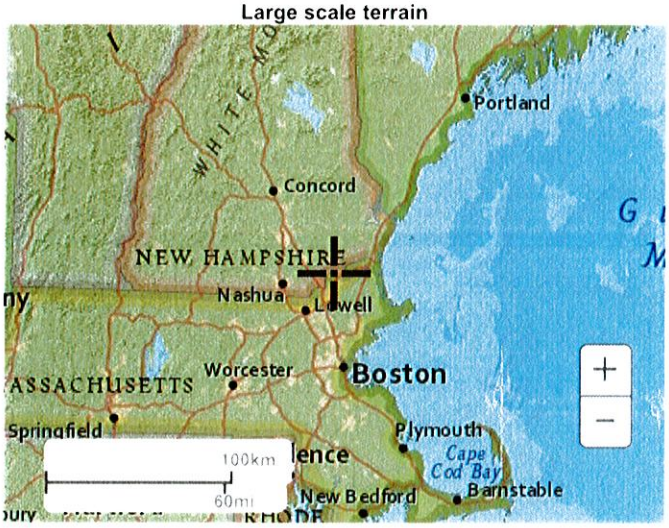
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Maps & aerials

Small scale terrain



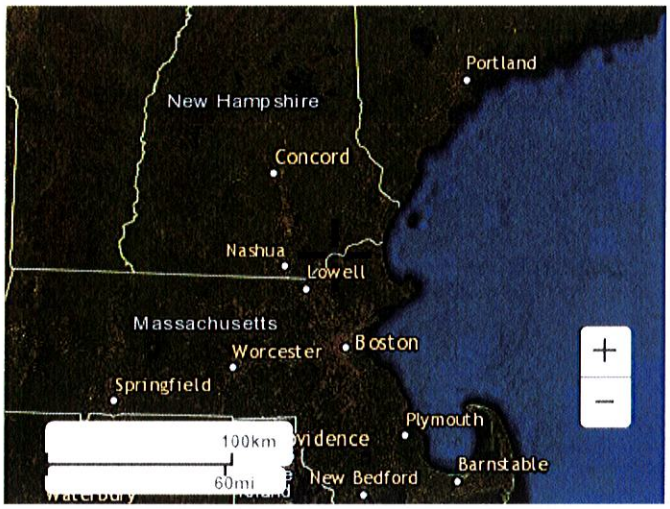
Large scale terrain



Large scale map



Large scale aerial

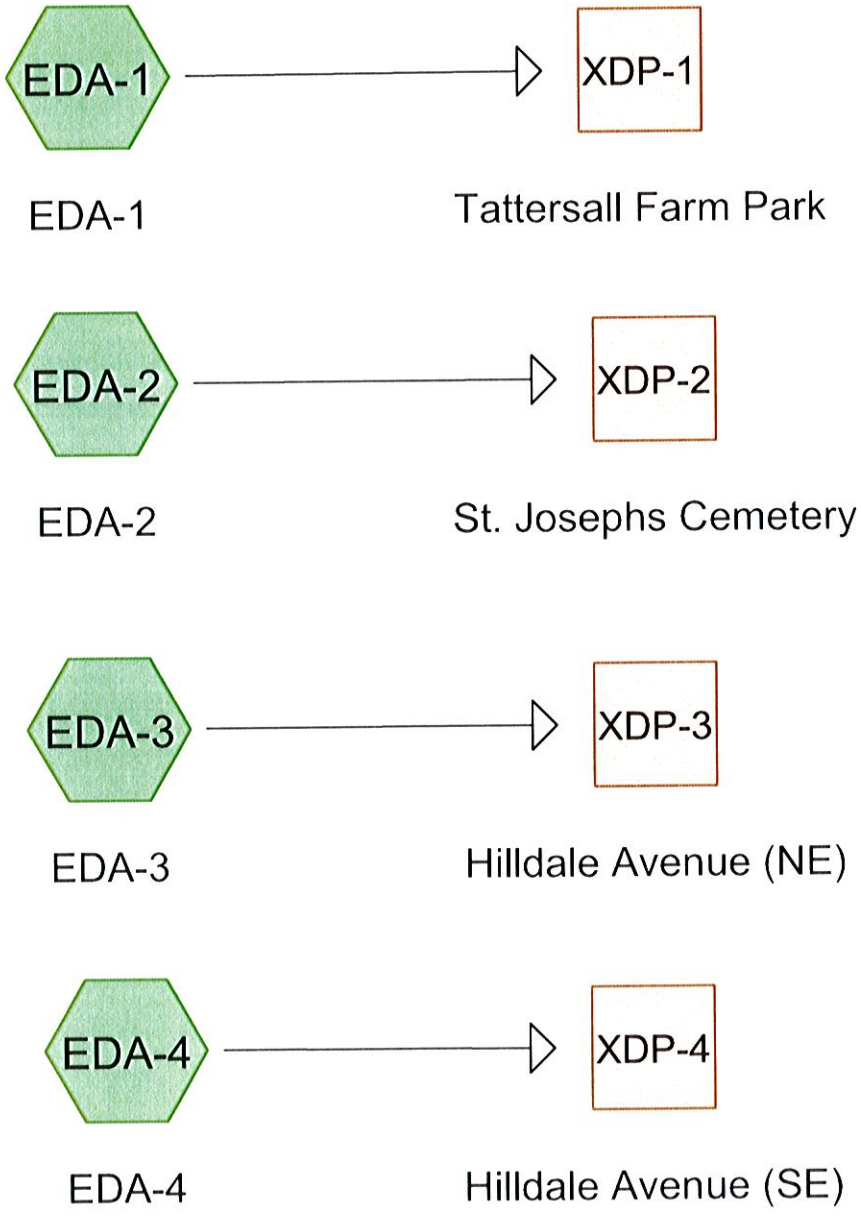


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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
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Disclaimer

Pre-Development
Conditions



Subcat Reach Pond Link

Routing Diagram for 327400HC001A
Prepared by Beals and Thomas, Inc., Printed 5/8/2021
HydroCAD® 10.10-5a s/n 04493 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.573	39	>75% Grass cover, Good, HSG A (EDA-3, EDA-4)
19.578	74	>75% Grass cover, Good, HSG C (EDA-1, EDA-2, EDA-3, EDA-4)
10.478	80	>75% Grass cover, Good, HSG D (EDA-1, EDA-2, EDA-3, EDA-4)
0.844	96	Gravel surface (EDA-1, EDA-2, EDA-3, EDA-4)
0.039	98	Impervious Area (EDA-3)
0.068	98	Roofs (EDA-1)
2.810	30	Woods, Good, HSG A (EDA-3, EDA-4)
47.512	70	Woods, Good, HSG C (EDA-1, EDA-2, EDA-3, EDA-4)
6.789	77	Woods, Good, HSG D (EDA-1, EDA-2, EDA-3, EDA-4)
88.691	**71**	**TOTAL AREA**

Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-1: EDA-1 Runoff Area=33.214 ac 0.20% Impervious Runoff Depth>0.87"
Flow Length=1,530' Tc=31.0 min CN=71 Runoff=17.31 cfs 2.409 af

Subcatchment EDA-2: EDA-2 Runoff Area=30.816 ac 0.00% Impervious Runoff Depth>1.09"
Flow Length=1,377' Tc=28.0 min CN=75 Runoff=21.94 cfs 2.789 af

Subcatchment EDA-3: EDA-3 Runoff Area=11.740 ac 0.33% Impervious Runoff Depth>0.73"
Flow Length=534' Tc=7.7 min CN=68 Runoff=7.90 cfs 0.715 af

Subcatchment EDA-4: EDA-4 Runoff Area=12.921 ac 0.00% Impervious Runoff Depth>0.68"
Flow Length=1,066' Tc=16.0 min CN=67 Runoff=6.32 cfs 0.736 af

Reach XDP-1: Tattersall Farm Park Inflow=17.31 cfs 2.409 af
Outflow=17.31 cfs 2.409 af

Reach XDP-2: St. Josephs Cemetery Inflow=21.94 cfs 2.789 af
Outflow=21.94 cfs 2.789 af

Reach XDP-3: Hilldale Avenue (NE) Inflow=7.90 cfs 0.715 af
Outflow=7.90 cfs 0.715 af

Reach XDP-4: Hilldale Avenue (SE) Inflow=6.32 cfs 0.736 af
Outflow=6.32 cfs 0.736 af

Total Runoff Area = 88.691 ac Runoff Volume = 6.650 af Average Runoff Depth = 0.90"
99.88% Pervious = 88.584 ac 0.12% Impervious = 0.107 ac

Summary for Subcatchment EDA-1: EDA-1

Runoff = 17.31 cfs @ 12.49 hrs, Volume= 2.409 af, Depth> 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
*	0.068	98	Roofs
	29.698	70	Woods, Good, HSG C
	1.468	77	Woods, Good, HSG D
	1.650	74	>75% Grass cover, Good, HSG C
	0.193	80	>75% Grass cover, Good, HSG D
*	0.137	96	Gravel surface
	33.214	71	Weighted Average
	33.146		99.80% Pervious Area
	0.068		0.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	57	0.1400	1.87		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
21.0	1,423	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
31.0	1,530	Total			

Summary for Subcatchment EDA-2: EDA-2

Runoff = 21.94 cfs @ 12.42 hrs, Volume= 2.789 af, Depth> 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	8.871	70	Woods, Good, HSG C
	2.495	77	Woods, Good, HSG D
	10.086	74	>75% Grass cover, Good, HSG C
	8.950	80	>75% Grass cover, Good, HSG D
*	0.414	96	Gravel surface
	30.816	75	Weighted Average
	30.816		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.0050	0.08		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
8.5	567	0.0250	1.11		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.1	183	0.0440	1.47		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
7.4	577	0.0670	1.29		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
28.0	1,377	Total			

Summary for Subcatchment EDA-3: EDA-3

Runoff = 7.90 cfs @ 12.13 hrs, Volume= 0.715 af, Depth> 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
*	0.039	98	Impervious Area
	0.790	30	Woods, Good, HSG A
	5.895	70	Woods, Good, HSG C
	0.284	77	Woods, Good, HSG D
	0.341	39	>75% Grass cover, Good, HSG A
	4.311	74	>75% Grass cover, Good, HSG C
	0.038	80	>75% Grass cover, Good, HSG D
*	0.042	96	Gravel surface
	11.740	68	Weighted Average
	11.701		99.67% Pervious Area
	0.039		0.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.6	220	0.1050	2.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.8	264	0.2350	2.42		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
7.7	534	Total			

Summary for Subcatchment EDA-4: EDA-4

Runoff = 6.32 cfs @ 12.26 hrs, Volume= 0.736 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	2.020	30	Woods, Good, HSG A
	3.048	70	Woods, Good, HSG C
	2.542	77	Woods, Good, HSG D
	0.232	39	>75% Grass cover, Good, HSG A
	3.531	74	>75% Grass cover, Good, HSG C
	1.297	80	>75% Grass cover, Good, HSG D
*	0.251	96	Gravel surface
	12.921	67	Weighted Average
	12.921		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	173	0.0750	1.92		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.3	139	0.1290	1.80		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	187	0.2670	2.58		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
8.3	517	0.0430	1.04		**Shallow Concentrated Flow, Tc-5** Woodland Kv= 5.0 fps
16.0	1,066	Total			

Summary for Reach XDP-1: Tattersall Farm Park

Inflow Area = 33.214 ac, 0.20% Impervious, Inflow Depth > 0.87" for NOAA14-002yr event
Inflow = 17.31 cfs @ 12.49 hrs, Volume= 2.409 af
Outflow = 17.31 cfs @ 12.49 hrs, Volume= 2.409 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-2: St. Josephs Cemetery

Inflow Area = 30.816 ac, 0.00% Impervious, Inflow Depth > 1.09" for NOAA14-002yr event
Inflow = 21.94 cfs @ 12.42 hrs, Volume= 2.789 af
Outflow = 21.94 cfs @ 12.42 hrs, Volume= 2.789 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-3: Hilldale Avenue (NE)

Inflow Area = 11.740 ac, 0.33% Impervious, Inflow Depth > 0.73" for NOAA14-002yr event
Inflow = 7.90 cfs @ 12.13 hrs, Volume= 0.715 af
Outflow = 7.90 cfs @ 12.13 hrs, Volume= 0.715 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-4: Hilldale Avenue (SE)

Inflow Area = 12.921 ac, 0.00% Impervious, Inflow Depth > 0.68" for NOAA14-002yr event
Inflow = 6.32 cfs @ 12.26 hrs, Volume= 0.736 af
Outflow = 6.32 cfs @ 12.26 hrs, Volume= 0.736 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-1: EDA-1 Runoff Area=33.214 ac 0.20% Impervious Runoff Depth>2.15"
Flow Length=1,530' Tc=31.0 min CN=71 Runoff=46.29 cfs 5.962 af

Subcatchment EDA-2: EDA-2 Runoff Area=30.816 ac 0.00% Impervious Runoff Depth>2.49"
Flow Length=1,377' Tc=28.0 min CN=75 Runoff=52.48 cfs 6.398 af

Subcatchment EDA-3: EDA-3 Runoff Area=11.740 ac 0.33% Impervious Runoff Depth>1.93"
Flow Length=534' Tc=7.7 min CN=68 Runoff=24.03 cfs 1.885 af

Subcatchment EDA-4: EDA-4 Runoff Area=12.921 ac 0.00% Impervious Runoff Depth>1.85"
Flow Length=1,066' Tc=16.0 min CN=67 Runoff=19.77 cfs 1.987 af

Reach XDP-1: Tattersall Farm Park Inflow=46.29 cfs 5.962 af
Outflow=46.29 cfs 5.962 af

Reach XDP-2: St. Josephs Cemetery Inflow=52.48 cfs 6.398 af
Outflow=52.48 cfs 6.398 af

Reach XDP-3: Hilldale Avenue (NE) Inflow=24.03 cfs 1.885 af
Outflow=24.03 cfs 1.885 af

Reach XDP-4: Hilldale Avenue (SE) Inflow=19.77 cfs 1.987 af
Outflow=19.77 cfs 1.987 af

Total Runoff Area = 88.691 ac Runoff Volume = 16.232 af Average Runoff Depth = 2.20"
99.88% Pervious = 88.584 ac 0.12% Impervious = 0.107 ac

Summary for Subcatchment EDA-1: EDA-1

Runoff = 46.29 cfs @ 12.45 hrs, Volume= 5.962 af, Depth> 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
*	0.068	98	Roofs
	29.698	70	Woods, Good, HSG C
	1.468	77	Woods, Good, HSG D
	1.650	74	>75% Grass cover, Good, HSG C
	0.193	80	>75% Grass cover, Good, HSG D
*	0.137	96	Gravel surface
	33.214	71	Weighted Average
	33.146		99.80% Pervious Area
	0.068		0.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	57	0.1400	1.87		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
21.0	1,423	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
31.0	1,530	Total			

Summary for Subcatchment EDA-2: EDA-2

Runoff = 52.48 cfs @ 12.40 hrs, Volume= 6.398 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	8.871	70	Woods, Good, HSG C
	2.495	77	Woods, Good, HSG D
	10.086	74	>75% Grass cover, Good, HSG C
	8.950	80	>75% Grass cover, Good, HSG D
*	0.414	96	Gravel surface
	30.816	75	Weighted Average
	30.816		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.0050	0.08		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
8.5	567	0.0250	1.11		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.1	183	0.0440	1.47		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
7.4	577	0.0670	1.29		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
28.0	1,377	Total			

Summary for Subcatchment EDA-3: EDA-3

Runoff = 24.03 cfs @ 12.12 hrs, Volume= 1.885 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
*	0.039	98	Impervious Area
	0.790	30	Woods, Good, HSG A
	5.895	70	Woods, Good, HSG C
	0.284	77	Woods, Good, HSG D
	0.341	39	>75% Grass cover, Good, HSG A
	4.311	74	>75% Grass cover, Good, HSG C
	0.038	80	>75% Grass cover, Good, HSG D
*	0.042	96	Gravel surface
	11.740	68	Weighted Average
	11.701		99.67% Pervious Area
	0.039		0.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.6	220	0.1050	2.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.8	264	0.2350	2.42		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
7.7	534	Total			

Summary for Subcatchment EDA-4: EDA-4

Runoff = 19.77 cfs @ 12.24 hrs, Volume= 1.987 af, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	2.020	30	Woods, Good, HSG A
	3.048	70	Woods, Good, HSG C
	2.542	77	Woods, Good, HSG D
	0.232	39	>75% Grass cover, Good, HSG A
	3.531	74	>75% Grass cover, Good, HSG C
	1.297	80	>75% Grass cover, Good, HSG D
*	0.251	96	Gravel surface
	12.921	67	Weighted Average
	12.921		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	173	0.0750	1.92		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.3	139	0.1290	1.80		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	187	0.2670	2.58		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
8.3	517	0.0430	1.04		**Shallow Concentrated Flow, Tc-5** Woodland Kv= 5.0 fps
16.0	1,066	Total			

Summary for Reach XDP-1: Tattersall Farm Park

Inflow Area = 33.214 ac, 0.20% Impervious, Inflow Depth > 2.15" for NOAA14-010yr event
Inflow = 46.29 cfs @ 12.45 hrs, Volume= 5.962 af
Outflow = 46.29 cfs @ 12.45 hrs, Volume= 5.962 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-2: St. Josephs Cemetery

Inflow Area = 30.816 ac, 0.00% Impervious, Inflow Depth > 2.49" for NOAA14-010yr event
Inflow = 52.48 cfs @ 12.40 hrs, Volume= 6.398 af
Outflow = 52.48 cfs @ 12.40 hrs, Volume= 6.398 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-3: Hilldale Avenue (NE)

Inflow Area = 11.740 ac, 0.33% Impervious, Inflow Depth > 1.93" for NOAA14-010yr event
Inflow = 24.03 cfs @ 12.12 hrs, Volume= 1.885 af
Outflow = 24.03 cfs @ 12.12 hrs, Volume= 1.885 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-4: Hilldale Avenue (SE)

Inflow Area = 12.921 ac, 0.00% Impervious, Inflow Depth > 1.85" for NOAA14-010yr event
Inflow = 19.77 cfs @ 12.24 hrs, Volume= 1.987 af
Outflow = 19.77 cfs @ 12.24 hrs, Volume= 1.987 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-1: EDA-1 Runoff Area=33.214 ac 0.20% Impervious Runoff Depth>4.58"
Flow Length=1,530' Tc=31.0 min CN=71 Runoff=99.77 cfs 12.669 af

Subcatchment EDA-2: EDA-2 Runoff Area=30.816 ac 0.00% Impervious Runoff Depth>5.04"
Flow Length=1,377' Tc=28.0 min CN=75 Runoff=106.34 cfs 12.950 af

Subcatchment EDA-3: EDA-3 Runoff Area=11.740 ac 0.33% Impervious Runoff Depth>4.26"
Flow Length=534' Tc=7.7 min CN=68 Runoff=54.60 cfs 4.163 af

Subcatchment EDA-4: EDA-4 Runoff Area=12.921 ac 0.00% Impervious Runoff Depth>4.13"
Flow Length=1,066' Tc=16.0 min CN=67 Runoff=46.11 cfs 4.451 af

Reach XDP-1: Tattersall Farm Park Inflow=99.77 cfs 12.669 af
Outflow=99.77 cfs 12.669 af

Reach XDP-2: St. Josephs Cemetery Inflow=106.34 cfs 12.950 af
Outflow=106.34 cfs 12.950 af

Reach XDP-3: Hilldale Avenue (NE) Inflow=54.60 cfs 4.163 af
Outflow=54.60 cfs 4.163 af

Reach XDP-4: Hilldale Avenue (SE) Inflow=46.11 cfs 4.451 af
Outflow=46.11 cfs 4.451 af

Total Runoff Area = 88.691 ac Runoff Volume = 34.233 af Average Runoff Depth = 4.63"
99.88% Pervious = 88.584 ac 0.12% Impervious = 0.107 ac

Summary for Subcatchment EDA-1: EDA-1

Runoff = 99.77 cfs @ 12.43 hrs, Volume= 12.669 af, Depth> 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
*	0.068	98	Roofs
	29.698	70	Woods, Good, HSG C
	1.468	77	Woods, Good, HSG D
	1.650	74	>75% Grass cover, Good, HSG C
	0.193	80	>75% Grass cover, Good, HSG D
*	0.137	96	Gravel surface
	33.214	71	Weighted Average
	33.146		99.80% Pervious Area
	0.068		0.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	57	0.1400	1.87		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
21.0	1,423	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
31.0	1,530	Total			

Summary for Subcatchment EDA-2: EDA-2

Runoff = 106.34 cfs @ 12.38 hrs, Volume= 12.950 af, Depth> 5.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
	8.871	70	Woods, Good, HSG C
	2.495	77	Woods, Good, HSG D
	10.086	74	>75% Grass cover, Good, HSG C
	8.950	80	>75% Grass cover, Good, HSG D
*	0.414	96	Gravel surface
	30.816	75	Weighted Average
	30.816		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.0050	0.08		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
8.5	567	0.0250	1.11		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.1	183	0.0440	1.47		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
7.4	577	0.0670	1.29		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
28.0	1,377	Total			

Summary for Subcatchment EDA-3: EDA-3

Runoff = 54.60 cfs @ 12.11 hrs, Volume= 4.163 af, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
*	0.039	98	Impervious Area
	0.790	30	Woods, Good, HSG A
	5.895	70	Woods, Good, HSG C
	0.284	77	Woods, Good, HSG D
	0.341	39	>75% Grass cover, Good, HSG A
	4.311	74	>75% Grass cover, Good, HSG C
	0.038	80	>75% Grass cover, Good, HSG D
*	0.042	96	Gravel surface
	11.740	68	Weighted Average
	11.701		99.67% Pervious Area
	0.039		0.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.6	220	0.1050	2.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.8	264	0.2350	2.42		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
7.7	534	Total			

Summary for Subcatchment EDA-4: EDA-4

Runoff = 46.11 cfs @ 12.22 hrs, Volume= 4.451 af, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
	2.020	30	Woods, Good, HSG A
	3.048	70	Woods, Good, HSG C
	2.542	77	Woods, Good, HSG D
	0.232	39	>75% Grass cover, Good, HSG A
	3.531	74	>75% Grass cover, Good, HSG C
	1.297	80	>75% Grass cover, Good, HSG D
*	0.251	96	Gravel surface
	12.921	67	Weighted Average
	12.921		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	173	0.0750	1.92		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.3	139	0.1290	1.80		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	187	0.2670	2.58		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
8.3	517	0.0430	1.04		**Shallow Concentrated Flow, Tc-5** Woodland Kv= 5.0 fps
16.0	1,066	Total			

Summary for Reach XDP-1: Tattersall Farm Park

Inflow Area = 33.214 ac, 0.20% Impervious, Inflow Depth > 4.58" for NOAA14-100yr event
Inflow = 99.77 cfs @ 12.43 hrs, Volume= 12.669 af
Outflow = 99.77 cfs @ 12.43 hrs, Volume= 12.669 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-2: St. Josephs Cemetery

Inflow Area = 30.816 ac, 0.00% Impervious, Inflow Depth > 5.04" for NOAA14-100yr event
Inflow = 106.34 cfs @ 12.38 hrs, Volume= 12.950 af
Outflow = 106.34 cfs @ 12.38 hrs, Volume= 12.950 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-3: Hilldale Avenue (NE)

Inflow Area = 11.740 ac, 0.33% Impervious, Inflow Depth > 4.26" for NOAA14-100yr event
Inflow = 54.60 cfs @ 12.11 hrs, Volume= 4.163 af
Outflow = 54.60 cfs @ 12.11 hrs, Volume= 4.163 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-4: Hilldale Avenue (SE)

Inflow Area = 12.921 ac, 0.00% Impervious, Inflow Depth > 4.13" for NOAA14-100yr event
Inflow = 46.11 cfs @ 12.22 hrs, Volume= 4.451 af
Outflow = 46.11 cfs @ 12.22 hrs, Volume= 4.451 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Attachment 3
Post-Development Hydrologic Analysis

BEALS + THOMAS
CIVIL ENGINEERS | LANDSCAPE ARCHITECTS |
LAND SURVEYORS | PLANNERS | ENVIRONMENTAL SPECIALISTS

CALCULATION SUMMARY

JOB NO. LOCATION:

3274.00
Haverhill, MA

CLIENT/PROJECT:

BWC Camp Brook, LLC
Hilldale Avenue Solar 2

SUBJECT TITLE:

Post-Development Conditions Hydrology

OBJECTIVE OF CALCULATION:

- To determine the post-development peak rates of runoff from the site for the 2, 10, & 100-year storm events at the design points.

CALCULATION METHOD(S):

- Runoff curve numbers (CN), time-of-concentration (Tc), and runoff rates were calculated based on TR-55 methodology.
- AutoCAD 2019 computer program was utilized for digitizing ground cover areas.
- Peak runoff rates were computed using HydroCAD version 10.00.
- Design storms calculated using NOAA Atlas 14 point precipitation frequency estimates.

ASSUMPTIONS:

- The ground cover types were determined using aerial imagery. Hydrologic soil groups based on United States Department of Agriculture, NRCS Soil Survey map information.
- Stormwater runoff from offsite tributary areas was included in the calculations.
- Woodbridge soils were modeled as HSG "D" for this calculation.
- Off-site area contour information retrieved from MassGIS.

SOURCES OF DATA/EQUATIONS:

- Post-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc. File No. 327400P004A-002.
- NRCS Soil Survey for Plymouth County, hydrologic soil group report, downloaded from Web Soil Survey on 02/26/2021.
- TR-55 urban Hydrology for Small Watersheds, SCS, 1986.
- Massachusetts DEP Stormwater Management Handbook, February 2008.

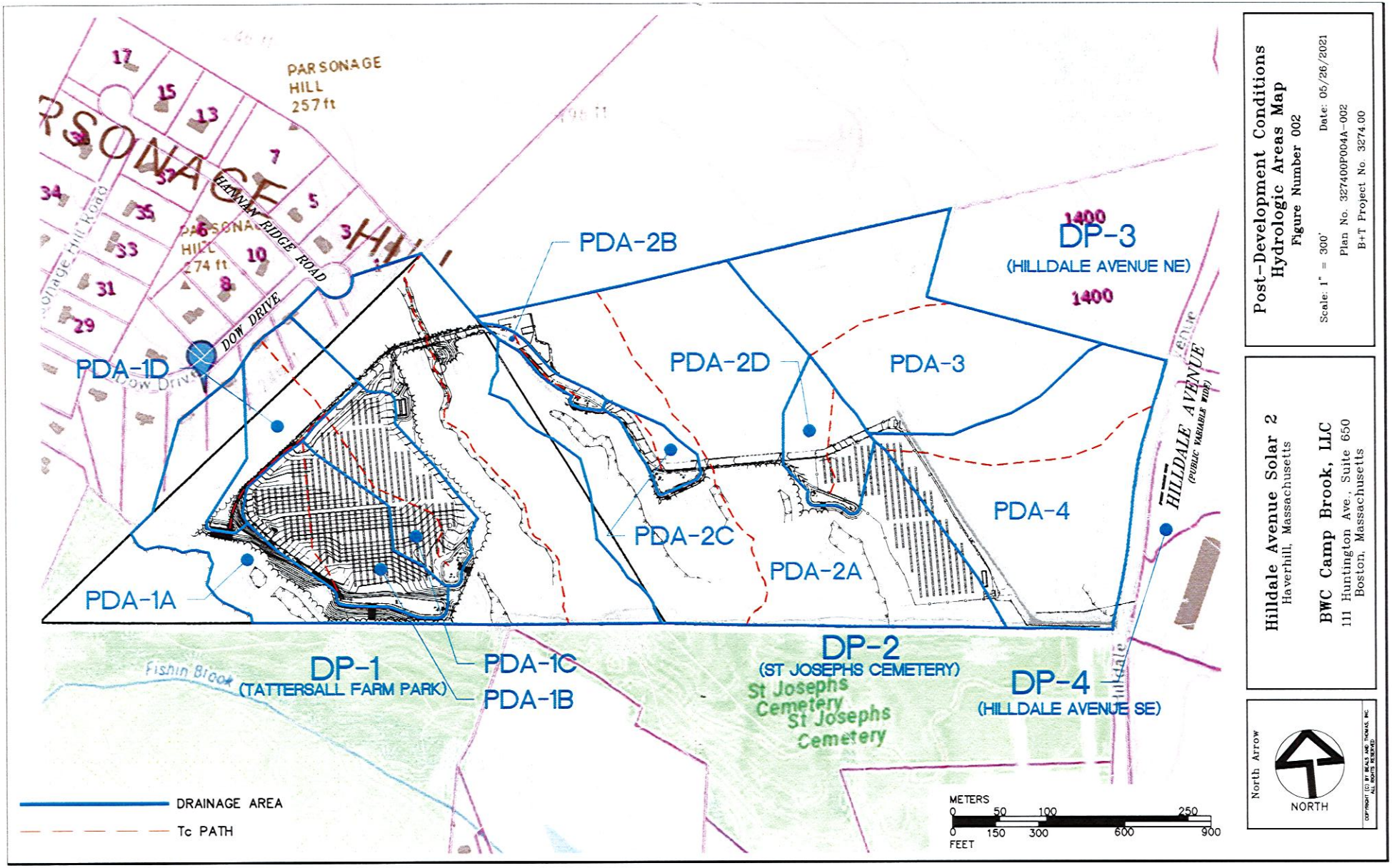
CONCLUSIONS:

Peak Runoff Rates (CFS):

Storm Event	DP-1	DP-2	DP-3	DP-4
2-Year	16.08	21.17	7.90	6.32
10-Year	45.77	50.47	24.03	19.77
100-Year	96.24	102.74	54.60	46.11

Conclusion: Overall runoff rates from the project area will be less than existing conditions in accordance with Standard 2 of the MassDEP Stormwater Management Regulations.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	NBB	05/06/2021	JRM	05/26/2021	JRM	05/27/2021



Post-Development Conditions Hydrologic Areas Map
Figure Number 002

Scale: 1" = 300' Date: 05/26/2021

Plan No. 327400P004A-002

B+T Project No. 3274.00

Hillsdale Avenue Solar 2
Haverhill, Massachusetts

BWC Camp Brook, LLC
111 Huntington Ave., Suite 650
Boston, Massachusetts

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NOAA Atlas 14, Volume 10, Version 3
Location name: Haverhill, Massachusetts, USA*
Latitude: 42.8101°, Longitude: -71.1237°
Elevation: 207.44 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	0.311 (0.242-0.396)	0.371 (0.288-0.472)	0.469 (0.363-0.599)	0.550 (0.423-0.706)	0.662 (0.493-0.886)	0.746 (0.545-1.02)	0.834 (0.591-1.18)	0.932 (0.627-1.35)	1.07 (0.694-1.61)	1.18 (0.749-1.81)
10-min	0.441 (0.342-0.561)	0.526 (0.408-0.669)	0.665 (0.515-0.849)	0.780 (0.600-1.00)	0.938 (0.698-1.25)	1.06 (0.771-1.45)	1.18 (0.837-1.67)	1.32 (0.889-1.91)	1.52 (0.983-2.28)	1.68 (1.06-2.57)
15-min	0.519 (0.403-0.660)	0.619 (0.480-0.787)	0.782 (0.604-0.998)	0.917 (0.705-1.18)	1.10 (0.821-1.48)	1.24 (0.906-1.70)	1.39 (0.985-1.97)	1.55 (1.05-2.25)	1.79 (1.16-2.68)	1.97 (1.25-3.02)
30-min	0.714 (0.554-0.908)	0.851 (0.660-1.08)	1.08 (0.831-1.37)	1.26 (0.970-1.62)	1.52 (1.13-2.03)	1.71 (1.25-2.34)	1.91 (1.36-2.71)	2.14 (1.44-3.10)	2.45 (1.59-3.68)	2.71 (1.72-4.15)
60-min	0.909 (0.706-1.16)	1.08 (0.841-1.38)	1.37 (1.06-1.75)	1.61 (1.24-2.06)	1.93 (1.44-2.59)	2.18 (1.59-2.98)	2.44 (1.73-3.45)	2.72 (1.83-3.94)	3.12 (2.02-4.68)	3.45 (2.19-5.28)
2-hr	1.18 (0.919-1.49)	1.41 (1.10-1.78)	1.79 (1.39-2.27)	2.11 (1.63-2.69)	2.54 (1.91-3.40)	2.87 (2.11-3.92)	3.21 (2.31-4.57)	3.63 (2.45-5.23)	4.24 (2.76-6.33)	4.77 (3.03-7.25)
3-hr	1.36 (1.07-1.71)	1.64 (1.28-2.06)	2.09 (1.63-2.64)	2.46 (1.91-3.13)	2.98 (2.25-3.97)	3.36 (2.49-4.58)	3.77 (2.73-5.37)	4.28 (2.89-6.15)	5.04 (3.28-7.50)	5.70 (3.63-8.64)
6-hr	1.74 (1.37-2.17)	2.10 (1.66-2.63)	2.70 (2.13-3.40)	3.20 (2.50-4.04)	3.88 (2.95-5.15)	4.39 (3.27-5.96)	4.94 (3.59-7.00)	5.62 (3.81-8.03)	6.67 (4.35-9.85)	7.57 (4.83-11.4)
12-hr	2.17 (1.73-2.70)	2.65 (2.11-3.31)	3.44 (2.73-4.30)	4.10 (3.23-5.15)	4.99 (3.82-6.59)	5.66 (4.24-7.65)	6.38 (4.66-8.99)	7.27 (4.96-10.3)	8.64 (5.66-12.7)	9.82 (6.28-14.7)
24-hr	2.57 (2.06-3.18)	3.19 (2.56-3.95)	4.21 (3.36-5.23)	5.06 (4.01-6.32)	6.22 (4.79-8.18)	7.08 (5.35-9.53)	8.02 (5.91-11.3)	9.19 (6.29-13.0)	11.0 (7.25-16.1)	12.7 (8.12-18.8)
2-day	2.89 (2.33-3.55)	3.66 (2.95-4.51)	4.93 (3.96-6.09)	5.98 (4.78-7.42)	7.42 (5.76-9.74)	8.48 (6.46-11.4)	9.65 (7.20-13.6)	11.2 (7.68-15.7)	13.7 (9.00-19.8)	15.9 (10.2-23.4)
3-day	3.16 (2.57-3.88)	4.00 (3.24-4.90)	5.36 (4.33-6.60)	6.49 (5.20-8.03)	8.04 (6.27-10.5)	9.17 (7.02-12.3)	10.4 (7.82-14.7)	12.1 (8.32-16.9)	14.8 (9.77-21.4)	17.2 (11.1-25.3)
4-day	3.43 (2.79-4.20)	4.29 (3.49-5.25)	5.70 (4.61-6.99)	6.86 (5.52-8.47)	8.46 (6.61-11.0)	9.63 (7.39-12.9)	10.9 (8.20-15.3)	12.6 (8.72-17.7)	15.4 (10.2-22.3)	17.9 (11.6-26.3)
7-day	4.18 (3.42-5.08)	5.07 (4.14-6.17)	6.53 (5.32-7.97)	7.74 (6.26-9.50)	9.40 (7.38-12.2)	10.6 (8.17-14.1)	12.0 (8.99-16.6)	13.7 (9.50-19.1)	16.6 (11.0-23.8)	19.1 (12.4-27.9)
10-day	4.86 (3.99-5.89)	5.77 (4.74-7.01)	7.27 (5.95-8.86)	8.52 (6.92-10.4)	10.2 (8.05-13.2)	11.5 (8.85-15.1)	12.9 (9.66-17.7)	14.6 (10.2-20.2)	17.4 (11.6-24.9)	19.9 (12.9-29.0)
20-day	6.81 (5.64-8.21)	7.82 (6.46-9.43)	9.47 (7.80-11.5)	10.8 (8.87-13.2)	12.7 (10.0-16.1)	14.1 (10.9-18.3)	15.6 (11.6-21.0)	17.4 (12.1-23.8)	19.9 (13.3-28.2)	21.9 (14.3-31.8)
30-day	8.43 (7.01-10.1)	9.52 (7.91-11.4)	11.3 (9.35-13.6)	12.8 (10.5-15.5)	14.8 (11.7-18.6)	16.4 (12.6-21.0)	17.9 (13.3-23.8)	19.6 (13.8-26.8)	21.9 (14.7-31.0)	23.7 (15.5-34.2)
45-day	10.5 (8.76-12.6)	11.7 (9.73-14.0)	13.6 (11.3-16.3)	15.2 (12.5-18.3)	17.4 (13.8-21.7)	19.1 (14.7-24.3)	20.8 (15.3-27.2)	22.4 (15.8-30.4)	24.5 (16.5-34.5)	26.1 (17.0-37.5)
60-day	12.2 (10.3-14.6)	13.5 (11.3-16.1)	15.5 (12.9-18.6)	17.2 (14.2-20.7)	19.5 (15.5-24.3)	21.3 (16.5-27.0)	23.1 (17.1-30.1)	24.7 (17.5-33.5)	26.8 (18.1-37.5)	28.2 (18.4-40.4)

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

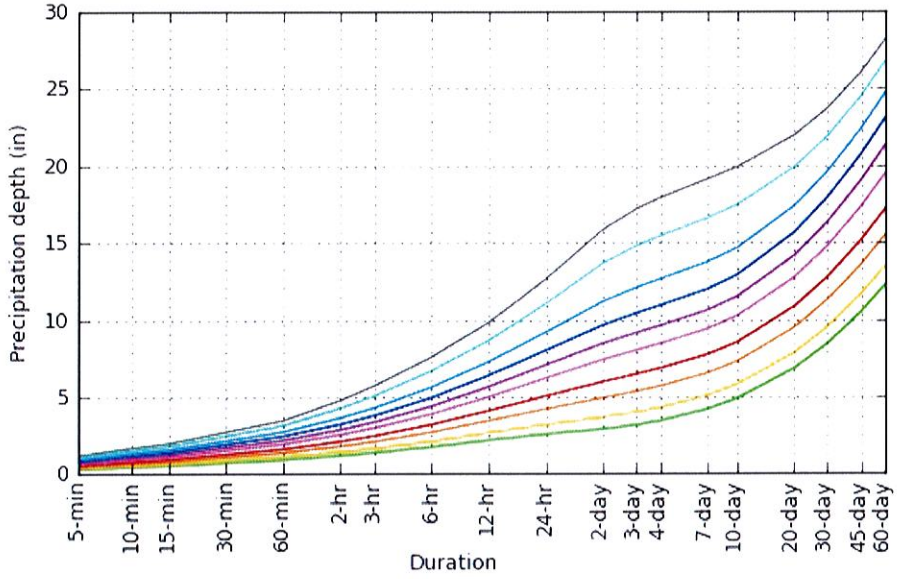
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

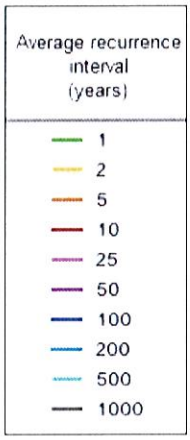
Please refer to NOAA Atlas 14 document for more information.

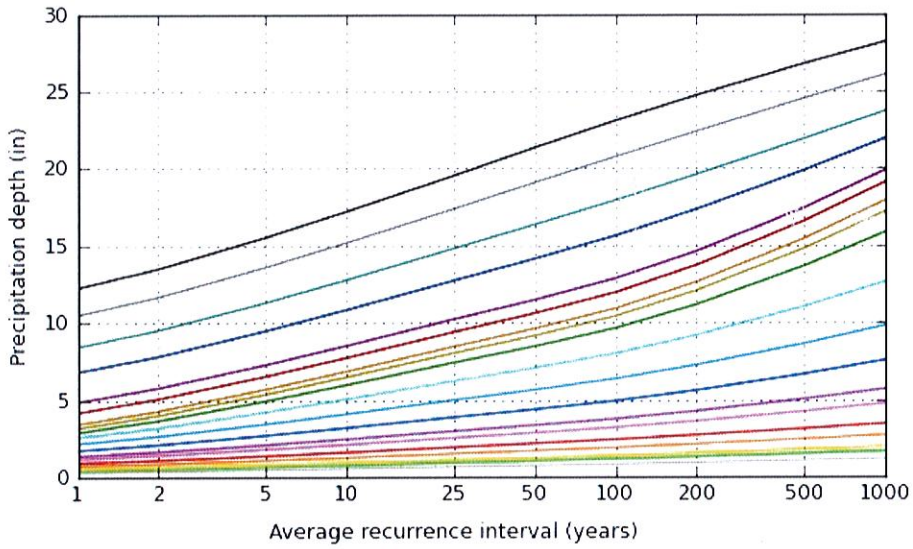
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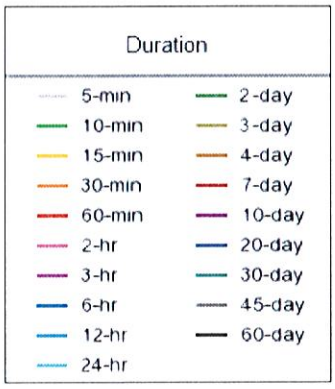
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.8101°, Longitude: -71.1237°









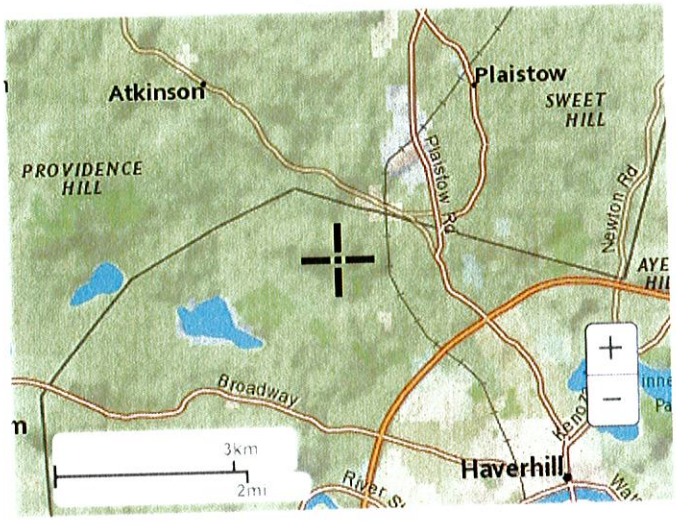
NOAA Atlas 14, Volume 10, Version 3

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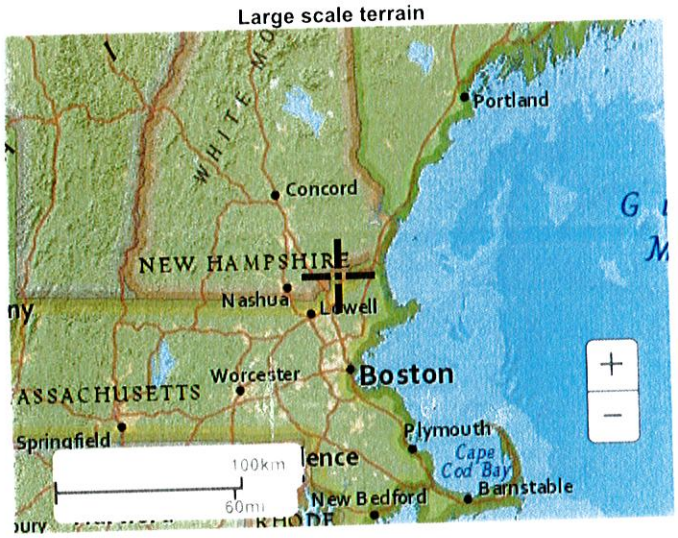
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Maps & aerials

Small scale terrain



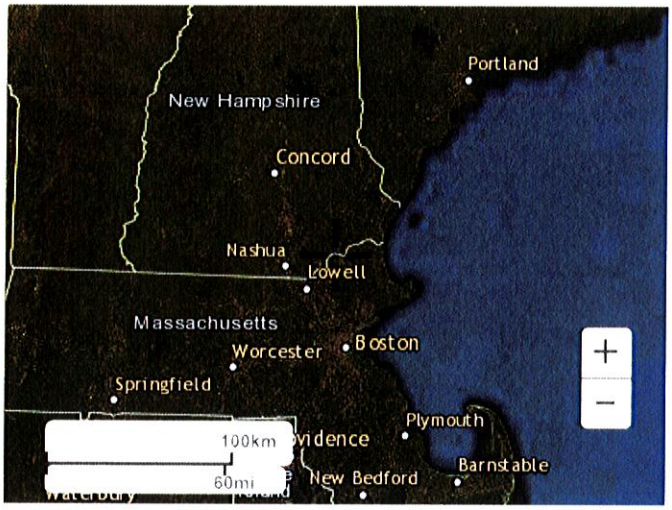
Large scale terrain



Large scale map



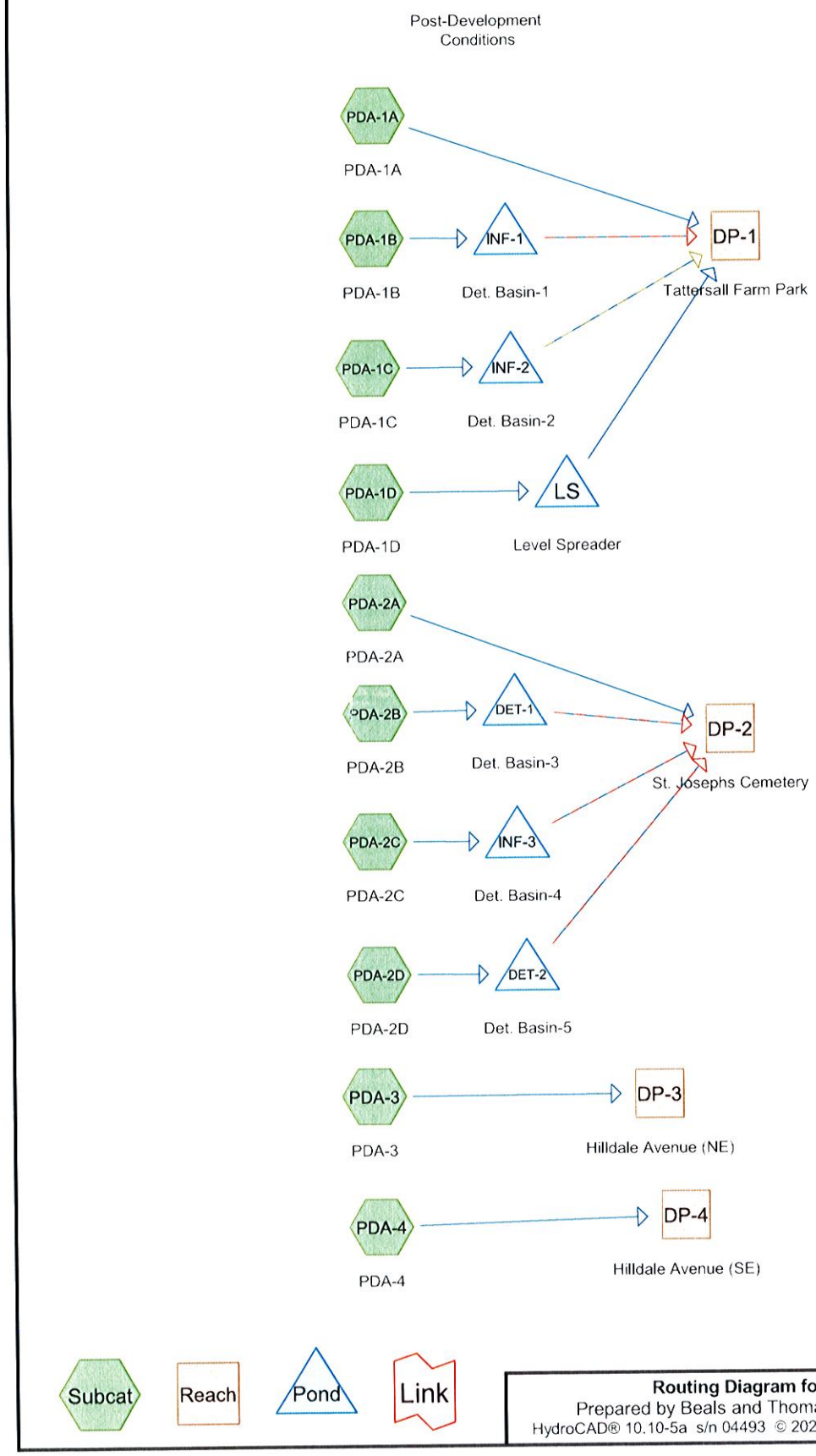
Large scale aerial



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Routing Diagram for 327400HC001A
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.573	39	>75% Grass cover, Good, HSG A (PDA-3, PDA-4)
30.309	74	>75% Grass cover, Good, HSG C (PDA-1A, PDA-1B, PDA-1C, PDA-1D, PDA-2A, PDA-2B, PDA-2C, PDA-2D, PDA-3, PDA-4)
10.466	80	>75% Grass cover, Good, HSG D (PDA-1A, PDA-1B, PDA-2A, PDA-2B, PDA-2C, PDA-3, PDA-4)
0.435	70	Brush, Fair, HSG C (PDA-1A)
0.104	98	Equipment Pad Area (PDA-1A, PDA-2A, PDA-4)
0.640	96	Existing Gravel surface (PDA-1A, PDA-2A, PDA-3, PDA-4)
0.039	98	Existing Impervious Area (PDA-3)
0.068	98	Existing Roofs (PDA-1A, PDA-1D)
2.348	96	Proposed Gravel surface (PDA-1A, PDA-1B, PDA-1C, PDA-2A, PDA-2B, PDA-2C, PDA-2D, PDA-3, PDA-4)
2.810	30	Woods, Good, HSG A (PDA-3, PDA-4)
34.779	70	Woods, Good, HSG C (PDA-1A, PDA-1D, PDA-2A, PDA-3, PDA-4)
6.120	77	Woods, Good, HSG D (PDA-1A, PDA-2A, PDA-3, PDA-4)
88.691	**73**	**TOTAL AREA**

Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1A: PDA-1A Runoff Area=20.550 ac 0.52% Impervious Runoff Depth>0.92"
Flow Length=1,530' Tc=31.0 min CN=72 Runoff=11.50 cfs 1.578 af

Subcatchment PDA-1B: PDA-1B Runoff Area=5.084 ac 0.00% Impervious Runoff Depth>1.15"
Tc=6.0 min CN=76 Runoff=6.52 cfs 0.488 af

Subcatchment PDA-1C: PDA-1C Runoff Area=4.185 ac 0.00% Impervious Runoff Depth>1.21"
Flow Length=727' Tc=8.2 min CN=77 Runoff=5.27 cfs 0.422 af

Subcatchment PDA-1D: PDA-1D Runoff Area=3.394 ac 0.80% Impervious Runoff Depth>0.88"
Flow Length=851' Tc=8.6 min CN=71 Runoff=2.84 cfs 0.248 af

Subcatchment PDA-2A: PDA-2A Runoff Area=26.689 ac 0.02% Impervious Runoff Depth>1.09"
Flow Length=1,377' Tc=28.0 min CN=75 Runoff=19.01 cfs 2.416 af

Subcatchment PDA-2B: PDA-2B Runoff Area=0.527 ac 0.00% Impervious Runoff Depth>1.91"
Tc=6.0 min CN=87 Runoff=1.16 cfs 0.084 af

Subcatchment PDA-2C: PDA-2C Runoff Area=1.028 ac 0.00% Impervious Runoff Depth>1.61"
Flow Length=223' Slope=0.0350 '/' Tc=6.6 min CN=83 Runoff=1.87 cfs 0.138 af

Subcatchment PDA-2D: PDA-2D Runoff Area=2.573 ac 0.00% Impervious Runoff Depth>1.09"
Flow Length=385' Tc=8.1 min CN=75 Runoff=2.89 cfs 0.234 af

Subcatchment PDA-3: PDA-3 Runoff Area=11.740 ac 0.33% Impervious Runoff Depth>0.73"
Flow Length=534' Tc=7.7 min CN=68 Runoff=7.90 cfs 0.715 af

Subcatchment PDA-4: PDA-4 Runoff Area=12.921 ac 0.26% Impervious Runoff Depth>0.68"
Flow Length=1,066' Tc=16.0 min CN=67 Runoff=6.32 cfs 0.736 af

Reach DP-1: Tattersall Farm Park Inflow=16.08 cfs 2.479 af
Outflow=16.08 cfs 2.479 af

Reach DP-2: St. Josephs Cemetery Inflow=21.17 cfs 2.768 af
Outflow=21.17 cfs 2.768 af

Reach DP-3: Hilldale Avenue (NE) Inflow=7.90 cfs 0.715 af
Outflow=7.90 cfs 0.715 af

Reach DP-4: Hilldale Avenue (SE) Inflow=6.32 cfs 0.736 af
Outflow=6.32 cfs 0.736 af

Pond DET-1: Det. Basin-3 Peak Elev=215.48' Storage=818 cf Inflow=1.16 cfs 0.084 af
Primary=0.67 cfs 0.082 af Secondary=0.00 cfs 0.000 af Outflow=0.67 cfs 0.082 af

Pond DET-2: Det. Basin-5 Peak Elev=194.08' Storage=2,029 cf Inflow=2.89 cfs 0.234 af
Primary=1.65 cfs 0.227 af Secondary=0.00 cfs 0.000 af Outflow=1.65 cfs 0.227 af

Pond INF-1: Det. Basin-1 Peak Elev=154.23' Storage=8,903 cf Inflow=6.52 cfs 0.488 af
Primary=1.08 cfs 0.355 af Secondary=0.00 cfs 0.000 af Outflow=1.08 cfs 0.355 af

Pond INF-2: Det. Basin-2 Peak Elev=165.64' Storage=5,401 cf Inflow=5.27 cfs 0.422 af
Primary=2.53 cfs 0.370 af Secondary=0.00 cfs 0.000 af Outflow=2.53 cfs 0.370 af

Pond INF-3: Det. Basin-4 Peak Elev=201.16' Storage=4,361 cf Inflow=1.87 cfs 0.138 af
Primary=0.04 cfs 0.043 af Secondary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.043 af

Pond LS: Level Spreader Peak Elev=174.86' Storage=2,725 cf Inflow=2.84 cfs 0.248 af
Discarded=0.01 cfs 0.013 af Primary=2.55 cfs 0.175 af Outflow=2.56 cfs 0.188 af

Total Runoff Area = 88.691 ac Runoff Volume = 7.059 af Average Runoff Depth = 0.96"
99.76% Pervious = 88.480 ac 0.24% Impervious = 0.211 ac

Summary for Subcatchment PDA-1A: PDA-1A

Runoff = 11.50 cfs @ 12.48 hrs, Volume= 1.578 af, Depth> 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
*	0.041	98	Existing Roofs
	15.159	70	Woods, Good, HSG C
	1.052	77	Woods, Good, HSG D
	0.435	70	Brush, Fair, HSG C
	2.743	74	>75% Grass cover, Good, HSG C
	0.572	80	>75% Grass cover, Good, HSG D
*	0.346	96	Proposed Gravel surface
*	0.137	96	Existing Gravel surface
*	0.065	98	Equipment Pad Area
	20.550	72	Weighted Average
	20.444		99.48% Pervious Area
	0.106		0.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	57	0.1400	1.87		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
21.0	1,423	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
31.0	1,530	Total			

Summary for Subcatchment PDA-1B: PDA-1B

Runoff = 6.52 cfs @ 12.10 hrs, Volume= 0.488 af, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	4.633	74	>75% Grass cover, Good, HSG C
	0.037	80	>75% Grass cover, Good, HSG D
*	0.414	96	Proposed Gravel surface
	5.084	76	Weighted Average
	5.084		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min.**

Summary for Subcatchment PDA-1C: PDA-1C

Runoff = 5.27 cfs @ 12.12 hrs, Volume= 0.422 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	3.690	74	>75% Grass cover, Good, HSG C
*	0.495	96	Proposed Gravel surface
	4.185	77	Weighted Average
	4.185		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0200	1.00		**Sheet Flow, Tc-1** Smooth surfaces n= 0.011 P2= 3.10"
1.7	28	0.1400	0.28		**Sheet Flow, Tc-2** Grass: Short n= 0.150 P2= 3.10"
2.0	254	0.0940	2.15		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
4.1	423	0.0610	1.73		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
8.2	727	Total			

Summary for Subcatchment PDA-1D: PDA-1D

Runoff = 2.84 cfs @ 12.14 hrs, Volume= 0.248 af, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
*	0.027	98	Existing Roofs
	2.455	70	Woods, Good, HSG C
	0.912	74	>75% Grass cover, Good, HSG C
	3.394	71	Weighted Average
	3.367		99.20% Pervious Area
	0.027		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	126	0.0800	1.41		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
1.8	166	0.0960	1.55		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
2.0	509	0.0830	4.32		**Shallow Concentrated Flow, Tc-4** Grassed Waterway Kv= 15.0 fps
8.6	851	Total			

Summary for Subcatchment PDA-2A: PDA-2A

Runoff = 19.01 cfs @ 12.42 hrs, Volume= 2.416 af, Depth> 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	8.222	70	Woods, Good, HSG C
	2.242	77	Woods, Good, HSG D
	8.169	74	>75% Grass cover, Good, HSG C
	7.451	80	>75% Grass cover, Good, HSG D
*	0.371	96	Proposed Gravel surface
*	0.228	96	Existing Gravel surface
*	0.006	98	Equipment Pad Area
	26.689	75	Weighted Average
	26.683		99.98% Pervious Area
	0.006		0.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.0050	0.08		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
8.5	567	0.0250	1.11		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.1	183	0.0440	1.47		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
7.4	577	0.0670	1.29		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
28.0	1,377	Total			

Summary for Subcatchment PDA-2B: PDA-2B

Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.084 af, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	0.004	74	>75% Grass cover, Good, HSG C
	0.275	80	>75% Grass cover, Good, HSG D
*	0.248	96	Proposed Gravel surface
	0.527	87	Weighted Average
	0.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min.**

Summary for Subcatchment PDA-2C: PDA-2C

Runoff = 1.87 cfs @ 12.10 hrs, Volume= 0.138 af, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	0.014	74	>75% Grass cover, Good, HSG C
	0.796	80	>75% Grass cover, Good, HSG D
*	0.218	96	Proposed Gravel surface
	1.028	83	Weighted Average
	1.028		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0350	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.8	144	0.0350	1.31		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	29	0.0350	3.01		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
6.6	223	Total			

Summary for Subcatchment PDA-2D: PDA-2D

Runoff = 2.89 cfs @ 12.12 hrs, Volume= 0.234 af, Depth> 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	2.416	74	>75% Grass cover, Good, HSG C
*	0.157	96	Proposed Gravel surface
	2.573	75	Weighted Average
	2.573		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.4	163	0.0740	1.90		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.0400	3.22		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.9	147	0.1360	2.58		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
8.1	385	Total			

Summary for Subcatchment PDA-3: PDA-3

Runoff = 7.90 cfs @ 12.13 hrs, Volume= 0.715 af, Depth> 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
*	0.039	98	Existing Impervious Area
	0.790	30	Woods, Good, HSG A
	5.895	70	Woods, Good, HSG C
	0.284	77	Woods, Good, HSG D
	0.341	39	>75% Grass cover, Good, HSG A
	4.262	74	>75% Grass cover, Good, HSG C
	0.038	80	>75% Grass cover, Good, HSG D
*	0.067	96	Proposed Gravel surface
*	0.024	96	Existing Gravel surface
	11.740	68	Weighted Average
	11.701		99.67% Pervious Area
	0.039		0.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.6	220	0.1050	2.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.8	264	0.2350	2.42		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
7.7	534	Total			

Summary for Subcatchment PDA-4: PDA-4

Runoff = 6.32 cfs @ 12.26 hrs, Volume= 0.736 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-002yr Rainfall=3.20"

	Area (ac)	CN	Description
	2.020	30	Woods, Good, HSG A
	3.048	70	Woods, Good, HSG C
	2.542	77	Woods, Good, HSG D
	0.232	39	>75% Grass cover, Good, HSG A
	3.466	74	>75% Grass cover, Good, HSG C
	1.297	80	>75% Grass cover, Good, HSG D
*	0.032	96	Proposed Gravel surface
*	0.251	96	Existing Gravel surface
*	0.033	98	Equipment Pad Area
	12.921	67	Weighted Average
	12.888		99.74% Pervious Area
	0.033		0.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	173	0.0750	1.92		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.3	139	0.1290	1.80		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	187	0.2670	2.58		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
8.3	517	0.0430	1.04		**Shallow Concentrated Flow, Tc-5** Woodland Kv= 5.0 fps
16.0	1,066	Total			

Summary for Reach DP-1: Tattersall Farm Park

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 33.213 ac, 0.40% Impervious, Inflow Depth > 0.90" for NOAA14-002yr event
Inflow = 16.08 cfs @ 12.45 hrs, Volume= 2.479 af
Outflow = 16.08 cfs @ 12.45 hrs, Volume= 2.479 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: St. Josephs Cemetery

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 30.817 ac, 0.02% Impervious, Inflow Depth > 1.08" for NOAA14-002yr event
Inflow = 21.17 cfs @ 12.41 hrs, Volume= 2.768 af
Outflow = 21.17 cfs @ 12.41 hrs, Volume= 2.768 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-3: Hilldale Avenue (NE)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	11.740 ac,	0.33% Impervious,	Inflow Depth >	0.73"	for NOAA14-002yr event
Inflow =	7.90 cfs @	12.13 hrs,	Volume=	0.715 af	
Outflow =	7.90 cfs @	12.13 hrs,	Volume=	0.715 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-4: Hilldale Avenue (SE)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	12.921 ac,	0.26% Impervious,	Inflow Depth >	0.68"	for NOAA14-002yr event
Inflow =	6.32 cfs @	12.26 hrs,	Volume=	0.736 af	
Outflow =	6.32 cfs @	12.26 hrs,	Volume=	0.736 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond DET-1: Det. Basin-3

Inflow Area =	0.527 ac,	0.00% Impervious,	Inflow Depth >	1.91"	for NOAA14-002yr event
Inflow =	1.16 cfs @	12.09 hrs,	Volume=	0.084 af	
Outflow =	0.67 cfs @	12.22 hrs,	Volume=	0.082 af,	Atten= 42%, Lag= 7.7 min
Primary =	0.67 cfs @	12.22 hrs,	Volume=	0.082 af	
Secondary =	0.00 cfs @	1.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 215.48' @ 12.22 hrs Surf.Area= 1,878 sf Storage= 818 cf

Plug-Flow detention time= 45.8 min calculated for 0.082 af (97% of inflow)
Center-of-Mass det. time= 30.1 min (848.5 - 818.3)

Volume	Invert	Avail.Storage	Storage Description
#1	215.00'	4,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	1,509	0	0
217.00	3,037	4,546	4,546

Device	Routing	Invert	Outlet Devices
#1	Primary	215.00'	**12.0" Round Culvert** L= 24.0' Ke= 1.000 Inlet / Outlet Invert= 215.00' / 214.50' S= 0.0208 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Secondary	216.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.66 cfs @ 12.22 hrs HW=215.48' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.66 cfs @ 1.77 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=215.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DET-2: Det. Basin-5

Inflow Area =	2.573 ac,	0.00% Impervious,	Inflow Depth > 1.09"	for NOAA14-002yr event
Inflow =	2.89 cfs @	12.12 hrs, Volume=	0.234 af	
Outflow =	1.65 cfs @	12.32 hrs, Volume=	0.227 af, Atten= 43%, Lag= 11.6 min	
Primary =	1.65 cfs @	12.32 hrs, Volume=	0.227 af	
Secondary =	0.00 cfs @	1.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 194.08' @ 12.32 hrs Surf.Area= 3,826 sf Storage= 2,029 cf

Plug-Flow detention time= 41.3 min calculated for 0.227 af (97% of inflow)
Center-of-Mass det. time= 25.2 min (885.0 - 859.8)

Volume	Invert	Avail.Storage	Storage Description
#1	193.50'	11,592 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.50	3,171	0	0
194.00	3,729	1,725	1,725
196.00	6,138	9,867	11,592

Device	Routing	Invert	Outlet Devices
#1	Primary	193.50'	**12.0" Round Culvert** L= 26.0' Ke= 0.100 Inlet / Outlet Invert= 193.50' / 193.00' S= 0.0192 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Secondary	195.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.64 cfs @ 12.32 hrs HW=194.08' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.64 cfs @ 5.02 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=193.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond INF-1: Det. Basin-1

Inflow Area =	5.084 ac,	0.00% Impervious,	Inflow Depth > 1.15"	for NOAA14-002yr event
Inflow =	6.52 cfs @	12.10 hrs, Volume=	0.488 af	
Outflow =	1.08 cfs @	12.66 hrs, Volume=	0.355 af, Atten= 83%, Lag= 33.8 min	
Primary =	1.08 cfs @	12.66 hrs, Volume=	0.355 af	
Secondary =	0.00 cfs @	1.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 154.23' @ 12.66 hrs Surf.Area= 13,065 sf Storage= 8,903 cf

Plug-Flow detention time= 196.7 min calculated for 0.355 af (73% of inflow)
Center-of-Mass det. time= 100.7 min (955.6 - 854.9)

Volume	Invert	Avail.Storage	Storage Description
#1	153.50'	35,857 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
153.50	11,270	0	0
154.00	12,494	5,941	5,941
156.00	17,422	29,916	35,857

Device	Routing	Invert	Outlet Devices
#1	Primary	153.00'	**18.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 153.00' / 152.50' S= 0.0200 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Primary	153.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	154.00'	**2.5' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	155.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	155.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.08 cfs @ 12.66 hrs HW=154.23' (Free Discharge)
- **1=Culvert** (Passes 0.89 cfs of 4.40 cfs potential flow)
  - **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.89 cfs @ 1.57 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **2=Orifice/Grate** (Orifice Controls 0.18 cfs @ 3.75 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=153.50' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond INF-2: Det. Basin-2

Inflow Area =	4.185 ac,	0.00% Impervious,	Inflow Depth > 1.21"	for NOAA14-002yr event
Inflow =	5.27 cfs @	12.12 hrs, Volume=	0.422 af	
Outflow =	2.53 cfs @	12.38 hrs, Volume=	0.370 af, Atten= 52%, Lag= 15.4 min	
Primary =	2.53 cfs @	12.38 hrs, Volume=	0.370 af	
Secondary =	0.00 cfs @	1.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 165.64' @ 12.38 hrs Surf.Area= 5,346 sf Storage= 5,401 cf

Plug-Flow detention time= 128.0 min calculated for 0.370 af (88% of inflow)
Center-of-Mass det. time= 71.4 min (924.8 - 853.4)

Volume	Invert	Avail.Storage	Storage Description
#1	164.50'	21,250 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.50	4,165	0	0
166.00	5,725	7,418	7,418
168.00	8,107	13,832	21,250

Device	Routing	Invert	Outlet Devices
#1	Primary	164.00'	**18.0" Round Culvert** L= 30.0' Ke= 1.000 Inlet / Outlet Invert= 164.00' / 163.50' S= 0.0167 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Primary	164.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	165.25'	**3.0' long x 1.75' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	167.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	167.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.52 cfs @ 12.38 hrs HW=165.63' (Free Discharge)
- **1=Culvert** (Passes 2.28 cfs of 6.00 cfs potential flow)
  - **3=Sharp-Crested Rectangular Weir** (Weir Controls 2.28 cfs @ 2.03 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **2=Orifice/Grate** (Orifice Controls 0.24 cfs @ 4.84 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=164.50' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond INF-3: Det. Basin-4

Inflow Area =	1.028 ac,	0.00% Impervious,	Inflow Depth > 1.61"	for NOAA14-002yr event
Inflow =	1.87 cfs @	12.10 hrs, Volume=	0.138 af	
Outflow =	0.04 cfs @	17.93 hrs, Volume=	0.043 af,	Atten= 98%, Lag= 349.9 min
Primary =	0.04 cfs @	17.93 hrs, Volume=	0.043 af	
Secondary =	0.00 cfs @	1.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 201.16' @ 17.93 hrs Surf.Area= 6,996 sf Storage= 4,361 cf

Plug-Flow detention time= 381.2 min calculated for 0.043 af (32% of inflow)
Center-of-Mass det. time= 252.3 min (1,085.1 - 832.8)

Volume	Invert	Avail.Storage	Storage Description
#1	200.50'	19,354 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
200.50	6,153	0	0
202.00	8,060	10,660	10,660
203.00	9,328	8,694	19,354

Device	Routing	Invert	Outlet Devices
#1	Primary	200.50'	**4.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 200.50' / 200.00' S= 0.0200 '/' Cc= 0.900 n= 0.100, Flow Area= 0.09 sf
#2	Secondary	202.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.04 cfs @ 17.93 hrs HW=201.16' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 0.04 cfs @ 0.51 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=200.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond LS: Level Spreader

Inflow Area = 3.394 ac, 0.80% Impervious, Inflow Depth = 0.88" for NOAA14-002yr event
Inflow = 2.84 cfs @ 12.14 hrs, Volume= 0.248 af
Outflow = 2.56 cfs @ 12.31 hrs, Volume= 0.188 af, Atten= 10%, Lag= 10.0 min
Discarded = 0.01 cfs @ 12.31 hrs, Volume= 0.013 af
Primary = 2.55 cfs @ 12.31 hrs, Volume= 0.175 af

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 174.86' @ 12.31 hrs Surf.Area= 2,072 sf Storage= 2,725 cf

Plug-Flow detention time= 140.6 min calculated for 0.187 af (76% of inflow)
Center-of-Mass det. time= 48.5 min (922.0 - 873.5)

Volume	Invert	Avail.Storage	Storage Description
#1	173.00'	5,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
173.00	905	0	0
174.00	1,495	1,200	1,200
176.00	2,845	4,340	5,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	173.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	174.80'	**70.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 12.31 hrs HW=174.85' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.29 cfs @ 12.31 hrs HW=174.85' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 2.29 cfs @ 0.64 fps)

Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1A: PDA-1A Runoff Area=20.550 ac 0.52% Impervious Runoff Depth>2.24"
Flow Length=1,530' Tc=31.0 min CN=72 Runoff=29.84 cfs 3.830 af

Subcatchment PDA-1B: PDA-1B Runoff Area=5.084 ac 0.00% Impervious Runoff Depth>2.59"
Tc=6.0 min CN=76 Runoff=15.15 cfs 1.098 af

Subcatchment PDA-1C: PDA-1C Runoff Area=4.185 ac 0.00% Impervious Runoff Depth>2.68"
Flow Length=727' Tc=8.2 min CN=77 Runoff=12.03 cfs 0.934 af

Subcatchment PDA-1D: PDA-1D Runoff Area=3.394 ac 0.80% Impervious Runoff Depth>2.17"
Flow Length=851' Tc=8.6 min CN=71 Runoff=7.61 cfs 0.613 af

Subcatchment PDA-2A: PDA-2A Runoff Area=26.689 ac 0.02% Impervious Runoff Depth>2.49"
Flow Length=1,377' Tc=28.0 min CN=75 Runoff=45.46 cfs 5.541 af

Subcatchment PDA-2B: PDA-2B Runoff Area=0.527 ac 0.00% Impervious Runoff Depth>3.63"
Tc=6.0 min CN=87 Runoff=2.15 cfs 0.159 af

Subcatchment PDA-2C: PDA-2C Runoff Area=1.028 ac 0.00% Impervious Runoff Depth>3.23"
Flow Length=223' Slope=0.0350 '/' Tc=6.6 min CN=83 Runoff=3.75 cfs 0.277 af

Subcatchment PDA-2D: PDA-2D Runoff Area=2.573 ac 0.00% Impervious Runoff Depth>2.50"
Flow Length=385' Tc=8.1 min CN=75 Runoff=6.92 cfs 0.537 af

Subcatchment PDA-3: PDA-3 Runoff Area=11.740 ac 0.33% Impervious Runoff Depth>1.93"
Flow Length=534' Tc=7.7 min CN=68 Runoff=24.03 cfs 1.885 af

Subcatchment PDA-4: PDA-4 Runoff Area=12.921 ac 0.26% Impervious Runoff Depth>1.85"
Flow Length=1,066' Tc=16.0 min CN=67 Runoff=19.77 cfs 1.987 af

Reach DP-1: Tattersall Farm Park Inflow=45.77 cfs 6.175 af
Outflow=45.77 cfs 6.175 af

Reach DP-2: St. Josephs Cemetery Inflow=50.47 cfs 6.285 af
Outflow=50.47 cfs 6.285 af

Reach DP-3: Hilldale Avenue (NE) Inflow=24.03 cfs 1.885 af
Outflow=24.03 cfs 1.885 af

Reach DP-4: Hilldale Avenue (SE) Inflow=19.77 cfs 1.987 af
Outflow=19.77 cfs 1.987 af

Pond DET-1: Det. Basin-3 Peak Elev=215.73' Storage=1,312 cf Inflow=2.15 cfs 0.159 af
Primary=1.35 cfs 0.156 af Secondary=0.00 cfs 0.000 af Outflow=1.35 cfs 0.156 af

Pond DET-2: Det. Basin-5 Peak Elev=194.62' Storage=4,290 cf Inflow=6.92 cfs 0.537 af
Primary=4.08 cfs 0.527 af Secondary=0.00 cfs 0.000 af Outflow=4.08 cfs 0.527 af

Pond INF-1: Det. Basin-1 Peak Elev=154.80' Storage=16,656 cf Inflow=15.15 cfs 1.098 af
Primary=5.68 cfs 0.950 af Secondary=0.00 cfs 0.000 af Outflow=5.68 cfs 0.950 af

Pond INF-2: Det. Basin-2 Peak Elev=166.22' Storage=8,705 cf Inflow=12.03 cfs 0.934 af
Primary=8.04 cfs 0.857 af Secondary=0.00 cfs 0.000 af Outflow=8.04 cfs 0.857 af

Pond INF-3: Det. Basin-4 Peak Elev=201.86' Storage=9,556 cf Inflow=3.75 cfs 0.277 af
Primary=0.06 cfs 0.061 af Secondary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.061 af

Pond LS: Level Spreader Peak Elev=174.91' Storage=2,849 cf Inflow=7.61 cfs 0.613 af
Discarded=0.01 cfs 0.014 af Primary=7.60 cfs 0.538 af Outflow=7.62 cfs 0.553 af

Total Runoff Area = 88.691 ac Runoff Volume = 16.859 af Average Runoff Depth = 2.28"
99.76% Pervious = 88.480 ac 0.24% Impervious = 0.211 ac

Summary for Subcatchment PDA-1A: PDA-1A

Runoff = 29.84 cfs @ 12.45 hrs, Volume= 3.830 af, Depth> 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
*	0.041	98	Existing Roofs
	15.159	70	Woods, Good, HSG C
	1.052	77	Woods, Good, HSG D
	0.435	70	Brush, Fair, HSG C
	2.743	74	>75% Grass cover, Good, HSG C
	0.572	80	>75% Grass cover, Good, HSG D
*	0.346	96	Proposed Gravel surface
*	0.137	96	Existing Gravel surface
*	0.065	98	Equipment Pad Area
	20.550	72	Weighted Average
	20.444		99.48% Pervious Area
	0.106		0.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	57	0.1400	1.87		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
21.0	1,423	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
31.0	1,530	Total			

Summary for Subcatchment PDA-1B: PDA-1B

Runoff = 15.15 cfs @ 12.09 hrs, Volume= 1.098 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	4.633	74	>75% Grass cover, Good, HSG C
	0.037	80	>75% Grass cover, Good, HSG D
*	0.414	96	Proposed Gravel surface
	5.084	76	Weighted Average
	5.084		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min.**

Summary for Subcatchment PDA-1C: PDA-1C

Runoff = 12.03 cfs @ 12.12 hrs, Volume= 0.934 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	3.690	74	>75% Grass cover, Good, HSG C
*	0.495	96	Proposed Gravel surface
	4.185	77	Weighted Average
	4.185		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0200	1.00		**Sheet Flow, Tc-1** Smooth surfaces n= 0.011 P2= 3.10"
1.7	28	0.1400	0.28		**Sheet Flow, Tc-2** Grass: Short n= 0.150 P2= 3.10"
2.0	254	0.0940	2.15		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
4.1	423	0.0610	1.73		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
8.2	727	Total			

Summary for Subcatchment PDA-1D: PDA-1D

Runoff = 7.61 cfs @ 12.13 hrs, Volume= 0.613 af, Depth> 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
*	0.027	98	Existing Roofs
	2.455	70	Woods, Good, HSG C
	0.912	74	>75% Grass cover, Good, HSG C
	3.394	71	Weighted Average
	3.367		99.20% Pervious Area
	0.027		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	126	0.0800	1.41		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
1.8	166	0.0960	1.55		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
2.0	509	0.0830	4.32		**Shallow Concentrated Flow, Tc-4** Grassed Waterway Kv= 15.0 fps
8.6	851	Total			

Summary for Subcatchment PDA-2A: PDA-2A

Runoff = 45.46 cfs @ 12.40 hrs, Volume= 5.541 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	8.222	70	Woods, Good, HSG C
	2.242	77	Woods, Good, HSG D
	8.169	74	>75% Grass cover, Good, HSG C
	7.451	80	>75% Grass cover, Good, HSG D
*	0.371	96	Proposed Gravel surface
*	0.228	96	Existing Gravel surface
*	0.006	98	Equipment Pad Area
	26.689	75	Weighted Average
	26.683		99.98% Pervious Area
	0.006		0.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.0050	0.08		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
8.5	567	0.0250	1.11		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.1	183	0.0440	1.47		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
7.4	577	0.0670	1.29		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
28.0	1,377	Total			

Summary for Subcatchment PDA-2B: PDA-2B

Runoff = 2.15 cfs @ 12.09 hrs, Volume= 0.159 af, Depth> 3.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	0.004	74	>75% Grass cover, Good, HSG C
	0.275	80	>75% Grass cover, Good, HSG D
*	0.248	96	Proposed Gravel surface
	0.527	87	Weighted Average
	0.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min.**

Summary for Subcatchment PDA-2C: PDA-2C

Runoff = 3.75 cfs @ 12.10 hrs, Volume= 0.277 af, Depth> 3.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	0.014	74	>75% Grass cover, Good, HSG C
	0.796	80	>75% Grass cover, Good, HSG D
*	0.218	96	Proposed Gravel surface
	1.028	83	Weighted Average
	1.028		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0350	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.8	144	0.0350	1.31		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	29	0.0350	3.01		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
6.6	223	Total			

Summary for Subcatchment PDA-2D: PDA-2D

Runoff = 6.92 cfs @ 12.12 hrs, Volume= 0.537 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	2.416	74	>75% Grass cover, Good, HSG C
*	0.157	96	Proposed Gravel surface
	2.573	75	Weighted Average
	2.573		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.4	163	0.0740	1.90		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.0400	3.22		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.9	147	0.1360	2.58		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
8.1	385	Total			

Summary for Subcatchment PDA-3: PDA-3

Runoff = 24.03 cfs @ 12.12 hrs, Volume= 1.885 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
*	0.039	98	Existing Impervious Area
	0.790	30	Woods, Good, HSG A
	5.395	70	Woods, Good, HSG C
	0.284	77	Woods, Good, HSG D
	0.341	39	>75% Grass cover, Good, HSG A
	4.262	74	>75% Grass cover, Good, HSG C
	0.038	80	>75% Grass cover, Good, HSG D
*	0.067	96	Proposed Gravel surface
*	0.024	96	Existing Gravel surface
	11.740	68	Weighted Average
	11.701		99.67% Pervious Area
	0.039		0.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.6	220	0.1050	2.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.8	264	0.2350	2.42		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
7.7	534	Total			

Summary for Subcatchment PDA-4: PDA-4

Runoff = 19.77 cfs @ 12.24 hrs, Volume= 1.987 af, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-010yr Rainfall=5.07"

	Area (ac)	CN	Description
	2.020	30	Woods, Good, HSG A
	3.048	70	Woods, Good, HSG C
	2.542	77	Woods, Good, HSG D
	0.232	39	>75% Grass cover, Good, HSG A
	3.466	74	>75% Grass cover, Good, HSG C
	1.297	80	>75% Grass cover, Good, HSG D
*	0.032	96	Proposed Gravel surface
*	0.251	96	Existing Gravel surface
*	0.033	98	Equipment Pad Area
	12.921	67	Weighted Average
	12.888		99.74% Pervious Area
	0.033		0.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	173	0.0750	1.92		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.3	139	0.1290	1.80		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	187	0.2670	2.58		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
8.3	517	0.0430	1.04		**Shallow Concentrated Flow, Tc-5** Woodland Kv= 5.0 fps
16.0	1,066	Total			

Summary for Reach DP-1: Tattersall Farm Park

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 33.213 ac, 0.40% Impervious, Inflow Depth > 2.23" for NOAA14-010yr event
Inflow = 45.77 cfs @ 12.39 hrs, Volume= 6.175 af
Outflow = 45.77 cfs @ 12.39 hrs, Volume= 6.175 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: St. Josephs Cemetery

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 30.817 ac, 0.02% Impervious, Inflow Depth > 2.45" for NOAA14-010yr event
Inflow = 50.47 cfs @ 12.39 hrs, Volume= 6.285 af
Outflow = 50.47 cfs @ 12.39 hrs, Volume= 6.285 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-3: Hilldale Avenue (NE)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 11.740 ac, 0.33% Impervious, Inflow Depth > 1.93" for NOAA14-010yr event
Inflow = 24.03 cfs @ 12.12 hrs, Volume= 1.885 af
Outflow = 24.03 cfs @ 12.12 hrs, Volume= 1.885 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-4: Hilldale Avenue (SE)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 12.921 ac, 0.26% Impervious, Inflow Depth > 1.85" for NOAA14-010yr event
Inflow = 19.77 cfs @ 12.24 hrs, Volume= 1.987 af
Outflow = 19.77 cfs @ 12.24 hrs, Volume= 1.987 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond DET-1: Det. Basin-3

Inflow Area = 0.527 ac, 0.00% Impervious, Inflow Depth > 3.63" for NOAA14-010yr event
Inflow = 2.15 cfs @ 12.09 hrs, Volume= 0.159 af
Outflow = 1.35 cfs @ 12.20 hrs, Volume= 0.156 af, Atten= 37%, Lag= 6.6 min
Primary = 1.35 cfs @ 12.20 hrs, Volume= 0.156 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 215.73' @ 12.20 hrs Surf.Area= 2,069 sf Storage= 1,312 cf

Plug-Flow detention time= 35.9 min calculated for 0.156 af (98% of inflow)
Center-of-Mass det. time= 24.7 min (824.9 - 800.2)

Volume	Invert	Avail.Storage	Storage Description
#1	215.00'	4,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	1,509	0	0
217.00	3,037	4,546	4,546

Device	Routing	Invert	Outlet Devices
#1	Primary	215.00'	**12.0" Round Culvert** L= 24.0' Ke= 1.000 Inlet / Outlet Invert= 215.00' / 214.50' S= 0.0208 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Secondary	216.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.35 cfs @ 12.20 hrs HW=215.73' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.35 cfs @ 2.19 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=215.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DET-2: Det. Basin-5

Inflow Area = 2.573 ac, 0.00% Impervious, Inflow Depth > 2.50" for NOAA14-010yr event
Inflow = 6.92 cfs @ 12.12 hrs, Volume= 0.537 af
Outflow = 4.08 cfs @ 12.27 hrs, Volume= 0.527 af, Atten= 41%, Lag= 9.4 min
Primary = 4.08 cfs @ 12.27 hrs, Volume= 0.527 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 194.62' @ 12.27 hrs Surf.Area= 4,482 sf Storage= 4,290 cf

Plug-Flow detention time= 30.3 min calculated for 0.527 af (98% of inflow)
Center-of-Mass det. time= 19.9 min (855.2 - 835.3)

Volume	Invert	Avail.Storage	Storage Description
#1	193.50'	11,592 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.50	3,171	0	0
194.00	3,729	1,725	1,725
196.00	6,138	9,867	11,592

Device	Routing	Invert	Outlet Devices
#1	Primary	193.50'	**12.0" Round Culvert** L= 26.0' Ke= 0.100 Inlet / Outlet Invert= 193.50' / 193.00' S= 0.0192 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Secondary	195.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.06 cfs @ 12.27 hrs HW=194.62' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.06 cfs @ 5.17 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=193.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond INF-1: Det. Basin-1

Inflow Area = 5.084 ac, 0.00% Impervious, Inflow Depth > 2.59" for NOAA14-010yr event
Inflow = 15.15 cfs @ 12.09 hrs, Volume= 1.098 af
Outflow = 5.68 cfs @ 12.38 hrs, Volume= 0.950 af, Atten= 62%, Lag= 17.0 min
Primary = 5.68 cfs @ 12.38 hrs, Volume= 0.950 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 154.80' @ 12.38 hrs Surf.Area= 14,453 sf Storage= 16,656 cf

Plug-Flow detention time= 115.1 min calculated for 0.948 af (86% of inflow)
Center-of-Mass det. time= 55.7 min (886.7 - 831.1)

Volume	Invert	Avail.Storage	Storage Description
#1	153.50'	35,857 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
153.50	11,270	0	0
154.00	12,494	5,941	5,941
156.00	17,422	29,916	35,857

Device	Routing	Invert	Outlet Devices
#1	Primary	153.00'	**18.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 153.00' / 152.50' S= 0.0200 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Primary	153.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	154.00'	**2.5' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	155.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	155.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=5.67 cfs @ 12.38 hrs HW=154.79' (Free Discharge)
- **1=Culvert** (Passes 5.42 cfs of 6.52 cfs potential flow)
  - **3=Sharp-Crested Rectangular Weir** (Weir Controls 5.42 cfs @ 2.91 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **2=Orifice/Grate** (Orifice Controls 0.26 cfs @ 5.21 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=153.50' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond INF-2: Det. Basin-2

Inflow Area =	4.185 ac,	0.00% Impervious,	Inflow Depth >	2.68" for NOAA14-010yr event
Inflow =	12.03 cfs @	12.12 hrs, Volume=	0.934 af	
Outflow =	8.04 cfs @	12.24 hrs, Volume=	0.857 af,	Atten= 33%, Lag= 7.3 min
Primary =	8.04 cfs @	12.24 hrs, Volume=	0.857 af	
Secondary =	0.00 cfs @	1.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 166.22' @ 12.24 hrs Surf.Area= 5,987 sf Storage= 8,705 cf

Plug-Flow detention time= 69.9 min calculated for 0.855 af (92% of inflow)
Center-of-Mass det. time= 29.0 min (859.3 - 830.3)

Volume	Invert	Avail.Storage	Storage Description
#1	164.50'	21,250 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.50	4,165	0	0
166.00	5,725	7,418	7,418
168.00	8,107	13,832	21,250

Device	Routing	Invert	Outlet Devices
#1	Primary	164.00'	**18.0" Round Culvert** L= 30.0' Ke= 1.000 Inlet / Outlet Invert= 164.00' / 163.50' S= 0.0167 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Primary	164.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	165.25'	**3.0' long x 1.75' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	167.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	167.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=8.03 cfs @ 12.24 hrs HW=166.22' (Free Discharge)
- **1=Culvert** (Inlet Controls 7.73 cfs @ 4.37 fps)
  - **3=Sharp-Crested Rectangular Weir** (Passes 7.73 cfs of 8.72 cfs potential flow)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **2=Orifice/Grate** (Orifice Controls 0.30 cfs @ 6.07 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=164.50' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond INF-3: Det. Basin-4

Inflow Area =	1.028 ac,	0.00% Impervious,	Inflow Depth > 3.23"	for NOAA14-010yr event
Inflow =	3.75 cfs @	12.10 hrs, Volume=	0.277 af	
Outflow =	0.06 cfs @	20.24 hrs, Volume=	0.061 af, Atten= 98%, Lag= 488.8 min	
Primary =	0.06 cfs @	20.24 hrs, Volume=	0.061 af	
Secondary =	0.00 cfs @	1.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 201.86' @ 20.24 hrs Surf.Area= 7,884 sf Storage= 9,556 cf

Plug-Flow detention time= 409.6 min calculated for 0.061 af (22% of inflow)
Center-of-Mass det. time= 262.1 min (1,074.9 - 812.8)

Volume	Invert	Avail.Storage	Storage Description
#1	200.50'	19,354 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
200.50	6,153	0	0
202.00	8,060	10,660	10,660
203.00	9,328	8,694	19,354

Device	Routing	Invert	Outlet Devices
#1	Primary	200.50'	**4.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 200.50' / 200.00' S= 0.0200 '/' Cc= 0.900 n= 0.100, Flow Area= 0.09 sf
#2	Secondary	202.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.06 cfs @ 20.24 hrs HW=201.86' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 0.06 cfs @ 0.70 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=200.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond LS: Level Spreader

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.394 ac, 0.80% Impervious, Inflow Depth > 2.17" for NOAA14-010yr event
Inflow = 7.61 cfs @ 12.13 hrs, Volume= 0.613 af
Outflow = 7.62 cfs @ 12.14 hrs, Volume= 0.553 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.14 hrs, Volume= 0.014 af
Primary = 7.60 cfs @ 12.14 hrs, Volume= 0.538 af

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 174.91' @ 12.14 hrs Surf.Area= 2,112 sf Storage= 2,849 cf

Plug-Flow detention time= 64.8 min calculated for 0.551 af (90% of inflow)
Center-of-Mass det. time= 17.7 min (863.5 - 845.8)

Volume	Invert	Avail.Storage	Storage Description
#1	173.00'	5,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
173.00	905	0	0
174.00	1,495	1,200	1,200
176.00	2,845	4,340	5,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	173.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	174.80'	**70.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 12.14 hrs HW=174.91' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=7.43 cfs @ 12.14 hrs HW=174.91' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 7.43 cfs @ 0.94 fps)

Time span=1.00-24.00 hrs, dt=0.05 hrs, 461 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1A: PDA-1A Runoff Area=20.550 ac 0.52% Impervious Runoff Depth>4.69"
Flow Length=1,530' Tc=31.0 min CN=72 Runoff=63.26 cfs 8.036 af

Subcatchment PDA-1B: PDA-1B Runoff Area=5.084 ac 0.00% Impervious Runoff Depth>5.18"
Tc=6.0 min CN=76 Runoff=30.08 cfs 2.195 af

Subcatchment PDA-1C: PDA-1C Runoff Area=4.185 ac 0.00% Impervious Runoff Depth>5.30"
Flow Length=727' Tc=8.2 min CN=77 Runoff=23.63 cfs 1.847 af

Subcatchment PDA-1D: PDA-1D Runoff Area=3.394 ac 0.80% Impervious Runoff Depth>4.60"
Flow Length=851' Tc=8.6 min CN=71 Runoff=16.52 cfs 1.301 af

Subcatchment PDA-2A: PDA-2A Runoff Area=26.689 ac 0.02% Impervious Runoff Depth>5.04"
Flow Length=1,377' Tc=28.0 min CN=75 Runoff=92.10 cfs 11.216 af

Subcatchment PDA-2B: PDA-2B Runoff Area=0.527 ac 0.00% Impervious Runoff Depth>6.47"
Tc=6.0 min CN=87 Runoff=3.73 cfs 0.284 af

Subcatchment PDA-2C: PDA-2C Runoff Area=1.028 ac 0.00% Impervious Runoff Depth>6.00"
Flow Length=223' Slope=0.0350 '/' Tc=6.6 min CN=83 Runoff=6.79 cfs 0.514 af

Subcatchment PDA-2D: PDA-2D Runoff Area=2.573 ac 0.00% Impervious Runoff Depth>5.06"
Flow Length=385' Tc=8.1 min CN=75 Runoff=13.99 cfs 1.085 af

Subcatchment PDA-3: PDA-3 Runoff Area=11.740 ac 0.33% Impervious Runoff Depth>4.26"
Flow Length=534' Tc=7.7 min CN=68 Runoff=54.60 cfs 4.163 af

Subcatchment PDA-4: PDA-4 Runoff Area=12.921 ac 0.26% Impervious Runoff Depth>4.13"
Flow Length=1,066' Tc=16.0 min CN=67 Runoff=46.11 cfs 4.451 af

Reach DP-1: Tattersall Farm Park Inflow=96.24 cfs 13.058 af
Outflow=96.24 cfs 13.058 af

Reach DP-2: St. Josephs Cemetery Inflow=102.74 cfs 12.838 af
Outflow=102.74 cfs 12.838 af

Reach DP-3: Hilldale Avenue (NE) Inflow=54.60 cfs 4.163 af
Outflow=54.60 cfs 4.163 af

Reach DP-4: Hilldale Avenue (SE) Inflow=46.11 cfs 4.451 af
Outflow=46.11 cfs 4.451 af

Pond DET-1: Det. Basin-3 Peak Elev=216.06' Storage=2,037 cf Inflow=3.73 cfs 0.284 af
Primary=2.13 cfs 0.277 af Secondary=0.44 cfs 0.004 af Outflow=2.57 cfs 0.280 af

Pond DET-2: Det. Basin-5 Peak Elev=195.32' Storage=7,672 cf Inflow=13.99 cfs 1.085 af
Primary=5.75 cfs 0.987 af Secondary=5.08 cfs 0.086 af Outflow=10.83 cfs 1.073 af

Pond INF-1: Det. Basin-1 Peak Elev=155.36' Storage=25,185 cf Inflow=30.08 cfs 2.195 af
Primary=8.40 cfs 1.745 af Secondary=12.42 cfs 0.289 af Outflow=20.82 cfs 2.034 af

Pond INF-2: Det. Basin-2 Peak Elev=167.29' Storage=15,811 cf Inflow=23.63 cfs 1.847 af
Primary=10.56 cfs 1.693 af Secondary=4.52 cfs 0.070 af Outflow=15.08 cfs 1.764 af

Pond INF-3: Det. Basin-4 Peak Elev=202.16' Storage=11,947 cf Inflow=6.79 cfs 0.514 af
Primary=0.07 cfs 0.070 af Secondary=1.76 cfs 0.199 af Outflow=1.82 cfs 0.269 af

Pond LS: Level Spreader Peak Elev=174.99' Storage=3,013 cf Inflow=16.52 cfs 1.301 af
Discarded=0.01 cfs 0.016 af Primary=16.39 cfs 1.225 af Outflow=16.41 cfs 1.240 af

Total Runoff Area = 88.691 ac Runoff Volume = 35.091 af Average Runoff Depth = 4.75"
99.76% Pervious = 88.480 ac 0.24% Impervious = 0.211 ac

Summary for Subcatchment PDA-1A: PDA-1A

Runoff = 63.26 cfs @ 12.43 hrs, Volume= 8.036 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
*	0.041	98	Existing Roofs
	15.159	70	Woods, Good, HSG C
	1.052	77	Woods, Good, HSG D
	0.435	70	Brush, Fair, HSG C
	2.743	74	>75% Grass cover, Good, HSG C
	0.572	80	>75% Grass cover, Good, HSG D
*	0.346	96	Proposed Gravel surface
*	0.137	96	Existing Gravel surface
*	0.065	98	Equipment Pad Area
	20.550	72	Weighted Average
	20.444		99.48% Pervious Area
	0.106		0.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	57	0.1400	1.87		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
21.0	1,423	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
31.0	1,530	Total			

Summary for Subcatchment PDA-1B: PDA-1B

Runoff = 30.08 cfs @ 12.09 hrs, Volume= 2.195 af, Depth> 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
	4.633	74	>75% Grass cover, Good, HSG C
	0.037	80	>75% Grass cover, Good, HSG D
*	0.414	96	Proposed Gravel surface
	5.084	76	Weighted Average
	5.084		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min.**

Summary for Subcatchment PDA-1C: PDA-1C

Runoff = 23.63 cfs @ 12.12 hrs, Volume= 1.847 af, Depth> 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

Area (ac)	CN	Description
3.690	74	>75% Grass cover, Good, HSG C
* 0.495	96	Proposed Gravel surface
4.185	77	Weighted Average
4.185		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0200	1.00		**Sheet Flow, Tc-1** Smooth surfaces n= 0.011 P2= 3.10"
1.7	28	0.1400	0.28		**Sheet Flow, Tc-2** Grass: Short n= 0.150 P2= 3.10"
2.0	254	0.0940	2.15		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
4.1	423	0.0610	1.73		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
8.2	727	Total			

Summary for Subcatchment PDA-1D: PDA-1D

Runoff = 16.52 cfs @ 12.12 hrs, Volume= 1.301 af, Depth> 4.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

Area (ac)	CN	Description
* 0.027	98	Existing Roofs
2.455	70	Woods, Good, HSG C
0.912	74	>75% Grass cover, Good, HSG C
3.394	71	Weighted Average
3.367		99.20% Pervious Area
0.027		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	126	0.0800	1.41		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
1.8	166	0.0960	1.55		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
2.0	509	0.0830	4.32		**Shallow Concentrated Flow, Tc-4** Grassed Waterway Kv= 15.0 fps
8.6	851	Total			

Summary for Subcatchment PDA-2A: PDA-2A

Runoff = 92.10 cfs @ 12.38 hrs, Volume= 11.216 af, Depth> 5.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
	8.222	70	Woods, Good, HSG C
	2.242	77	Woods, Good, HSG D
	8.169	74	>75% Grass cover, Good, HSG C
	7.451	80	>75% Grass cover, Good, HSG D
*	0.371	96	Proposed Gravel surface
*	0.228	96	Existing Gravel surface
*	0.006	98	Equipment Pad Area
	26.689	75	Weighted Average
	26.683		99.98% Pervious Area
	0.006		0.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.0050	0.08		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
8.5	567	0.0250	1.11		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.1	183	0.0440	1.47		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
7.4	577	0.0670	1.29		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
28.0	1,377	Total			

Summary for Subcatchment PDA-2B: PDA-2B

Runoff = 3.73 cfs @ 12.09 hrs, Volume= 0.284 af, Depth> 6.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
	0.004	74	>75% Grass cover, Good, HSG C
	0.275	80	>75% Grass cover, Good, HSG D
*	0.248	96	Proposed Gravel surface
	0.527	87	Weighted Average
	0.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc Min.**

Summary for Subcatchment PDA-2C: PDA-2C

Runoff = 6.79 cfs @ 12.10 hrs, Volume= 0.514 af, Depth> 6.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
	0.014	74	>75% Grass cover, Good, HSG C
	0.796	80	>75% Grass cover, Good, HSG D
*	0.218	96	Proposed Gravel surface
	1.028	83	Weighted Average
	1.028		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0350	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.8	144	0.0350	1.31		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	29	0.0350	3.01		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
6.6	223	Total			

Summary for Subcatchment PDA-2D: PDA-2D

Runoff = 13.99 cfs @ 12.12 hrs, Volume= 1.085 af, Depth> 5.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
	2.416	74	>75% Grass cover, Good, HSG C
*	0.157	96	Proposed Gravel surface
	2.573	75	Weighted Average
	2.573		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.4	163	0.0740	1.90		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.0400	3.22		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.9	147	0.1360	2.58		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
8.1	385	Total			

Summary for Subcatchment PDA-3: PDA-3

Runoff = 54.60 cfs @ 12.11 hrs, Volume= 4.163 af, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
*	0.039	98	Existing Impervious Area
	0.790	30	Woods, Good, HSG A
	5.895	70	Woods, Good, HSG C
	0.284	77	Woods, Good, HSG D
	0.341	39	>75% Grass cover, Good, HSG A
	4.262	74	>75% Grass cover, Good, HSG C
	0.038	80	>75% Grass cover, Good, HSG D
*	0.067	96	Proposed Gravel surface
*	0.024	96	Existing Gravel surface
	11.740	68	Weighted Average
	11.701		99.67% Pervious Area
	0.039		0.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.6	220	0.1050	2.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.8	264	0.2350	2.42		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
7.7	534	Total			

Summary for Subcatchment PDA-4: PDA-4

Runoff = 46.11 cfs @ 12.22 hrs, Volume= 4.451 af, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
	2.020	30	Woods, Good, HSG A
	3.048	70	Woods, Good, HSG C
	2.542	77	Woods, Good, HSG D
	0.232	39	>75% Grass cover, Good, HSG A
	3.466	74	>75% Grass cover, Good, HSG C
	1.297	80	>75% Grass cover, Good, HSG D
*	0.032	96	Proposed Gravel surface
*	0.251	96	Existing Gravel surface
*	0.033	98	Equipment Pad Area
	12.921	67	Weighted Average
	12.888		99.74% Pervious Area
	0.033		0.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
1.5	173	0.0750	1.92		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.3	139	0.1290	1.80		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	187	0.2670	2.58		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
8.3	517	0.0430	1.04		**Shallow Concentrated Flow, Tc-5** Woodland Kv= 5.0 fps
16.0	1,066	Total			

Summary for Reach DP-1: Tattersall Farm Park

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 33.213 ac, 0.40% Impervious, Inflow Depth > 4.72" for NOAA14-100yr event
Inflow = 96.24 cfs @ 12.34 hrs, Volume= 13.058 af
Outflow = 96.24 cfs @ 12.34 hrs, Volume= 13.058 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: St. Josephs Cemetery

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 30.817 ac, 0.02% Impervious, Inflow Depth > 5.00" for NOAA14-100yr event
Inflow = 102.74 cfs @ 12.37 hrs, Volume= 12.838 af
Outflow = 102.74 cfs @ 12.37 hrs, Volume= 12.838 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-3: Hilldale Avenue (NE)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 11.740 ac, 0.33% Impervious, Inflow Depth > 4.26" for NOAA14-100yr event
Inflow = 54.60 cfs @ 12.11 hrs, Volume= 4.163 af
Outflow = 54.60 cfs @ 12.11 hrs, Volume= 4.163 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP-4: Hilldale Avenue (SE)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 12.921 ac, 0.26% Impervious, Inflow Depth > 4.13" for NOAA14-100yr event
Inflow = 46.11 cfs @ 12.22 hrs, Volume= 4.451 af
Outflow = 46.11 cfs @ 12.22 hrs, Volume= 4.451 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond DET-1: Det. Basin-3

Inflow Area = 0.527 ac, 0.00% Impervious, Inflow Depth > 6.47" for NOAA14-100yr event
Inflow = 3.73 cfs @ 12.09 hrs, Volume= 0.284 af
Outflow = 2.57 cfs @ 12.18 hrs, Volume= 0.280 af, Atten= 31%, Lag= 5.4 min
Primary = 2.13 cfs @ 12.18 hrs, Volume= 0.277 af
Secondary = 0.44 cfs @ 12.18 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 216.06' @ 12.18 hrs Surf.Area= 2,321 sf Storage= 2,037 cf

Plug-Flow detention time= 29.4 min calculated for 0.280 af (99% of inflow)
Center-of-Mass det. time= 21.0 min (805.4 - 784.4)

Volume	Invert	Avail.Storage	Storage Description
#1	215.00'	4,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	1,509	0	0
217.00	3,037	4,546	4,546

Device	Routing	Invert	Outlet Devices
#1	Primary	215.00'	**12.0" Round Culvert** L= 24.0' Ke= 1.000 Inlet / Outlet Invert= 215.00' / 214.50' S= 0.0208 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Secondary	216.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.12 cfs @ 12.18 hrs HW=216.06' (Free Discharge)
↑**1=Culvert** (Inlet Controls 2.12 cfs @ 2.70 fps)

Secondary OutFlow Max=0.40 cfs @ 12.18 hrs HW=216.06' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.40 cfs @ 0.68 fps)

Summary for Pond DET-2: Det. Basin-5

Inflow Area =	2.573 ac,	0.00% Impervious,	Inflow Depth > 5.06"	for NOAA14-100yr event
Inflow =	13.99 cfs @	12.12 hrs, Volume=	1.085 af	
Outflow =	10.83 cfs @	12.21 hrs, Volume=	1.073 af,	Atten= 23%, Lag= 5.6 min
Primary =	5.75 cfs @	12.21 hrs, Volume=	0.987 af	
Secondary =	5.08 cfs @	12.21 hrs, Volume=	0.086 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 195.32' @ 12.21 hrs Surf.Area= 5,313 sf Storage= 7,672 cf

Plug-Flow detention time= 24.4 min calculated for 1.073 af (99% of inflow)
Center-of-Mass det. time= 17.3 min (832.4 - 815.2)

Volume	Invert	Avail.Storage	Storage Description
#1	193.50'	11,592 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.50	3,171	0	0
194.00	3,729	1,725	1,725
196.00	6,138	9,867	11,592

Device	Routing	Invert	Outlet Devices
#1	Primary	193.50'	**12.0" Round Culvert** L= 26.0' Ke= 0.100 Inlet / Outlet Invert= 193.50' / 193.00' S= 0.0192 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Secondary	195.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=5.73 cfs @ 12.21 hrs HW=195.31' (Free Discharge)
↑**1=Culvert** (Barrel Controls 5.73 cfs @ 7.30 fps)

Secondary OutFlow Max=4.92 cfs @ 12.21 hrs HW=195.31' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 4.92 cfs @ 1.59 fps)

Summary for Pond INF-1: Det. Basin-1

Inflow Area =	5.084 ac,	0.00% Impervious,	Inflow Depth > 5.18"	for NOAA14-100yr event
Inflow =	30.08 cfs @	12.09 hrs, Volume=	2.195 af	
Outflow =	20.82 cfs @	12.18 hrs, Volume=	2.034 af,	Atten= 31%, Lag= 5.5 min
Primary =	8.40 cfs @	12.18 hrs, Volume=	1.745 af	
Secondary =	12.42 cfs @	12.18 hrs, Volume=	0.289 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 155.36' @ 12.18 hrs Surf.Area= 15,841 sf Storage= 25,185 cf

Plug-Flow detention time= 78.3 min calculated for 2.030 af (92% of inflow)
Center-of-Mass det. time= 41.0 min (852.2 - 811.3)

Volume	Invert	Avail.Storage	Storage Description
#1	153.50'	35,857 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
153.50	11,270	0	0
154.00	12,494	5,941	5,941
156.00	17,422	29,916	35,857

Device	Routing	Invert	Outlet Devices
#1	Primary	153.00'	**18.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 153.00' / 152.50' S= 0.0200 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Primary	153.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	154.00'	**2.5' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	155.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	155.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=8.39 cfs @ 12.18 hrs HW=155.35' (Free Discharge)
- **1=Culvert** (Inlet Controls 8.08 cfs @ 4.57 fps)
  - **3=Sharp-Crested Rectangular Weir** (Passes < 10.26 cfs potential flow)
  - **4=Orifice/Grate** (Passes < 10.99 cfs potential flow)
- **2=Orifice/Grate** (Orifice Controls 0.31 cfs @ 6.33 fps)

Secondary OutFlow Max=12.16 cfs @ 12.18 hrs HW=155.35' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Weir Controls 12.16 cfs @ 1.72 fps)

Summary for Pond INF-2: Det. Basin-2

Inflow Area =	4.185 ac,	0.00% Impervious,	Inflow Depth > 5.30"	for NOAA14-100yr event
Inflow =	23.63 cfs @	12.12 hrs, Volume=	1.847 af	
Outflow =	15.08 cfs @	12.25 hrs, Volume=	1.764 af, Atten= 36%, Lag= 8.1 min	
Primary =	10.56 cfs @	12.25 hrs, Volume=	1.693 af	
Secondary =	4.52 cfs @	12.25 hrs, Volume=	0.070 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 167.29' @ 12.25 hrs Surf.Area= 7,264 sf Storage= 15,811 cf

Plug-Flow detention time= 48.6 min calculated for 1.764 af (95% of inflow)
Center-of-Mass det. time= 23.6 min (834.4 - 810.9)

Volume	Invert	Avail.Storage	Storage Description
#1	164.50'	21,250 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.50	4,165	0	0
166.00	5,725	7,418	7,418
168.00	8,107	13,832	21,250

Device	Routing	Invert	Outlet Devices
#1	Primary	164.00'	**18.0" Round Culvert** L= 30.0' Ke= 1.000 Inlet / Outlet Invert= 164.00' / 163.50' S= 0.0167 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf
#2	Primary	164.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	165.25'	**3.0' long x 1.75' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	167.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	167.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=10.56 cfs @ 12.25 hrs HW=167.29' (Free Discharge)
- **1=Culvert** (Inlet Controls 10.17 cfs @ 5.76 fps)
  - **3=Sharp-Crested Rectangular Weir** (Passes < 23.91 cfs potential flow)
  - **4=Orifice/Grate** (Passes < 8.24 cfs potential flow)
- **2=Orifice/Grate** (Orifice Controls 0.39 cfs @ 7.86 fps)

Secondary OutFlow Max=4.50 cfs @ 12.25 hrs HW=167.29' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Weir Controls 4.50 cfs @ 1.54 fps)

Summary for Pond INF-3: Det. Basin-4

Inflow Area =	1.028 ac,	0.00% Impervious,	Inflow Depth > 6.00"	for NOAA14-100yr event
Inflow =	6.79 cfs @	12.10 hrs, Volume=	0.514 af	
Outflow =	1.82 cfs @	12.47 hrs, Volume=	0.269 af, Atten= 73%, Lag= 22.4 min	
Primary =	0.07 cfs @	12.47 hrs, Volume=	0.070 af	
Secondary =	1.76 cfs @	12.47 hrs, Volume=	0.199 af	

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 202.16' @ 12.47 hrs Surf.Area= 8,260 sf Storage= 11,947 cf

Plug-Flow detention time= 226.0 min calculated for 0.269 af (52% of inflow)
Center-of-Mass det. time= 116.1 min (911.6 - 795.5)

Volume	Invert	Avail.Storage	Storage Description
#1	200.50'	19,354 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
200.50	6,153	0	0
202.00	8,060	10,660	10,660
203.00	9,328	8,694	19,354

Device	Routing	Invert	Outlet Devices
#1	Primary	200.50'	**4.0" Round Culvert** L= 25.0' Ke= 1.000 Inlet / Outlet Invert= 200.50' / 200.00' S= 0.0200 '/' Cc= 0.900 n= 0.100, Flow Area= 0.09 sf
#2	Secondary	202.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.07 cfs @ 12.47 hrs HW=202.16' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.07 cfs @ 0.76 fps)

Secondary OutFlow Max=1.74 cfs @ 12.47 hrs HW=202.16' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.74 cfs @ 1.11 fps)

Summary for Pond LS: Level Spreader

Inflow Area = 3.394 ac, 0.80% Impervious, Inflow Depth > 4.60" for NOAA14-100yr event
Inflow = 16.52 cfs @ 12.12 hrs, Volume= 1.301 af
Outflow = 16.41 cfs @ 12.13 hrs, Volume= 1.240 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.13 hrs, Volume= 0.016 af
Primary = 16.39 cfs @ 12.13 hrs, Volume= 1.225 af

Routing by Stor-Ind method, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 174.99' @ 12.13 hrs Surf.Area= 2,164 sf Storage= 3,013 cf

Plug-Flow detention time= 36.7 min calculated for 1.240 af (95% of inflow)
Center-of-Mass det. time= 11.3 min (835.4 - 824.1)

Volume	Invert	Avail.Storage	Storage Description
#1	173.00'	5,540 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
173.00	905	0	0
174.00	1,495	1,200	1,200
176.00	2,845	4,340	5,540

Device	Routing	Invert	Outlet Devices
#1	Discarded	173.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	174.80'	**70.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 12.13 hrs HW=174.99' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=15.99 cfs @ 12.13 hrs HW=174.99' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 15.99 cfs @ 1.21 fps)

Attachment 4
Hydraulic Calculations

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

3274.00
Haverhill, MA

CLIENT/PROJECT:

BWC Camp Brook, LLC
Hilldale Avenue Solar 2

SUBJECT TITLE:

Hydraulic Calculations

OBJECTIVE OF CALCULATION:

- To size culvert pipes to adequately convey flows from the proposed project and to meet the design standards of the Massachusetts DEP Stormwater Handbook for inlet capacity, pipe flow, and scour.

CALCULATION METHOD(S):

- Culverts are designed using the Rational Formula, based on a 50-year storm event for the City of Boston (see attached IDF curve).

ASSUMPTIONS:

- Runoff coefficient C=0.3 for pervious areas and C=0.9 for impervious areas.
- Manning's n=0.012 for HDPE pipe.
- The times of concentration for contributing subcatchments are approximately 6 minutes for flows to FE-1.
- The minimum full-flow (scour) velocity is 2 feet per second.
- The maximum full-flow (scour) velocity is 10 feet per second.

SOURCES OF DATA/EQUATIONS:

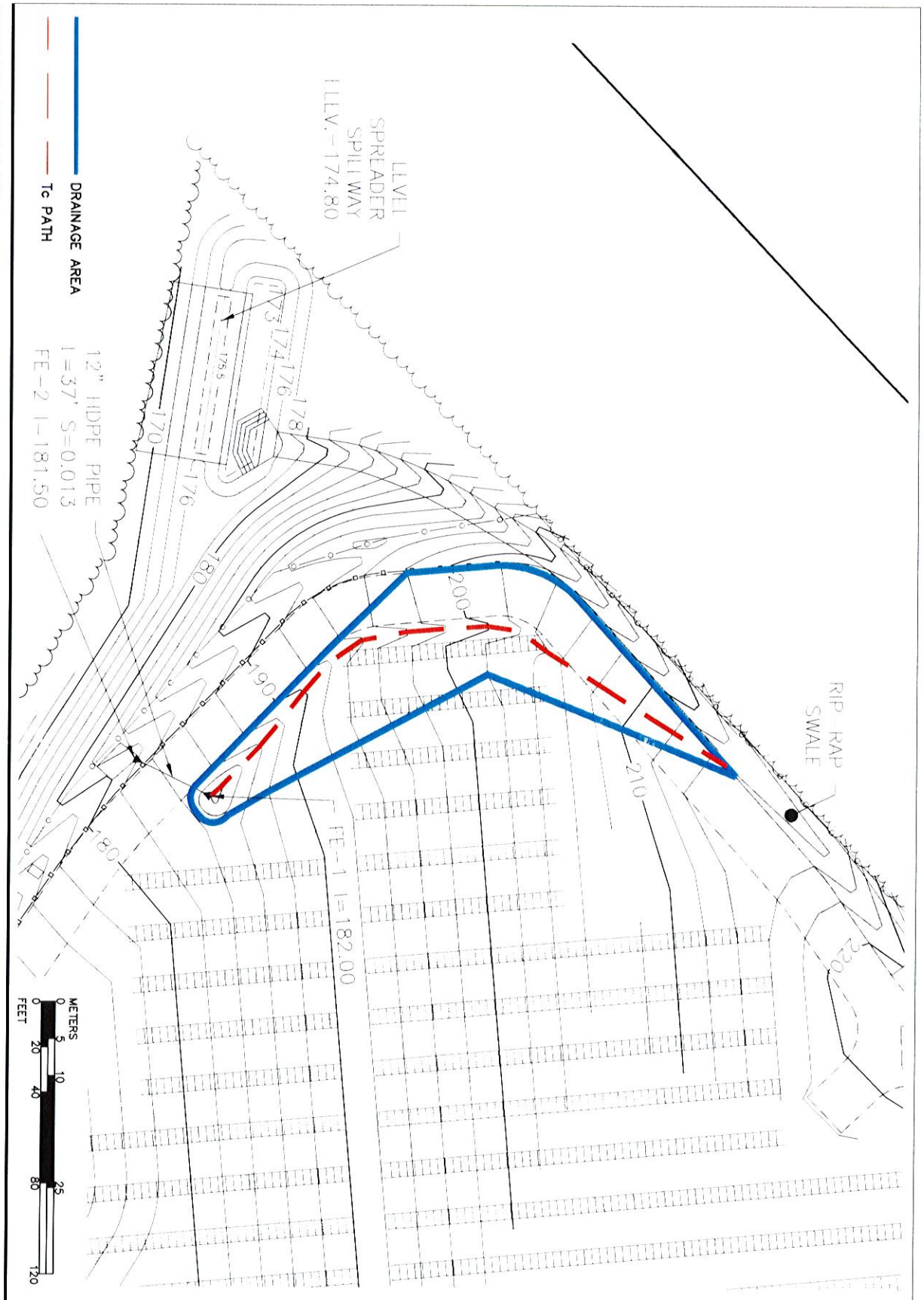
- Hilldale Avenue Solar 2 Site Plan, prepared by Beals and Thomas, Inc., plan numbers 314000P003A-004-005.
- Rational Method (Q=CiA) was used to calculate peak runoff rates tributary to FE-1.
- Manning's Equation was used to determine pipe capacities.
- 50-year storm intensity obtained from the Intensity/Duration rainfall curve for the City of Boston in S.C.S Technical Report No. 40.
- Massachusetts DEP Stormwater Management Handbook, February 2008.

CONCLUSIONS:

- The proposed culvert pipes will adequately convey the 50-year storm event runoff rates.
- The proposed stormwater management design has been reviewed for compliance with the stormwater management standards described in the Massachusetts DEP Stormwater Management Handbook.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	NBB	05/06/2021	JRM	05/07/2021	JRM	05/27/2021

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NORTH

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Hilldale Avenue Solar 2
Haverhill, Massachusetts

BWC Camp Brook, LLC
111 Huntington Ave., Suite 650
Boston, Massachusetts

Proposed Hydraulic Areas Map
Figure Number 003

Scale: 1" = 40' Date: 05/06/2021
Plan No. 327400P004A-003
B+T Project No. 3274.00

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Hydraulic Drainage Areas & Corresponding Rational Method Flows

Using the Rational Method:

$$Q = CIA$$

Where:

Q = flow (cfs)
C = Runoff Coefficient
I = Rainfall Intensity, 50-year storm (in/hr) (from Boston, MA IDF curve, see attached)
A = Contributing Area (acres)

Assumptions: - Coefficient of runoff for Gravel Surfaces = 0.9
- Coefficient of runoff for Pervious Surfaces = 0.3

Inlet	Contributing Area (Acres)	Weighted Average Rational Coefficients	Rainfall Intensity for Boston (in/hr)	Contributing Flow (cfs)
FE-1	0.223	0.60	6.60	0.88

JOB NO. 3274.00 FILE Hilldale Ave. Solar 2

COMPUTED BY NBB DATE 5/6/2021

CHECKED BY JRM DATE 5/7/2021

BEALS + THOMAS
Hydraulic Pipe Sizing Calculations

Using the Manning Equation to Verify Pipe Capacities Versus Pipe Flows:

$$Q = \frac{1.49}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

Where:

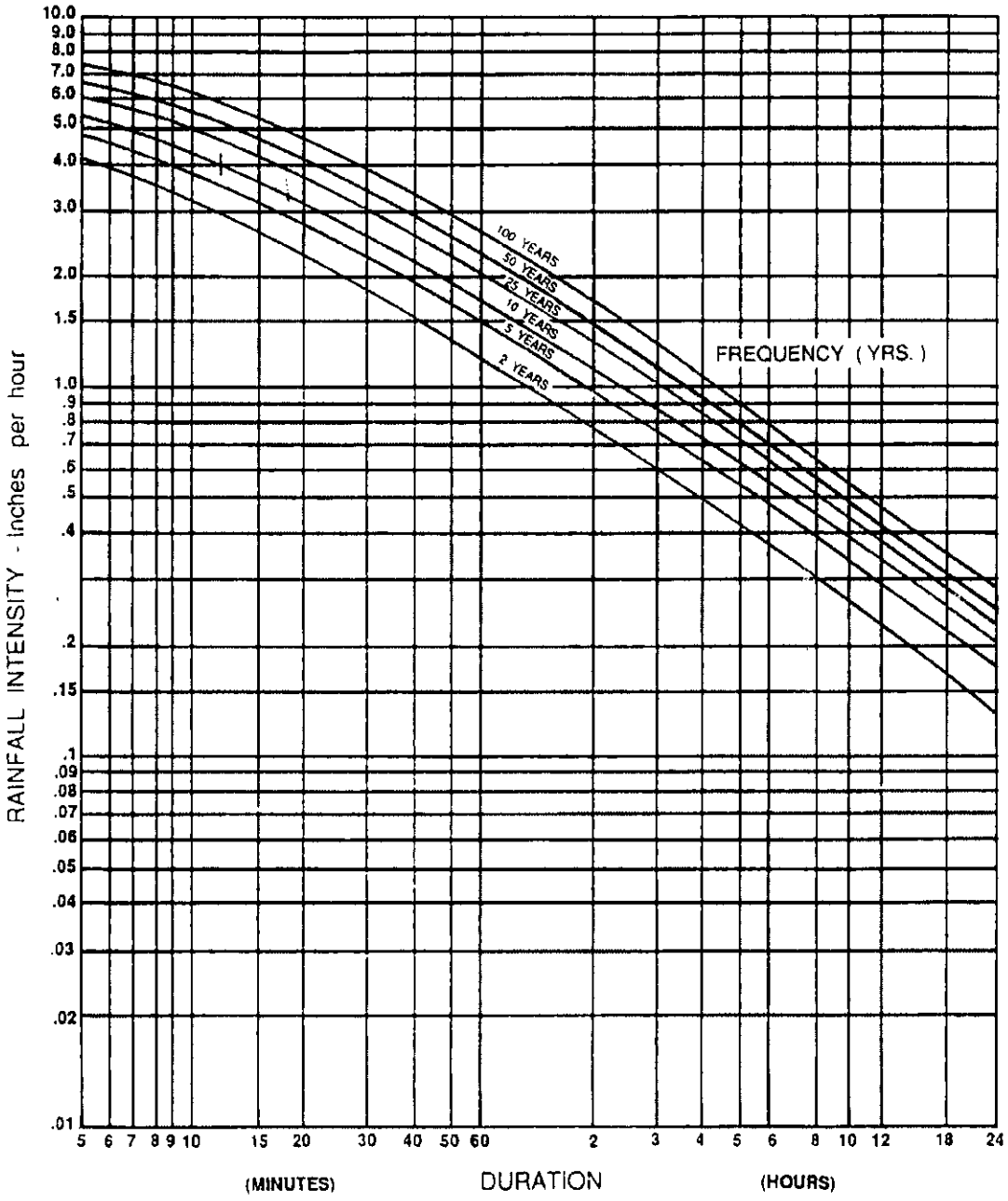
Q = flow (cfs)
n = Manning's roughness coefficient
A = Cross Sectional Area (sf)
R = Hydraulic Radius (ft)
S = Pipe Slope

Assumptions: n = 0.012 for HDPE pipe
Pipe velocity shall be between 2.0 ft/sec and 10 ft/sec

Pipe Connection	Contributing Flow-50 Year Storm(cfs)	Proposed Pipe Size and Material	Proposed Pipe Slope (rise/run)	Full-Flow Capacity of Pipe from Manning Equation (cfs)	Adequate	Full Flow Velocity (ft/sec)
FE-1 to FE-2	0.88	12" HDPE	0.013	4.41	OK	5.6

JOB NO. 3274.00 Hilldale Ave. Solar
FILE 2
COMPUTED BY NBB
DATE 5/6/2021
CHECKED BY JRM
DATE 5/7/2021

Exhibit 8-12
Intensity - Duration - Frequency Curve for Boston, MA



Source: TR55 - Urban Hydrology for Small Wetlands. NRCS

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BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
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www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO. LOCATION:
3274.00
Haverhill, MA

CLIENT/PROJECT:
BWC Camp Brook, LLC
Hilldale Avenue Solar 2

SUBJECT TITLE:
Stream Crossing Hydraulic Calculations

OBJECTIVE OF CALCULATION:

- To confirm the proposed box culvert can adequately pass the 100-year contributing flow from the upgradient watershed area.

CALCULATION METHOD(S):

- Flow to box-culvert stream crossing was analyzed using HydroCAD version 10.00 for a 100-year storm event using NOAA Atlas 14 precipitation data.
- Capacity of box culvert performed for basic cross-sectional area of upstream end of box culvert opening.

ASSUMPTIONS:

- The ground cover types were determined using aerial imagery. Hydrologic soil groups based on United States Department of Agriculture, NRCS Soil Survey map information.
- Stormwater runoff from offsite tributary areas was included in the calculations.
- Off-site area contour information retrieved from MassGIS.
- Manning's n=0.022 for Earth, clean & straight channel flow.
- The times of concentration for contributing subcatchment is approximately 20 minutes.

SOURCES OF DATA/EQUATIONS:

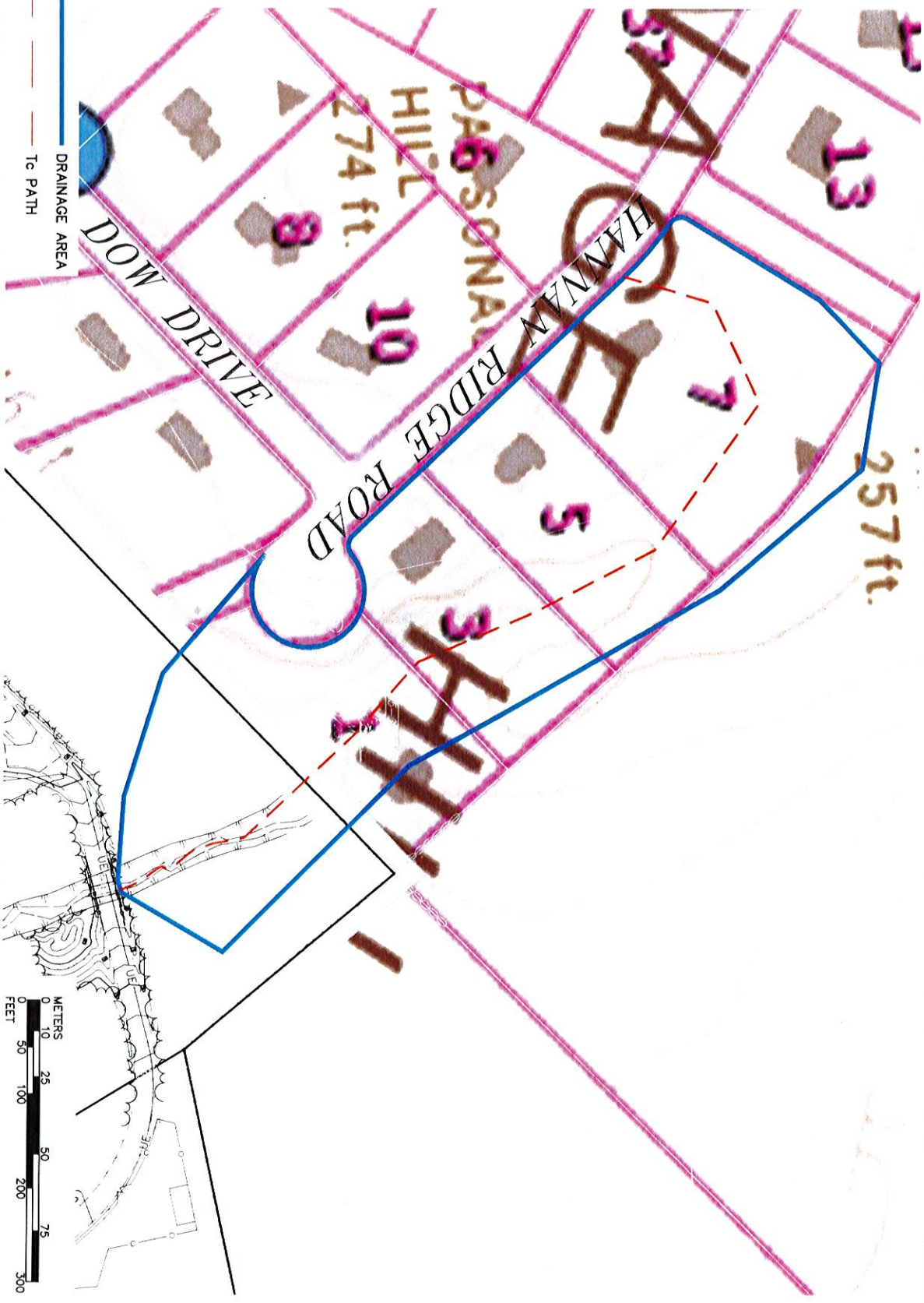
- Hilldale Avenue Solar 2 Site Plan, prepared by Beals and Thomas, Inc., plan numbers 314000P003A-004-005.
- TR-55 urban Hydrology for Small Watersheds, SCS, 1986.
- Manning's Equation was used to determine stream crossing capacities.
- Design storm calculated using NOAA Atlas 14, point precipitation frequency estimates.
- Massachusetts DEP Stormwater Management Handbook, February 2008.

CONCLUSIONS:

- The proposed stream crossing will adequately convey the 100-year storm event runoff flow rate.
- Q_{bidge}=641.5 cfs > $Q_{tributary}$=20.7 cfs.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	NBB	05/06/2021	JRM	05/11/2021	JRM	05/11/2021

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Hilldale Avenue Solar 2
Haverhill, Massachusetts

BWC Camp Brook, LLC
111 Huntington Ave., Suite 650
Boston, Massachusetts

Proposed Stream Crossing Hydraulic Areas Map

Figure Number 004

Scale: 1" = 100' Date: 05/06/2021

Plan No. 327400P004A-004

B+T Project No. 3274.00

Manning Formula Uniform Trapezoidal Channel Flow at Given Slope and Depth

Printable Title

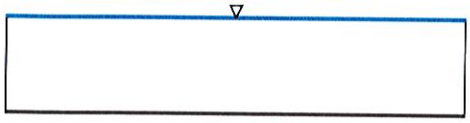
Printable Subtitle

Inputs

Bottom width	12	ft
Side slope 1 (horiz.:vert.)	0	
Side slope 2 (horiz.:vert.)	0	
Manning roughness, n	.022	
Channel slope	.047	rise/run
Flow depth	2.5	ft
Bend Angle2 (for riprap sizing)	0	
Stone specific gravity (2.65)	2.65	
Lining median rock size	1	ft

Results

Flow area	30.0010	ft^2
Wetted perimeter	17.0000	ft
Hydraulic radius	1.7647	ft
Velocity, v	21.3830	ft/sec
Flow, Q (See notes)	641.4818	cfs



Summary for Subcatchment SC: Stream Crossing

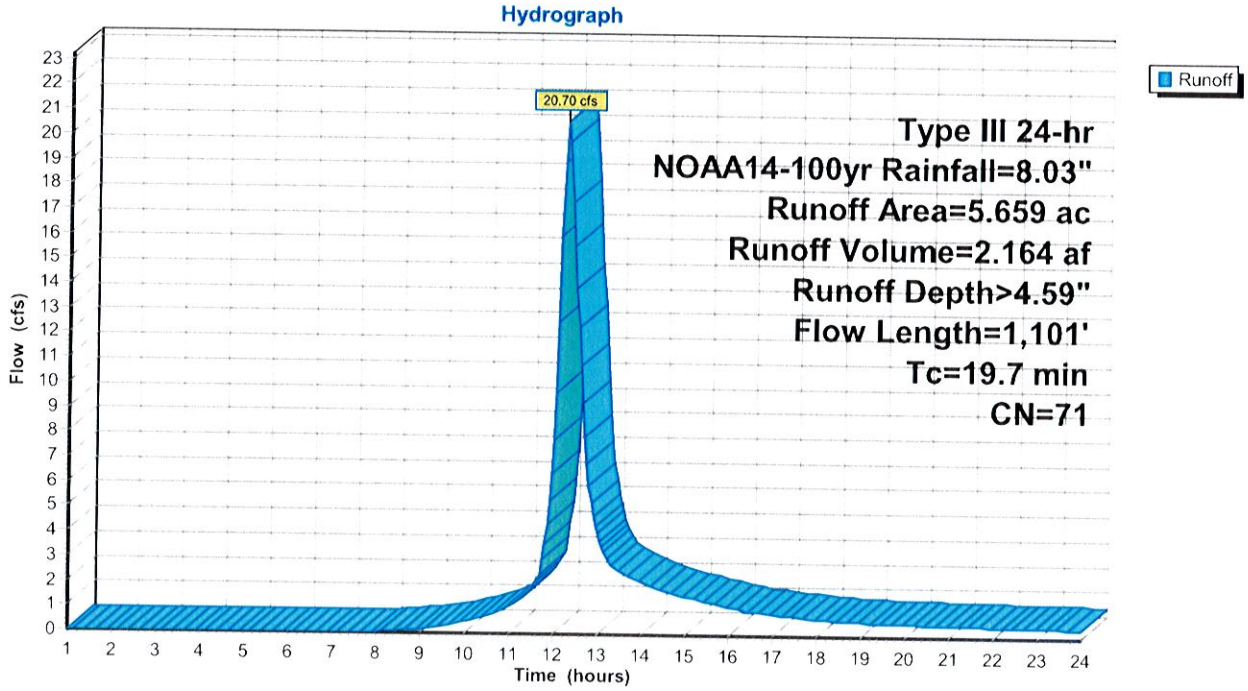
Runoff = 20.70 cfs @ 12.27 hrs, Volume= 2.164 af, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr NOAA14-100yr Rainfall=8.03"

	Area (ac)	CN	Description
*	0.106	98	Existing Roofs
	5.553	70	Woods, Good, HSG C
	5.659	71	Weighted Average
	5.553		98.13% Pervious Area
	0.106		1.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.10"
3.8	358	0.0500	1.57		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
10.2	693	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
19.7	1,101	Total			

Subcatchment SC: Stream Crossing



Attachment 5
Groundwater Recharge, Drawdown and Rip Rap Apron Sizing

Groundwater Recharge Volume Required:

- Western Equipment Pad & Animal Shelter: 800 sf x 0.25"/12" = 17 cf required (x2)
- Western Battery Storage Pads: 2 x 896 sf x 0.25"/12" = 38 cf required
- Eastern Equipment Pad: 800 sf x 0.25"/12" = 17 cf required
- Eastern Battery Storage Pad: 896 sf x 0.25"/12 = 19 cf required

Total = 108 cf required

Note: Calculations based on Hydrologic Soil Group "C"

Groundwater Recharge Volume Provided:

- Western Equipment Pad & Animal Shelter Trench: 2' x 1' x 40' x 0.40 = 32 cf (x2) provided
- Western Battery Storage Pad Trench: 2' x 1' x 94' x 0.40 = 75 cf provided
- Eastern Equipment Pad Trench: 2' x 1' x 22' x 0.40 = 18 cf provided
- Eastern Battery Storage Pad Trench: 1' x 1' x 74' x 0.40 = 30 cf provided

Total = 187 cf provided

Note: Trenches calculated using 40% voids

JOB NO. 3274.00 CALC BY: NBB DATE: 05/11/2021
TOWN: Haverhill, MA CHECKED BY: JRM DATE: 5/11/2021
PROJECT: Hilldale Ave. Solar 2 PAGE 1 OF 1

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Standard 3: Drawdown

$$\text{Drawdown Time} = \frac{Rv}{(K)\,(\text{Bottom Area})}$$

where:

Rv = Storage Volume Below Outlet [cf]
K= Infiltration Rate [in/hr]
Bottom Area= Bottom Area of Recharge System [sf]

Western Equipment Pad Trench

Rv =	32.00 cf	
K =	0.27 in/hr	
Bottom Area =	80.00 sf	
Drawdown Time =	**17.778 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Western Battery Storage Trench

Rv =	75.00 cf	
K =	0.27 in/hr	
Bottom Area =	188.00 sf	
Drawdown Time =	**17.730 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Eastern Equipment Pad Trench

Rv =	18.00 cf	
K =	0.27 in/hr	
Bottom Area =	44.00 sf	
Drawdown Time =	**18.182 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Eastern Battery Storage Trench

Rv =	30.00 cf	
K =	0.27 in/hr	
Bottom Area =	74.00 sf	
Drawdown Time =	**18.018 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Animal Shelter

Rv =	32.00 cf	
K =	0.27 in/hr	
Bottom Area =	80.00 sf	
Drawdown Time =	**17.778 Hours**	*< 72 Hours, Design is in compliance with the standard.*

Note:

1. The infiltration BMPs have been designed to fully drain within 72 hours, therefore the proposed stormwater management design is in compliance with Standard 3 .

2. Infiltration Rate based on Volume 3, Chapter 1, Table 2.3.3 *Rawls Rates* from the 2008 MA DEP Stormwater Management Handbook.

JOB NO.	3274.00	COMPUTED BY:	JRM	CHECKED BY:	JRM
JOB:	Hilldale Ave. Solar 2	DATE:	05/26/21	DATE:	05/27/21

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Riprap Apron Sizing

Median Stone Sizing:

$$D_{50} = 0.2 D_0 \left(\frac{Q}{\sqrt{g} D_0^{2.5}} \right)^{\frac{4}{3}} \left(\frac{D_0}{TW} \right)$$

Where:

D_0 = Maximum Inside Pipe Diameter (ft)

D_{50} = Median Riprap Diameter (ft)

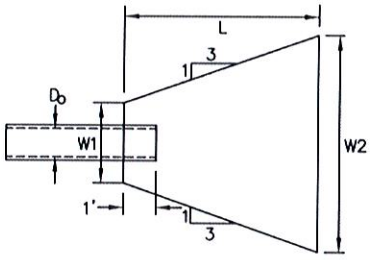
Q = Peak Discharge Rate from Hydraulic Design (cfs)

TW = Tailwater Depth (ft); (Use $0.4D_0$ if TW is unknown, max $1.0D_0$)

g = Gravitational Acceleration Constant = 32.2 ft/s^2

Apron Sizing:

D_{50} [In]	Apron Length (L) [ft]	Apron Depth [In]	Apron Width At Beginning	Apron Width At End
5	$4D_0$	$3.5D_{50}$	$3D_0$	$3D_0 + \frac{2}{3}L$
6	$4D_0$	$3.3D_{50}$	$3D_0$	$3D_0 + \frac{2}{3}L$
10	$5D_0$	$2.4D_{50}$	$3D_0$	$3D_0 + \frac{2}{3}L$
14	$6D_0$	$2.2D_{50}$	$3D_0$	$3D_0 + \frac{2}{3}L$
20	$7D_0$	$2.0D_{50}$	$3D_0$	$3D_0 + \frac{2}{3}L$
22	$8D_0$	$2.0D_{50}$	$3D_0$	$3D_0 + \frac{2}{3}L$



FLARED END SECTION	PIPE DIAMETER (D_0) (FEET)	100-YEAR STORM FLOW (Q) (CFS)	TAILWATER (TW) [ft]	MEDIAN STONE DIAMETER (D_{50}) (INCHES)	APRON LENGTH (L) (FEET)	APRON DEPTH [In]	APRON WIDTH AT BEGINING (W_1) [ft]	APRON WIDTH AT END (W_2) [ft]
FE-2	1.0	1.48	0.4	5	4.00	17.5	3.0	5.7
FE-3	1.5	8.40	0.6	5	6.00	17.5	4.5	8.5
FE-4	1.5	10.56	0.6	6	6.00	19.8	4.5	8.5
FE-6	1.0	2.13	0.4	5	4.00	17.5	3	5.7
FE-8	0.3	0.07	0.132	5	1.32	17.5	0.99	1.9
FE-10	1.0	5.75	0.4	10	5.00	24	3	6.3

Notes

[1] Calculations performed in accordance with Hydraulic Engineering Circular No. 14, Third Edition; Hydraulic Design of Energy Dissipaters for Culverts and Channels, dated July 2006.

[2] Pipe shall extend 1 foot into riprap.

[3] For maximum pipe size of 60".

JOB NO: 3274.00 COMPUTED BY: NBB CHECKED BY: JRM

JOB: Hilldale Ave. Solar 2 DATE: 05/26/21 DATE: 5/26/2021

Attachment 6
Site Owner's Manual

Site Owner's Manual

HILLDALE AVENUE SOLAR 2

1050 Hilldale Avenue
Haverhill, Massachusetts

Prepared for:
BWC Camp Brook, LLC
P.O. Box 171381
Boston, MA 02117

Prepared by:
BEALS + THOMAS
CIVIL ENGINEERS | LANDSCAPE ARCHITECTS |
LAND SURVEYORS | PLANNERS |
ENVIRONMENTAL SPECIALISTS

May 27, 2021

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FIGURES

Figure 1: Site Plan

APPENDICES

Appendix A: Solar facility operation & maintenance plan
Appendix B: Operation and Maintenance Log
Appendix C: List of Emergency Contacts

1.0 INTRODUCTION

The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (DEP) Stormwater Handbook. The Manual outlines source control and pollution prevention measures and maintenance requirements of stormwater best management practices (BMPs) associated with the proposed development.

2.0 SITE OWNER'S AGREEMENT

2.1 Operation and Maintenance Compliance Statement

Site Owner: BWC Camp Brook, LLC
P.O. Box 171381
Boston, MA 02117

Responsible Party: BWC Camp Brook, LLC

BWC Camp Brook, LLC or their successors shall maintain ownership of the on-site stormwater management system as well as the responsibility for operation and maintenance during the post-development stages of the project. The site has been inspected for erosion and appropriate measures have been taken to permanently stabilize any eroded areas. All aspects of stormwater best management practices (BMPs) have been inspected for damage, wear and malfunction, and appropriate steps have been taken to repair or replace the system or portions of the system so that the stormwater at the site may be managed in accordance with the Stormwater Management Standards. Future responsible parties shall be notified of their continuing legal responsibility to operate and maintain the BMPs. The operation and maintenance plan for the stormwater BMPs is being implemented.

Responsible Party Signature

05/27/2021
Date

2.2 Stormwater Maintenance Easements

There are no off-site areas utilized for stormwater control, therefore no stormwater management easements are required. The Site Owner will have access to all stormwater practices for inspection and maintenance, including direct maintenance access by heavy equipment to structures requiring regular maintenance.

2.3 Record Keeping

The Site Owner shall maintain a rolling log in which all inspections and maintenance activities for the past three years shall be recorded. The Operation and Maintenance Log includes information pertaining to inspections, repairs, and disposal relevant to the project's stormwater management system. The Log is located in Appendix A.

The Operation and Maintenance Log shall be made available to the Conservation Commission and the DEP upon request. The Conservation Commission and the DEP shall be allowed to enter and inspect the premises to evaluate and ensure that the responsible party complies with the maintenance requirements for each BMP.

2.4 Training

Employees involved in grounds maintenance and emergency response will be educated on the general concepts of stormwater management and groundwater protection. The Site Owner's Manual will be reviewed with the maintenance staff. The staff will be trained on the proper course of action for specific events expected to be incurred during routine maintenance or emergency situations.

3.0 LONG-TERM POLLUTION PREVENTION PLAN

In compliance with Standard 4 of the 2008 DEP Stormwater Management Handbook, this section outlines source control and pollution prevention measures to be employed on-site after construction.

3.1 Storage of Materials and Waste

The site shall be kept clear of trash and debris at all times. Certain materials and waste products shall be stored inside or outside upon an impervious surface and covered, as required by local and state regulations.

3.2 Vehicle Washing

No commercial vehicle washing shall take place on site.

3.3 Routine Inspections and Maintenance of Stormwater BMPs

See Section 4.0 Long-Term Operation and Maintenance Plan, for routine inspection and maintenance requirements for all proposed stormwater BMPs.

3.4 Spill Prevention and Response

A contingency plan shall be implemented to address the spill or release of petroleum products and hazardous materials and will include the following measures:

1. Equipment necessary to quickly attend to inadvertent spills or leaks shall be stored on-site in a secure but accessible location. Such equipment shall include but not be limited to the following: safety goggles, chemically resistant gloves and overshoe boots, water and chemical fire extinguishers, sand and shovels, suitable absorbent materials, storage containers and first aid equipment (i.e. Indian Valley Industries, Inc. 55-gallon Spill Containment kit or approved equivalent).

2. Spills or leaks shall be treated properly according to material type, volume of spillage and location of spill. Mitigation shall include preventing further spillage, containing the spilled material in the smallest practical area, removing spilled material in a safe and environmentally-friendly manner, and remediation of any damage to the environment.

3. For large spills, Massachusetts DEP Hazardous Waste Incident Response Group shall be notified immediately at 888-304-1133 and an emergency response contractor shall be consulted.

3.5 Maintenance of Vegetated Areas

Vegetated areas shall be maintained regularly by the facility operator. Vegetated BMPs will be maintained as outlined in Section 4.0.

3.6 Snow and Deicing Chemical Management

Snow removal and use of deicing chemicals at the proposed development shall comply with the following requirements:

- Plowed snow shall be placed in the areas outside of wetland boundaries and stormwater best management practices. The following maintenance measures shall be undertaken at all snow disposal sites:
  - Debris shall be cleared from an area prior to using it for snow disposal.
  - Debris and accumulated sediments shall be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.
- Salt and other de-icing chemicals will not be used for the proposed project.

3.7 Nutrient Management Plan

There are no TMDLs issued for the waterbodies downstream of the proposed project.

4.0 LONG-TERM OPERATION AND MAINTENANCE PLAN

This section outlines the stormwater best management practices (BMPs) associated with the proposed stormwater management system and identifies the long-term inspection and maintenance requirements for each BMP.

4.1 Stormwater Management System Components

The following table outlines the type and quantity of the BMPs and their general location. Please reference the site plan(s) provided in the Figures section for exact location. All basins are accessible for maintenance from access road/ perimeter of the array.

BMP Type	Quantity	Location
Detention Basin	5	Throughout the site.
Infiltration Trenches	5	Adjacent to Equipment Pads & Animal Structure

4.2 Inspection and Maintenance Schedules

All Structural Best Management Practices (BMP's) including the siltation control should be inspected after every major rainfall event exceeding 1.0-inch for the first 6 months after construction to ensure proper stabilization and construction.

4.2.1 Detention Basins

Detention basins shall be inspected twice a year and when there are discharges through the outlet control structure thereafter. Additionally, all pretreatment BMPs shall be inspected in accordance with the minimal requirements specified for those practices and after all major storm events. Inspections shall include the following measures:

- During and after major storm events, the length of time standing water remains in the basin shall be recorded.
  - If the time is greater than 72 hours, thoroughly inspect the basin for signs of clogging.
  - A corrective action plan shall be developed by a qualified professional to restore infiltrative function. The Site Owner shall take immediate action to implement these corrective measures.
- Examine the outlet structure for evidence of clogging or outflow release velocities that are greater than the design velocity.
- Identify areas of sediment accumulation, differential settlement, cracking, and erosion within the basin.
- Inspect embankments for leakage and tree growth.

- Examine the health of the vegetation within the basin and on the embankments.

Corrective measures shall be taken immediately as warranted by the inspections. If any evidence of hydrocarbons is found during inspection, the material shall be immediately removed using absorbent pads or other suitable measures and legally disposed.

Preventative maintenance shall include the following activities:

- Mow the buffer area and basin bottom and side slopes, if vegetated.
- Remove trash, debris, and accumulated organic matter.
- Remove clippings after mowing.

4.2.2 Stormwater Outfalls

Flared end sections and associated riprap spillways shall be inspected at least once per year and after major storm events (rainfall totals greater than 2.5 inches in 24 hours) to ensure that the stability of the outlet area is maintained. The outfall area shall be kept clear of debris such as trash, branches, and sediment. Repairs shall be made immediately if riprap displacement or downstream channel scour is observed.

4.2.3 Infiltration Trenches

The crushed stone infiltration trenches shall be inspected twice per year. If it is determined that the top stone above the filter fabric is silted or compromised, the top stone shall be removed, any damaged filter fabric shall be removed and replaced, and clean stone shall be placed over the filter fabric. All removed sediments are to be properly disposed of at a location to be approved by the Board of Health. Transportation and disposal of sediments shall comply with all local, state and federal regulations.

4.3 Estimated Operation and Maintenance Budget

An operations and maintenance budget was prepared to approximate the annual cost of the inspections required in compliance with the DEP Stormwater Management Policy. The table below estimates the annual cost to inspect and maintain each proposed BMP, based on the requirements in Section 4.2.

BMP Type	# of BMPS	Annual O&M Cost (per BMP)[1]	Total Cost
Detention Basin	5	$200 - $400	$1000-$2000
Infiltration Trenches	5	$200 - $400	$1000-$2000
Riprap Spillway	6	$50-$100	$300-$600
		Total	$2300-$4600

4.4 Public Safety Features

Safety measures are proposed to protect the public and prevent pollutant contamination of the stormwater management system and other water resources. Spill kits will be available on-site in the event of a fuel or other chemical or material spill. The majority of the site will be surrounded by a gated security fence. This fence will prevent the public from inadvertently entering the site and injuring themselves.

[1] Annual maintenance cost is based on estimate of the cost to complete all inspection and maintenance measures outlined in Section 4.2. For BMPs that require sediment removal at regular intervals (i.e. every 5 or 10 years), the annual cost includes the annual percentage of that cost.

Figures

Figure 1: Site Plans

Appendices

Appendix A

Solar Facility Operation & Maintenance Plan

Solar Facility Operation and Maintenance Plan

Property Location: 1050 Hilldale Avenue Haverhill, MA

Property Owners: Dixieland, LLC

Project Developer: BWC Camp Brook, LLC
P.O. Box 171381
Boston, Massachusetts 02117

Solar Array
Operation and Maintenance Plan
During Construction

- Contractor shall provide Building Inspector, Police Department and Fire Department with emergency contact information, including supervisor's names, addresses and telephone numbers.
- Contractor shall comply with all requirements of the Police and Fire Departments regarding emergency access to the job site.
- Contractor shall be required to post and maintain required signage at the job site.
- Contractor shall keep copies of any Town or State permits & approvals on site.
- Contractor activities shall occur between the hours of 7:00 a.m. and 5:00 p.m. unless further regulated by the Town.
- Contractor shall secure the site on a daily basis by closing and locking gates.
- Contractor shall keep construction vehicles, including worker's automobiles, from parking on Hilldale Avenue or obstructing access along Hilldale Avenue.
- Contractor shall do its best to minimize disturbance to residential neighbors located on Hilldale Avenue.
- Equipment fueling and maintenance of vehicles shall be performed off-site.

Post Construction Solar Array
Operation and Maintenance Plan

- Operation and maintenance of the facility will be done remotely. Any problems detected at the site will be addressed by the Developer.
- Maintenance of the grounds, including mowing, trimming, pruning, replacing vegetation, etc. will be done on an as needed basis.

- Emergency access to the site will be maintained year-round, including snow plowing.
- The security fence will be inspected and repaired as needed.
- Cleaning and maintenance of the solar panels and equipment will be done as needed.
- The facility shall be maintained in good condition, including signage, access gates, & locks.

Post Construction General Site Operation and Maintenance

1. The contractor shall be responsible for the proper inspection and maintenance of all stormwater management facilities including the continued stabilization of the site until such time as the project is accepted by the owner. Thereafter, the owner shall be responsible for the proper inspection and maintenance of any stormwater facilities in accordance with the Site Owner's Manual.

2. The access driveway into the facility shall be plowed after all snow events to maintain emergency access to the facility. Snow shall be stockpiled within the fenced area and allow to melt on-site and flow overland following natural drainage patterns.

3. The access driveway shall be monitored on a regular basis to insure its suitability for access. Gravel along the access driveway shall be replaced as necessary to maintain suitable access to the array. In addition, the entire facility shall be monitored on a regular basis for any signs of erosion due to stormwater runoff. Eroded areas shall be stabilized as soon as possible.

4. The site shall be monitored to ensure proposed drainage patterns are maintained following construction. Should channel flow from runoff develop within the site that requires corrective measures, these measures shall be reviewed with the Haverhill City Council prior to their implementation.

5. The site should be inspected for trash on a regular basis. Any accumulated trash, litter, and discarded materials should be removed.

6. No hazardous material shall be stored on-site during and/or following construction of the solar array.

7. No fertilizers or herbicides of any kind shall be used or stored on-site during and/or following construction of the proposed solar array, unless authorized and required for the agricultural uses on the property.

Appendix B

Operation and Maintenance Log

OPERATION AND MAINTENANCE LOG

This template is intended to comply with the operation and maintenance log requirements of the 2008 DEP Stormwater Management Handbook. Copies of this log should be made for all inspections and kept on file for three years from the inspection date.

Name/Company of Inspector:
Date/Time of Inspection:
Weather Conditions: (Note current weather and any recent precipitation events)

Stormwater BMP	Inspection Observations	Actions Required

Appendix C

List of Emergency Contacts

List of Emergency Contacts

Massachusetts DEP Hazardous Waste Incident Response Group
(617) 792-7653

City of Haverhill Fire Department
Emergencies: Dial 911
4 Summer Street
Haverhill, MA 01830
Tel: (978) 373-8460
Fax: (978) 521-4441
Fire Chief: Robert O'Brien

City of Haverhill Police Department
Emergencies: Dial 911
40 Bailey Boulevard
Haverhill, MA 01830
Tel: (978) 373-1212
Police Chief: Alan DeNaro

Attachment 7
Stormwater Pollution Prevention Plan

BEALS + THOMAS

Stormwater Pollution Prevention Plan

HILLDALE AVENUE SOLAR 2

1050 Hilldale Avenue
Haverhill, Massachusetts

Prepared for:
BWC Camp Brook, LLC
P.O. Box 171381
Boston, MA 02117

Prepared by:

BEALS + THOMAS

May 27, 2021

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1.0 CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 OPERATOR(S)/ SUBCONTRACTORS

Operator(s)

Company:	BWC Camp Brook, LLC				
Name:	TBD				
Address:	P.O. Box 171381				
City:	Boston	State:	MA	ZIP Code:	02117
Telephone:	TBD	Email:	TBD		

Subcontractor(s)

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			
Area of Control:		Site Work Contractor			

24-Hour Emergency Contact

Company:	BWC Camp Brook, LLC
Name:	TBD
Telephone:	TBD

1.2 STORMWATER TEAM

SWPPP Preparer

Company:	Beals and Thomas, Inc.				
Name:	Nathaniel Bautz, EIT				
Address:	144 Turnpike Road				
City:	Southborough	State:	MA	ZIP Code:	01772
Telephone:	508-366-0560	Email:	nbautz@bealsandthomas.com		

Personnel Responsible for Installation & Maintenance of Stormwater BMPs

Company:	BWC Camp Brook, LLC				
Name:	TBD				
Address:	P.O. Box 171381				
City:	Boston	State:	MA	ZIP Code:	02117
Telephone:	TBD	Email:	TBD		

Inspection Personnel

Company:	BWC Camp Brook, LLC				
Name:	TBD				
Address:	P.O. Box 171381				
City:	Boston	State:	MA	ZIP Code:	02117
Telephone:	TBD	Email:	TBD		

Personnel Responsible for Taking Corrective Actions

Company:	BWC Camp Brook, LLC				
Name:	TBD				
Address:	P.O. Box 171381				
City:	Boston	State:	MA	ZIP Code:	02117
Telephone:	TBD	Email:	TBD		

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2.0 SITE EVALUATION, ASSESSMENT AND PLANNING

2.1 PROJECT/SITE INFORMATION

Project/Site Name:	Hilldale Avenue Solar 2				
Project Street/Location:	1050 Hilldale Avenue				
City:	Haverhill	State:	MA	ZIP Code:	01832
County or Similar Subdivision:		Essex County			

Latitude:	42°49'02" N	Longitude:	71°07'09" W

Method for Determining Latitude/Longitude:

- ☐ USGS Topographic Map (specify scale: _____)
- ☐ EPA Website
- ☐ GPS
- ☒ Other (please specify): Google Earth

Horizontal Reference Datum:

- ☐ NAD 27
- ☐ WGS 84
- ☒ NAD 83
- ☐ Unknown

Is the project located on Indian country lands, or located on a property of religious of cultural significance to an Indian tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property:

_____

Is this project considered a federal facility? ☐ Yes ☒ No

Are you applying for permit coverage as a "federal operator" as defined in Appendix A of the 2017 CGP? ☐ Yes ☒ No

NPDES project or permit tracking number: TBD

2.1.1 Emergency-Related Projects

Is this project in response to a public emergency? ☐ Yes ☒ No

If yes, document the cause of the public emergency *(e.g., natural disaster, extreme flooding conditions)*, information substantiating its occurrence *(e.g., state disaster declaration)*, and a description of the construction necessary to reestablish effective public services:

2.2 NATURE AND SEQUENCE OF CONSTRUCTION ACTIVITY

2.2.1 Function of the Construction Activity

Function of the construction activity:

☐ Single-Family Residential
☐ Multi-Family Residential
☐ Institutional
☐ Utility
☐ Commercial
☐ Industrial
☐ Highway or Road Construction
☒ Other (please specify): Renew. Energy

2.2.2 Building Demolition

Will there be demolition of any structure built or renovated before January 1, 1980? ☐ Yes ☒ No

If yes, do any of the structures being demolished have at least 10,000 square feet of floor space? ☐ Yes ☐ No

2.2.3 Agricultural Land

Was the pre-development land use used for agriculture? ☒ Yes ☐ No

2.2.4 Estimated Project Dates

Estimated Project Start Date: TBD
Estimated Project Completion Date: TBD

Estimated Timeline of Activity	Construction Activity and BMP Descriptions
TBD	***Before any site grading activities begin*** 1. Stake Limit of Construction. Workers shall be informed that no construction activity is to occur beyond this limit at any time. 2. Delineate the limit of the natural buffer to be maintained with flags, tape or other similar device. 3. Clear vegetation as necessary within the limits of construction. A stockpile of wood chips from tree cutting shall be left on site for stabilization. 4. Grub the areas where silt fence is required, removing stumps and roots as necessary. The existing ground surface shall be disturbed as little as possible prior to the start of construction. 5. Install silt fence and straw bales as shown on the plans. An adequate stockpile of erosion control materials shall be on site at all times for emergency or routine replacement and shall include materials to repair silt fences, straw bales, or any other devices planned for use during construction. 6. Construct stabilized construction exits. 7. Construct staging and materials storage area. 8. Install temporary sanitary facilities and dumpsters or enclosed trash container if a dumpster is not feasible for the project.
TBD	***Site grading*** 1. Begin site clearing and grubbing operations. 2. Begin site grading and topsoil stripping in areas of proposed driveways and equipment pads. 3. Establish topsoil stockpile. 4. Install silt fences around stockpile and cover stockpiles. 5. Disturbed areas where construction will cease for more than 14 days shall be stabilized with erosion controls.
TBD	***Infrastructure (utilities, solar arrays, etc.)*** 1. Construct temporary concrete washout area. 2. Install utilities, electrical components, solar arrays, etc.

TBD	***Final stabilization and landscaping*** 1. Finalize grading activities. 2. Clean sediment from basins and establish permanent vegetation in detention basins. Remove all temporary control BMPs and stabilize any areas disturbed by their removal with erosion controls. 3. Prepare final seeding and landscaping. 4. Monitor stabilized areas until final stabilization is reached.

2.3 SOILS, SLOPES, VEGETATION, AND CURRENT DRAINAGE PATTERNS

Soil type(s): The Natural Resources Conservation Service (NRCS) lists the on-site soils as Montauk fine sandy loam and Woodbridge fine sandy loam.

Montauk fine sandy loam is a lodgment till classified by NRCS as a Hydrologic Class "C" soil.

Woodbridge fine sandy loam is a lodgment till classified by NRCS as a Hydrologic Class "C/D" soil.

Slopes: Slopes in the vicinity of the proposed project vary, but are generally between 5 and 30%.

Drainage Patterns: Runoff from the site drains primarily to the south and east.

Vegetation: The existing site is comprised of predominantly woodland area and farm fields.

2.4 CONSTRUCTION SITE ESTIMATES

Total property area:	88 acres
Total construction site area to be disturbed:	21 acres
Maximum area to be disturbed at one time:	21 acres
Percentage impervious area before construction:	<1%
Runoff coefficient before construction:	72
Percentage impervious area after construction:	<1 %

Runoff coefficient after construction: 73

2.5 DISCHARGE INFORMATION

2.5.1 Description of Receiving Storm Sewer Systems

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☐ Yes ☒ No

2.5.2 Receiving Waters

Runoff from the site drains to several on-site wetland systems that are tributary to Fishin Brook.

2.5.3 Impaired Waters/ TMDLs

Has the surface water been listed as "impaired?" ☐ Yes ☒ No

If yes, list the pollutant(s) causing the impairment:

Describe the method(s) used to determine whether or not your project site discharges to an impaired water:

Has a TMDL been completed? ☐ Yes ☐ No

If yes, list the title of the TMDL document:

List the pollutant(s) for which there is a TMDL:

2.5.4 Tier 2, 2.5, or 3 Waters

Is this surface water designated as a Tier 2, 2.5 or 3 water? ☐ Yes ☒ No

If yes specify which Tier the surface water is designated as:
☐ Tier 2 ☐ Tier 2.5 ☐ Tier 3

2.6 UNIQUE SITE FEATURES AND SENSITIVE AREAS

This site does not contain unique features or sensitive areas to be preserved.

2.7 CONSTRUCTION SUPPORT ACTIVITIES

Construction support activities are not required for the project.

2.8 POTENTIAL SOURCES OF POLLUTION

2.8.1 Potential Sources of Sediment

- Clearing and grubbing operations
- Grading and site excavation operations
- Vehicle tracking
- Topsoil stripping and stockpiling
- Landscaping operations

2.8.2 Potential Sources of Non-Sediment Pollutants

- Combined Staging Area — small fueling activities, minor equipment maintenance, sanitary facilities, and hazardous waste storage.
- Materials Storage Area — general building materials, solvents, adhesives, paving materials, paints, aggregates, trash, and so on.
- Construction Activity — paving, curb/gutter installation, concrete pouring/mortar/stucco, and building construction
- Concrete Washout Area

Material/ Chemical	Physical Description	Stormwater Pollutants	Location[1]
Pesticides/ Herbicides	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic	Pesticides used in outdoor locations to control insects. Herbicides used for noxious weed control
[2]Fertilizer	Liquid or solid grains	Nitrogen, phosphorous	Newly seeded areas
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	No equipment cleaning allowed in project limits
Curing compounds	Creamy white liquid	Naphtha	Curb and gutter, walkways
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil	Leaks or broken hoses from equipment

Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE	Secondary containment/staging area
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes	Secondary containment/staging area
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates	Secondary containment/staging area

[1] Area where material/chemical is used on-site.
[2] Use of fertilizers containing nitrogen and/ or phosphorus in ratios greater than recommended by the manufacture must be documented.

2.9 SITE PLANS

The Topographic Plan shows the undeveloped site and its current features. The Site Plans show the developed site.

These Site Plans include:

- ☐ Delineation of construction phasing, if applicable
- ☐ Areas of soil disturbance and areas that will not be disturbed
- ☐ Direction(s) of stormwater flow and approximate slopes before and after major grading activities
- ☒ Natural features to be preserved
- ☒ Locations of major structural and non-structural BMPs identified in the SWPPP
- ☐ Location(s) of sediment, soil or other construction materials will be stockpiled
- ☐ Locations [and timing] of stabilization measures
- ☐ Locations of off-site material, waste, borrow, or equipment storage areas
- ☒ Location of all waters of the U.S., including wetlands on or near the site. Indicate if water bodies are listed as impaired, or are identified as Tier 2, 2.5 or 3 waters.
- ☒ Boundary lines of any natural buffers,
- ☐ Locations of stormwater discharges and/ or authorized non-stormwater will be discharged to surface water(s)
- ☒ Locations of storm drain inlets and stormwater control measures on the site and in the immediate vicinity of the site
- ☐ Locations of all pollutant-generating activities

- ☐ Locations where polymers, flocculants, or other treatment chemicals will be used and stored
- ☐ Areas of federally listed critical habitat for endangered or threatened species

See Appendix B: Site Plans

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3.0 COMPLIANCE WITH APPLICABLE FEDERAL & STATE REQUIREMENTS

3.1 ENDANGERED SPECIES CERTIFICATION

Are endangered or threatened species and critical habitats on or near t1he project area?
☒ Yes ☐ No

Describe how this determination was made:
The U.S. Fish & Wildlife Service listed the Northern Long-eared Bat (*Myotis septentrionalis*) as a Threatened species under the Endangered Species Act (ESA, 50 CFR 17.11) on April 2, 2015 and mapped the full state of Massachusetts as habitat. The Northern Long-Eared Bat is also listed as Endangered under the Massachusetts Endangered Species Act (MESA, M.G.L. c. 131 A).

Projects that result in tree removal activities shall comply with the 4(d) rule under the ESA, which states: "Incidental take resulting from tree removal is prohibited if: 1) Occurs within 0.25 mile radius of known northern long-eared bat hibernacula or 2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot radius from the known maternity tree during the pup season (June 1 through July 31)."

The NHESP Northern Long-eared Bat Locations in Massachusetts map, last updated November 30, 2016 was reviewed. It was determined that the Project does not occur within 0.25 miles of a known winter hibernacula or within a 150-foot radius of a known maternity roost tree. Therefore, no further review of potential impacts to Northern Long-eared Bat is required pursuant to the MESA.

If yes, describe the species and/or critical habitat:

If yes, describe or refer to documentation that determines the likelihood of an impact on the identified species and/or habitat and the steps taken to address that impact.

3.2 HISTORIC PRESERVATION

Step 1
Will stormwater controls that require subsurface earth disturbance be installed on the site?

☒ Yes ☐ No

Step 2
If you answered yes in Step 1, have prior surveys or evaluations conducted on the site already determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties?

☒ Yes ☐ No

Step 3
If you answered no in Step 2, has it been determined that the installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties?

☐ Yes ☐ No

Step 4
If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond within 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties?

☐ Yes ☐ No

☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions.

☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls.

☐ Other:

3.3 SAFE DRINKING WATER ACT UNDERGROUND INJECTION CONTROL REQUIREMENTS

Do you plan to install any of the following controls?

☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☐ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow

☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, attach documentation of contact between you and the applicable state agency or EPA Regional Office responsible for implementing the requirements for underground injection wells in the Safe Drinking Water Act and EPA's implementing regulations at 40 CFR Parts 144-147.

3.4 APPLICABLE STATE OR LOCAL PROGRAMS

This SWPPP complies with the requirements of Standard 8 of the Massachusetts Department of Environmental Protection Stormwater Handbook, which states:

A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plans) shall be developed and implemented.

4.0 EROSION AND SEDIMENT CONTROL BMPS

This SWPPP contains a listing of the erosion and sediment control best management practices (BMPs) that will be implemented to control pollutants in stormwater discharges. The BMPs are categorized under one of the areas of BMP activity as described below:

- Natural Buffers or Equivalent Sediment Controls
- Minimize disturbed area and protect natural features and soil
- Stabilize soils
- Establish perimeter controls and sediment barriers
- Retain sediment on-site and control dewatering practices
- Establish stabilized construction exits

4.1 NATURAL BUFFERS OR EQUIVALENT SEDIMENT CONTROLS

Are there any surface waters located within 50 feet of your construction disturbances that receive stormwater discharges from the site? ☒ Yes ☐ No

If yes, check the compliance alternative that applies:

☐ A 50-foot undisturbed natural buffer will be maintained. The 50-foot buffer is shown on the attached site plans and will be clearly marked off with flags, tape, or a similar marking device prior to the commencement of earth disturbing activities.

☒ An undisturbed natural buffer of 25-feet will be provided along with supplemental erosion and sediment controls, which in combination achieves the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

☐ It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore erosion and sediment controls will be implemented that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer. The estimated sediment removal calculations are included in the appendixes of this report and have been calculated using the applicable tables included in Appendix G of the 2012 Construction General Permit **or** site-specific calculations were performed to estimate the sediment removal of a 50-buffer zone and the efficiency of the reduced buffer zone and supplemental erosion control measures.

Description:
Include rationale for why a natural buffer cannot be maintained. Provide a description of the additional erosion and sediment controls proposed, including the

model or other tool used to estimate the sediment load reductions and the results from the calculation. Include the estimated sediment removal rate from a natural 50-buffer and the proposed controls.

☐ The project qualifies for one of the exceptions in Part G.2.2 of Appendix G of the 2017 Construction General Permit. Specifically:

☐ There is no discharge of stormwater to surface waters through the area between the disturbed portions of the site and any surface waters located within 50 feet of the site. This includes situations where control measures have been implemented such as a berm or other barrier that will prevent such discharges.

☐ No natural buffer exists due to preexisting development disturbances, such as impervious surfaces or structures that were constructed prior to the initiation of planning for this project.

☐ For a "linear project," site constraints (e.g., limited right-of-way) make it infeasible for the site to meet any of the CGP Part 2.2.1.a compliance alternatives

☐ The project qualifies as "small residential lot" construction, and complies with:

☐ Alternative 1: A **[select one: 50-foot buffer, a buffer <50 feet and > 30 has been provided with double perimeter controls buffer less than 30-feet has been provided with double perimeter controls with 7-day site stabilization requirements has been provided.] Provide a description on how the controls will comply with the CGP requirements.**

☐ Alternative 2: A sediment discharge risk evaluation has been prepared and is included in the appendices of this report.

☐ Buffer disturbances are authorized under a CWA Section 404 permit.

☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail).

4.2 MINIMIZE DISTURBED AREA AND PROTECT NATURAL FEATURES AND SOIL

4.2.1 Stockpiling Topsoil

Description:	Topsoil stripped from the immediate construction area shall be stockpiled as identified on the Site Plans and Sitework Specifications or as approved by the SWPPP preparer. Stockpiles shall be located outside of any natural buffers and away from any stormwater conveyances, drain inlets, and areas where stormwater flow is concentrated.
Installation Schedule:	Topsoil stockpiles shall be established during grading activities. The silt fence and temporary erosion controls shall be installed immediately after the stockpile has been established. For piles that will be unused for 14 or more days provide cover over the stockpile or temporary stabilization to avoid direct contract with precipitation and wind. Install a sediment barrier along all downgradient perimeter areas of stockpiles.
Maintenance and Inspection:	The area shall be inspected weekly for erosion and immediately after storm events. Areas on or around the stockpile that have eroded shall be stabilized immediately with erosion controls. See following Silt Fence section for Maintenance and inspection procedures.

4.3 STABILIZE SOIL

4.3.1 Temporary Stabilization

Description:	Initiation of temporary vegetative cover shall occur immediately where construction will cease for more that 14 days. It shall be established using hydroseeding for areas of exposed soil (including stockpiles).
Installation Schedule:	Temporary stabilization measures shall be initiated immediately where construction activities will temporarily cease for more than 14 days. Stabilization will be completed as soon as practicable, but no later than 14 calendar days after stabilization has been initiated.
Maintenance and Inspection:	Stabilized areas shall be inspected weekly and after storm events until a dense cover of vegetation has become established. If failure is noticed at the seeded

	area, the area shall be reseeded, fertilized, and mulched immediately.

4.3.2 Mulching

Description:	Hydromulching shall provide immediate protection to exposed soils during short periods of disturbance. Hydromulch shall also be applied in areas that have been seeded for temporary or permanent stabilization.
Installation Schedule:	Hydromulch shall be applied to soil exposed temporarily for >14 days during construction.
Maintenance and Inspection:	Mulched areas shall be inspected weekly and after storm events to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, the surface shall be repaired, and new mulch shall be applied to the damaged area.

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4.3.3 Permanent Stabilization

Description:	Initiation of permanent stabilization measures shall occur immediately after the final design grades are achieved and earth moving activities cease. Vegetative cover shall be used to establish vegetative cover on exposed soils. Permanent stabilization shall be completed in accordance with the procedures outlined in the Final Stabilization section of this report.
Installation Schedule:	Portions of the site where construction activities have permanently ceased shall be stabilized as soon as possible, but no later than 14 calendar days after stabilization has been initiated.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately. Care shall be taken to avoid compacting newly placed topsoil. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

4.3.4 Dust Control

Description:	Dust from the site shall be controlled by using a mobile pressure-type distributor truck to apply water to disturbed areas. The mobile unit shall apply water at a rate of 300 gallons per acre and minimized as necessary to prevent runoff and ponding.
Installation Schedule:	Dust control shall be implemented as needed once site grading has been initiated and during windy conditions (forecasted or actual wind conditions of 20 mph or greater) while site grading is occurring. Spraying of water shall be performed no more than three times a day during the months of May–September and once per day during the months of October–April or whenever the dryness of the soil warrants it.
Maintenance and Inspection:	At least one mobile unit shall be available at all times to distribute water to control dust on the project area. Each

	mobile unit shall be equipped with a positive shutoff valve to prevent over watering of the disturbed area.

4.4 ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS

4.4.1 Sediment Control Barrier

☐ Permanent ☒ Temporary

Description:	A Sediment Control Barrier, consisting of entrenched straw bales, straw wattles, compost socks and siltation fencing, shall be installed along the downgradient side of the proposed project to decrease the velocity of sheet flows and intercept and detain small amounts of sediment from disturbed areas.
Installation Schedule:	Sediment Control Barrier shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Sediment Control Barrier shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches, or one-half of the above ground height of the barrier, whichever is less. Deteriorated fencing material shall be replaced. Used fencing shall be properly disposed of.

4.5 PREVENT SOIL COMPACTION

4.5.1 Protect Proposed Infiltration Areas

☐ Permanent ☒ Temporary

Description:	A Sediment Control Barrier, consisting of entrenched straw bales and siltation fencing, shall be installed around the perimeter of all proposed infiltration areas to prevent construction vehicles from impacting the area, to decrease the velocity of sheet flows and intercept, and detain small amounts of sediment from disturbed areas.
Installation Schedule:	The Sediment Control Barrier shall be installed after clearing and grubbing.
Maintenance and Inspection:	Silt fence shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches. Deteriorated fencing material shall be replaced. Used fencing shall be properly disposed of.

4.6 ESTABLISH STABILIZED CONSTRUCTION ENTRANCE/EXIT

☐ Permanent ☒ Temporary

Description:	Temporary gravel or crushed stone construction entrances/exits or other means shall be used to minimize off-site movement of soil with vehicles. Construction access points shall be maintained to minimize tracking of soil onto public roads and existing parking lots to remain. If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected.
Installation Schedule:	Stabilized construction entrance shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Stabilized construction entrances shall be inspected daily. Gravel or crushed stone shall be added if the pad is no longer in accordance with the specifications. If the construction entrance/ exit is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected. When sediment has been tracked off of the site, it shall be removed by the end of the same working day, or by the end of the next working day if track-out occurs on a non-work day. Remove sediment by sweeping, shoveling or vacuuming roadways were sediment has been tracked-out.

4.7 DEWATERING PRACTICES

Description:	All groundwater or stormwater discharged from excavations, trenches, foundations, vaults, or other similar point shall be treated by sediment basins, sediment traps, sediment socks, dewatering tanks, tube settlers or filtration systems specifically designed to remove sediment from the excavations. All dewatering practices shall conform to the following: • Visible floating solids or foam shall not be discharged; • An oil-water separator or suitable filtration device (such as a cartridge filter) that is designed to remove

	oil, grease, or other products if dewatering water is found to contain these materials shall be used; • To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area; • Velocity dissipaters shall be installed at all points where dewatering activities are discharged to the surface. • With backwash water, either haul it away for disposal or return it to the beginning of the treatment process; and • Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications. • Construction dewatering effluent shall not be discharged into stormwater infiltration systems.
Installation Schedule:	Install settling or filtration methods prior to commencing dewatering. Engineer is required to provide or approve settling of filtration method design prior to installation.
Maintenance and Inspection:	Settling of filtration controls shall be inspected weekly and following storms. Sediment shall be removed when it reaches a depth of one foot, or half the design capacity whichever is less.

5.0 GOOD HOUSEKEEPING BMPS

This SWPPP contains a listing of the good housekeeping best management practices (BMPs) that shall be implemented to control pollutants in stormwater discharges during construction-related work. The BMPs are categorized below:

- Material Handling and Waste Management
- Establish Proper Building Material Staging Areas
- Designate Washout Areas
- Establish Proper Equipment/Vehicle Fueling and Maintenance Practices
- Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing
- Spill Prevention and Control Plan

5.1 MATERIAL HANDLING AND WASTE MANAGEMENT

Several management procedures and practices are proposed to prevent and/or reduce the discharge of pollutants to stormwater from solid or liquid wastes that will be generated at the site. These measures are grouped into the following categories: (1) solid or construction waste disposal, (2) recycling, (3) sanitary and septic waste, and (4) hazardous materials.

5.1.1 Solid or Construction Waste Disposal

Description:	All waste materials shall be collected and disposed of into metal trash dumpsters or enclosed trash containers in the materials storage area. Dumpsters shall have a secure watertight lid, be placed away from stormwater conveyances and drains, and meet all federal, state, and municipal regulations. Only trash and construction debris from the site shall be deposited in the dumpster. No construction materials shall be buried on-site unless authorized by a program for recycling/beneficial use. All personnel shall be instructed regarding the correct disposal of trash and construction debris. Notices that state these practices shall be posted in the office trailer and the individual who manages day-today site operations shall be responsible for seeing that these practices are followed.
Installation Schedule:	Trash dumpsters shall be installed once the materials storage area has been established.

Maintenance and Inspection:	The dumpsters shall be inspected weekly and immediately after storm events. The dumpsters shall be emptied weekly and taken to an approved landfill or recycling facility. If trash and construction debris are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently. Waste container lids shall be closed when not in use and at the end of the business day. For waste containers that do not have lids, provide cover or a similarly effective means to minimize the discharge of pollutants.

5.1.2 Recycling

Description:	Wood pallets, cardboard boxes, and other recyclable construction scraps shall be disposed of in a designated dumpster for recycling. The dumpster shall have a secure watertight lid, be placed away from stormwater conveyances and drains and meet all local and state solid-waste management regulations. Only solid recyclable construction scraps from the site shall be deposited in the dumpster. All personnel shall be instructed regarding the correct procedure for disposal of recyclable construction scraps. Notices that state these procedures shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Designated recycling dumpsters shall be installed once the area has been established.
Maintenance and Inspection:	The recycling dumpster shall be inspected weekly and immediately after storm events. The recycling dumpster shall be emptied weekly and taken to an approved recycling center. If recyclable construction wastes are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently.

5.1.3 Sanitary and Septic Waste

Description:	Temporary sanitary facilities (portable toilets) shall be provided at the site throughout the construction phase. The portable toilets shall be located in the staging area, away from concentrated flow paths and traffic flow.
Installation Schedule:	The portable toilets shall be brought to the site once the staging area has been established.

Maintenance and Inspection:	All sanitary waste shall be collected from the portable facilities on a regular basis. The portable toilets shall be inspected weekly for evidence of leaking holding tanks. Toilets with leaking holding tanks shall be removed from the site and replaced with new portable toilets.

5.1.4 Hazardous Materials and Waste

Description:	All hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed shipping containers, within the hazardous materials storage area. Hazardous waste materials shall be stored in appropriate and clearly marked containers and segregated from other non-waste materials. Secondary containment shall be provided for all waste materials in the hazardous materials storage area and shall consist of commercially available spill pallets. Additionally, all hazardous waste materials shall be disposed of in accordance with federal, state, and municipal regulations. Hazardous waste materials shall not be disposed of into the on-site dumpsters. All personnel shall be instructed regarding proper procedures for hazardous waste disposal. Notices that state these procedures shall be posted in the office trailer and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Shipping containers used to store hazardous waste materials shall be installed once the site materials storage area has been installed.
Maintenance and Inspection:	The hazardous waste material storage areas shall be inspected weekly and after storm events. The storage areas shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety data sheets, material inventory, and emergency contact numbers shall be maintained in the office trailer.

5.2 ESTABLISH PROPER BUILDING MATERIAL STAGING AREAS

Description:	Construction equipment and maintenance materials shall be stored at the combined staging area and materials storage areas. A watertight shipping container shall be used to store hand tools, small parts, and other construction materials. Nonhazardous building materials such as

	packaging material (wood, plastic, and glass), and construction scrap material (brick, wood, steel, metal scraps, and pipe cuttings) shall be stored in a separate covered storage facility adjacent to the shipping container. All hazardous-waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed containers under cover within the storage area. All fertilizers, herbicides, insecticides and pesticides shall be stored in accordance with local, state, and federal regulations. At a minimum these materials shall be covered with plastic sheeting or a temporary roof to prevent contact with rainwater. Very large items, such as framing materials and stockpiled lumber, shall be stored in the open in the materials storage area. Such materials shall be elevated on wood blocks to minimize contact with runoff.
Installation Schedule:	The materials storage area shall be installed after grading and before any infrastructure is constructed at the site.
Maintenance and Inspection:	The storage area shall be inspected weekly and after storm events. The storage area shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

5.3 DESIGNATE WASHOUT AREAS

5.3.1 Concrete Washout

Description:	A designated temporary, above-grade concrete washout area shall be constructed. The temporary concrete washout area shall be constructed with a recommended minimum length and minimum width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The washout area shall be lined with plastic sheeting at least 10 mils thick and free of any holes or tears. Signs shall be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility.

	Concrete pours shall not be conducted during or before an anticipated storm event. Concrete mixer trucks and chutes shall be washed in the designated area or concrete wastes shall be properly disposed of off-site. When the temporary washout area is no longer needed for the construction project, the hardened concrete and materials used to construct the area shall be removed and disposed of according to the maintenance section below, and the area shall be stabilized.
Installation Schedule:	The washout area shall be constructed before concrete pours occur at the site.
Maintenance and Inspection:	The washout areas shall be inspected daily to ensure that all concrete washing is being discharged into the washout area, no leaks or tears are present, and to identify when concrete wastes need to be removed. The washout areas shall be cleaned out once the area is filled to 75 percent of the holding capacity. Once the area's holding capacity has been reached, the concrete wastes shall be allowed to harden; the concrete shall be broken up, removed, and taken to an approved landfill for disposal or recycled on-site or off-site in accordance with applicable laws. The plastic sheeting shall be replaced if tears occur during removal of concrete wastes from the washout area.

Design Specifications:

1. Temporary concrete washout type Above Grade shall be constructed as shown above, with a recommended minimum length and minimum width of 10 feet.
2. The washout shall be a minimum of 50 feet from storm drain inlets.
3. Plastic lining shall be free of holes, tears, or other defects that compromise the impermeability of the material.

5.4 ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

Description:	Several types of vehicles and equipment will likely be used on-site throughout the project, including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes, and forklifts. All major equipment/vehicle fueling and maintenance shall be performed outside of wetland buffer zones. When vehicle fueling must occur on-site, the fueling activity shall occur in the staging area. Only minor equipment maintenance shall occur on-site. All equipment fluids generated from maintenance activities shall be disposed of into designated drums stored on spill pallets in accordance with the Material Handling and Waste Management Section. Absorbent, spill-cleanup materials and spill kits shall be available at the combined staging and materials storage area. Drip pans shall be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.
Installation Schedule:	BMPs implemented for equipment and vehicle maintenance and fueling activities shall begin at the start of the project.
Maintenance and Inspection:	Inspect equipment/vehicle storage areas weekly and after storm events. Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately, using dry cleanup measures where possible and eliminating the source of the discharge. Problem vehicle(s) or equipment shall be removed from the project site. Keep ample supply of spill-cleanup materials on-site and immediately clean up spills and dispose of materials properly. Do not clean surfaces by hosing-down the area

5.5 ALLOWABLE NON-STORMWATER DISCHARGES AND CONTROL EQUIPMENT / VEHICLE WASHING

Description:	All equipment and vehicle washing shall be performed off-site, except as required for wheel washes and concrete washout areas.
Installation Schedule:	N/A
Maintenance and Inspection:	N/A

5.6 SPILL PREVENTION AND CONTROL PROCEDURES

Description:	i. Employee Training: All employees shall be trained as detailed in the Inspection and Maintenance section of this report. ii. Vehicle Maintenance: Vehicles and equipment shall be maintained off-site. All vehicles and equipment including subcontractor vehicles shall be checked for leaking oil and fluids. Vehicles leaking fluids shall not be allowed on-site. iii. Hazardous Material Storage: Hazardous materials shall be stored in accordance with this report and federal and municipal regulations. iv. Spill Kits: Spill kits shall be kept within the materials storage area. Spills: All spills shall be cleaned up immediately upon discovery. Spent absorbent materials and rags shall be hauled off-site immediately after the spill is cleaned up for disposal at an approved landfill. Spills large enough to discharge to surface water shall be reported to the National Response Center at 1-800-424-8802 and MA DEP at 888-304-1133. v. Material safety data sheets: A material inventory and emergency contact information shall be maintained at the on-site project trailer.
Installation Schedule:	The spill prevention and control procedures shall be implemented once construction begins on-site.
Maintenance and Inspection:	All personnel shall be instructed on the correct procedures for spill prevention and control. Notices that state these practices shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.

5.7 FERTILIZER DISCHARGE RESTRICTIONS

Description:	Discharges from fertilizers containing nitrogen and phosphorus shall be minimized. Fertilizers shall be applied at rates and amounts consistent with the manufacture's specification, and shall at no time exceed local, state, or federal specifications. See project landscape specifications for acceptable fertilizers that can be used for the project.
Installation Schedule:	Fertilizers shall be applied at an appropriate time of year, timed to coincide as closely as possible to the period of maximum vegetation uptake and growth. Avoid applying fertilizers before heavy rains. Do not apply fertilizers to frozen ground or stormwater conveyance channels flowing with water.

Maintenance and Inspection: N/A

5.8 ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

Any changes in construction activities that produce other allowable non-stormwater discharges shall be identified, and the SWPPP shall be amended and the appropriate erosion and sediment control shall be implemented.

The following is a list of allowable non-stormwater discharges:

- Water Used to Control Dust
- Uncontaminated Excavation Dewatering
- Landscape Irrigation
- Fire Hydrant Flushing
- Firefighting
- Non-Detergent Laden Vehicle Wash Water

Except for water used to control dust and irrigation water, the above discharges shall not be routed to areas of exposed soil.

6.0 POST-CONSTRUCTION BMPS

6.1 DETENTION BASIN

Description:	During the final stabilization phase of construction, temporary sediment basins in at detention basins shall be converted to permanent detention basins. Riprap spillways and outlet structures shall be constructed as detailed on the site plans.
Design Specifications:	Install according to sitework specifications and details.
Installation Schedule:	Temporary sediment basins at detention basins shall be converted to permanent detention basins during the final stabilization phase of construction.
Maintenance and Inspection:	The basins shall be inspected weekly and after storm events greater than 0.5 inches during construction. The area shall be checked for signs of erosion, seepage, and structural damage. Erosion, seepage, and structural damage shall be repaired immediately. The temporary sediment riser shall be checked for any damage or obstructions and any damage found shall be repaired and obstructions removed. Immediately after the completion of construction, the plant material shall be watered for 14 consecutive days unless there is sufficient natural rainfall. The area shall be monitored until final stabilization is reached. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

7.0 FINAL STABILIZATION

In compliance with the Construction General Permit, soil stabilization measures must be implemented immediately whenever earth-disturbing activities are temporarily or permanently ceased on any portion of the site. Earth-disturbing activities are temporarily ceased when clearing, grading, and excavation within any area of a site that will not include a permanent structure will not resume for a period of 14 or more calendar days, but such activities will resume in the future.

In the context of this provision, "immediately" means as soon as practicable, but no later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased. The following activities constitute the initiation of stabilization:

- Preparing the soil for vegetative or non-vegetative stabilization;
- applying mulch or other non-vegetative product to the exposed area;
- seeding or planting the exposed area;
- starting any of the activities in listed above on a portion of the area to be stabilized, but not on the entire area; and
- finalizing arrangements to have stabilization product fully installed in compliance with the applicable deadline for completing stabilization.

As soon as practicable, but no later than 14 calendar days after the initiation of soil stabilization measures the following activities are required to be completed:

- For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or
- For non-vegetative stabilization, the installation or application of all such non-vegetative measures.

The following sections detail the management practices proposed to achieve final stabilization of the site.

7.1 PERMANENT SEEDING

Description:	Permanent seeding shall be applied immediately after the final design grades are achieved on portions of the site but no later than 14 days after construction activities have permanently ceased. After the entire site is stabilized, any sediment that has accumulated shall be removed and hauled off-site for disposal at an approved landfill. Construction debris, trash and temporary BMPs (including silt fences, material

	storage areas, sanitary toilets, and inlet protection) shall also be removed and any areas disturbed during removal shall be seeded immediately. Seeding shall be performed in accordance to the Site Plans and Landscape Specifications for the project.
Installation Schedule:	Seeding shall occur at portions of the site where construction activities have permanently ceased shall be stabilized, as soon as possible but no later than 14 days after construction ceases.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities for failure and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

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8.0 INSPECTIONS AND MAINTENANCE

8.1 INSPECTIONS

8.1.1 Inspection Schedule and Procedures

Inspections of the site will be performed once every 7 days, or once every 14 days and within 24 hours of the end of a storm event of 0.25-inch or greater or greater unless otherwise specified. The inspections will verify that all BMPs required are implemented, maintained, and effectively minimizing erosion and preventing stormwater contamination from construction materials.

To determine if a storm event of 0.25 inches or greater has occurred on the site, either a properly maintained rain gauge will be kept on the site or the storm event information will be obtained from a weather station that is representative of the location. If an inspection is conducted because of rainfall measuring 0.25 inches or greater, the applicable rain gauge or weather station readings that triggered the inspection will be noted in the inspection report.

Inspections shall include all areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation. Inspectors shall look for evidence of, or the potential for, pollutants entering the storm water conveyance system. Sedimentation and erosion control measures identified in the SWPPP shall be observed to ensure proper operation. Discharge locations shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream location shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

For detailed inspection procedures, see Sections 4 and 5.

All inspections shall be coordinated with a representative from BWC Camp Brook, LLC.

Inspection reports are required to be completed within 24-hours of an inspection. If corrective actions are identified by the Inspector during the inspection, he/she shall notify and submit a copy of the inspection report to the Operator(s). For corrective actions identified, the project managers shall be responsible for initiating the corrective action within 24 hours of the report and

completing maintenance as soon as possible or before the next storm event. For any corrective actions requiring a SWPPP amendment or change to a stormwater conveyance or control design, the project manager shall notify BWC Camp Brook, LLC, as soon as possible, before initiating the corrective action.

The business days for the project are ***7:00 am to 5:00 pm, Monday through Friday***.

For a copy of the inspection report template, see Appendix E.

8.2 REDUCTIONS IN INSPECTION FREQUENCY

Once an area is stabilized, inspections may be reduced to twice per month for the first month, no more than 14 calendar days apart, then once per month. If construction resumes at the stabilized area the inspection frequency shall increase as outlined in section 8.1.

If earth-disturbing activities are suspended due to frozen conditions inspections can be temporarily suspended until a thaw occurs.

8.3 CORRECTIVE ACTION LOG

The corrective action log describes repairs, replacements, and maintenance of BMPs undertaken as a result of the inspections and maintenance procedures. Additionally, remedies of permit violations and clean and proper disposal of spills, releases other deposits should be recorded.

If it is determined the stormwater controls have not been installed as required, or that they are not functioning adequately corrective action is required within 7 calendar days.

The operator will document the completion of the corrective action within 24 hours.

See Appendix F – Corrective Action Log.

9.0 RECORDKEEPING AND TRAINING

9.1 RECORDKEEPING

A copy of the SWPPP, along with all inspection reports and corrective action logs are required to be stored at an accessible location at the site, and shall be made available upon request of the EPA, or state or local agency approving stormwater management plans. If an on-site location is unavailable to keep the SWPPP when no personnel are present, notice of the plan's location must be posted near the main entrance of your construction site.

The following records shall be kept at the project site (or posted location) and shall be available for inspectors to review. These records shall be retained for a minimum period of at least 3 years after the permit is terminated.

Date(s) when major grading activities occur:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when construction activities temporarily or permanently cease on a portion of the site:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when an area is either temporarily or permanently stabilized:
See Appendix I – Grading and Stabilization Activities Log

9.2 LOG OF CHANGES TO THE SWPPP

The log of changes to the SWPPP is maintained in Appendix G and includes additions of new BMPs, replacement of failed BMPs, significant changes in the activities or their timing on the project, changes in personnel, changes in inspection and maintenance procedures and update to site plans.

9.3 TRAINING

Prior to the commencement of earth-disturbing activities or pollutant-generating activities, whichever occurs first, training on the pollution prevention measures outlined in this SWPPP shall be provided to staff and subcontractors.

9.3.1 Individual(s) Responsible for Training

Company/Organization: Beals and Thomas, Inc.

Name: Jeffrey R, Murphy, PE

9.3.2 Description of Training Conducted

Informal training shall be conducted for all staff, including subcontractors, on the site. The training shall be conducted primarily via tailgate sessions and shall focus on avoiding damage to stormwater BMPs and preventing illicit discharges. The tailgate sessions shall be conducted biweekly and shall address the following topics: Erosion Control BMPs, Sediment Control BMPs, Non-Stormwater BMPs, Waste Management and Materials Storage BMPs, and Emergency Procedures specific to the construction site. (See Appendix J – Training Log)

Formal training shall be provided to all staff and subcontractors with specific stormwater responsibilities, such as installing and maintaining BMPs. The formal training shall cover all design and construction specifications for installing the BMPs and proper procedures for maintaining each BMP. Training shall also cover inspection schedules and procedures for personnel whose job duties are related to inspections. Formal training shall occur before any BMPs are installed on the site. (See Appendix J – Training Log)

10.0 CERTIFICATION AND NOTIFICATION

10.1 SIGNATURE, PLAN REVIEW, AND MAKING PLANS AVAILABLE

A copy of the SWPPP (including a copy of the Construction General Permit, NOI, and acknowledgement letter from EPA shall be retained at the construction site (or other location easily accessible during normal business hours to EPA, a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representatives of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service) from the date of commencement of construction activities to the date of final stabilization. A copy of the SWPPP shall be available at a central location on-site for the use of all those identified as having responsibilities under the SWPPP. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the plan's location shall be posted near the main entrance at the construction site.

10.2 NOTICE OF PERMIT COVERAGE

A sign must be posted at a safe, publicly accessible location in close proximity to the construction site detailing the permit coverage. The notice must be located so that it is visible from the public road that is nearest to the active part of the construction site, and it must use a font large enough to be readily viewed from a public right-of-way. At a minimum, the notice must include:

- The NPDES Permit Tracking Number,
- A contact name and phone number for obtaining additional construction site information,
- The Uniform Resource Locator (URL) for the SWPPP (if available), or the following statement: "If you would like to obtain a copy of the Stormwater Pollution Prevention Plan (SWPPP) for this site, contact the EPA Regional 1 Office at (617) 918-1038,
- The following statement "If you observe indicators of stormwater pollutants in the discharge or in the receiving waterbody, contact the EPA through the following website: https://www.epa.gov/enforcement/report-environmental-violations."

10.3 OWNER CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:_____ Title:_____

Signature:_____ Date:_____

10.4 OPERATOR CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:_____ Title:_____

Signature:_____ Date:_____

APPENDICES

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Appendix A

General Location Map

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Appendix B

Site Plans

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Appendix C

Construction General Permit

https://www.epa.gov/sites/production/files/2019-06/documents/final_2017_cgp_current_as_of_6-6-2019.pdf

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Appendix D

NOI and Acknowledgement Letter from EPA

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Appendix E

Inspection Reports

Inspections under this SWPPP shall be conducted in accordance with each installed BMPs recommended maintenance requirements. This inspection frequency may be reduced to at least once every month if: a) the entire site is temporarily stabilized, b) runoff is unlikely due to winter conditions (e.g. site is covered with snow, ice, or the ground is frozen), or c) construction is occurring during seasonal arid periods in arid areas and semi-arid areas. If an inspection report is filed according to this modified schedule it shall be noted at the end of the report under the "NOTES" section.

The following pages should be copied and completed for each inspection. All inspection forms should be compiled in a binder to prove compliance with this SWPPP.

Stormwater Pollution Prevention Plan: Inspection Checklist

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Describe present phase of construction			
Inspection Frequency: ☐ Every 7 days ☐ Every 14 days *and* within **24** hours of a 0.25" rain ☐ Other: ☐ Every 7 days *and* within 24 hours of a 0.25" rain			
Type of Inspection: ☐ Regular ☐ Pre-storm event ☐ During storm event ☐ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ☐ Yes ☐ No **If yes, provide:** Storm Start Date & Time Storm: Duration (hrs.): Approx. Amount of Precipitation (in):			
Weather at time of this inspection? ☐ Clear ☐Cloudy ☐ Rain ☐ Sleet ☐ Fog ☐ Snowing ☐ High Winds ☐ Other: Temperature: ºF			
Have any discharges occurred since the last inspection? ☐ Yes ☐ No **If yes, describe:**			
Are there any discharges at the time of inspection? ☐ Yes ☐ No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are all slopes and disturbed areas not actively being worked properly stabilized? *Note: Soil stockpiles not in use for a period of 14 days or more must be temporarily stabilized.	☐ Yes ☐ No	☐ Yes ☐ No	
Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	☐ Yes ☐ No	☐ Yes ☐ No	
Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	☐ Yes ☐ No	☐ Yes ☐ No	
Are discharge points and receiving waters free of any sediment deposits?	☐ Yes ☐ No	☐ Yes ☐ No	
Are storm drain inlets properly protected?	☐ Yes ☐ No	☐ Yes ☐ No	
Is the construction exit preventing sediment from being tracked into the street?	☐ Yes ☐ No	☐ Yes ☐ No	
Is trash/litter from work areas collected and placed in covered dumpsters?	☐ Yes ☐ No	☐ Yes ☐ No	
Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	☐ Yes ☐ No	☐ Yes ☐ No	

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	☐ Yes ☐ No	☐ Yes ☐ No	
Are materials that are potential stormwater contaminants stored inside or under cover?	☐ Yes ☐ No	☐ Yes ☐ No	
Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	☐ Yes ☐ No	☐ Yes ☐ No	
Are outfalls free of debris?	☐ Yes ☐ No	☐ Yes ☐ No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature: _____

Date: _____

BEALS+THOMAS

SWPPP PHOTOGRAPHIC LOG

Client Name:	Photo Location:	Project No:
Photo No: 1 / Date:		
Description:		

Client Name:	Photo Location:	Project No:
Photo No: 2 / Date:		
Description:		

DRAFT

Client Name:		Photo Location:	Project No:
Photo No: 3	Date:		
Description:			
Client Name:		Photo Location:	Project No:
Photo No: 4	Date:		
Description:			

Client Name:		Photo Location:	Project No:
Photo No: 5	Date:		
Description:			
Client Name:		Photo Location:	Project No:
Photo No: 6	Date:		
Description:			

DRAFT

Client Name:		Photo Location:	Project No:
Photo No: 7	Date:		
Description:			
Client Name:		Photo Location:	Project No:
Photo No: 8	Date:		
Description:			

DRAFT

Appendix F

Corrective Action Log

DRAFT

Corrective Action Log

Use this form to note the date and activity for accurate record keeping (make additional copies as necessary). Examples include the restaking or reinforcement of the Sediment Control Barrier, site watering to prevent dust erosion, street sweeping, equipment and machinery repair, etc.

Date	Activity Description	Additional Action Items

Appendix G

SWPPP Amendment Log

The SWPPP, including the site plans, shall be amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP.

The SWPPP shall be amended if during inspections or investigations by site staff, or by local, state, tribal or federal officials, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site.

Based on the results of an inspection, the SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) calendar days following the inspection. Implementation of these additional or modified BMPs shall be accomplished as described in Subpart 3.6B of the Construction General Permit (located in Appendix C).

SWPPP Amendment Log

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by (Name(s) and Title)

Appendix H

Subcontractor Certifications/Agreements

DRAFT

Sample Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____

Appendix I

Grading and Stabilization Activities Log

Site Plans in Appendix B should be annotated to indicate areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

DRAFT

The following records are to be kept by each Site Operator throughout the construction period and maintained in the SWPPP. Insert additional documentation for record keeping as necessary.

Grading and Stabilization Activities Log

Date	Location on Property	Description

Appendix J

Training Log

DRAFT

Training Log

Date	Training Topic	Attendee	Signature of Training Coordinator

Appendix K

Delegation of Authority

DRAFT

Sample Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

Appendix L

Endangered Species Documentation

DRAFT

Appendix M

Historic Preservation Documentation

DRAFT

Appendix N

Temporary Sediment Basin Sizing Calculations

DRAFT

575-1-3
CITY OF HAVERHILL
4 SUMMER ST
HAVERHILL, MA 01830

575-3-19
DAVIS WILLIAM E ETUX
3 HANNAN RIDGE RD
HAVERHILL, MA 01832

575-3-20
MURPHY BRIAN-ETUX
1 HANNAN RIDGE RD
HAVERHILL, MA 01832

575-3-21
WHITSON LOUIS ETUX
13 DOW DRIVE
HAVERHILL, MA 01830

575-3-22
HASTINGS GARY S ETUX
11 DOW DR
HAVERHILL, MA 01832

575-3-23
THE GREGORY CLAYTON PEGRAM REVOCAB
9 DOW DRIVE
HAVERHILL, MA 01832

575-3-24
AVENI JOHN ETUX
7 DOW DR
HAVERHILL, MA 01832

575-3-25
MAGLIO MICHAEL-ETUX
5 DOW DR
HAVERHILL, MA 01832

575-3-26A
SOLOMINI SCOT-ETAL
3 DOW DR
HAVERHILL, MA 01832

575-3-27
FOUR DOW REALTY TRUST
4 DOW DR
HAVERHILL, MA 01832

575-3-28
MCDONALD MICHAEL J-ETUX
6 DOW DRIVE
HAVERHILL, MA 01832

575-3-29
GRAZIO VANCE R-ETUX
8 DOW DRIVE
HAVERHILL, MA 01832

575-3-30
STEVENS FREDERICK N JR-ETAL
10 DOW DRIVE
HAVERHILL, MA 01832

575-3-38B
SULLIVAN JAMES M ETUX
23 PARSONAGE HILL RD
HAVERHILL, MA 01832

575-3-39A
CORRIVEAU PAUL-ETUX
21 PARSONAGE HILL RD
HAVERHILL, MA 01832

575-3-40A
ROSE MARIE FOLEY IRREVOCABLE T
19 PARSONAGE HILL RD
HAVERHILL, MA 01832

575-3-40B
MARTORI SAMUEL R ETUX
25 PARSONAGE HILL RD
HAVERHILL, MA 01832

575-3-41A
GARVEY MARK A-ETUX
13 PARSONAGE HILL RD
HAVERHILL, MA 01832

575-3-42
LAVOIE MICHAEL G ETUX
11 PARSONAGE HILL RD
HAVERHILL, MA 01832

575-3-4AB
CITY OF HAVERHILL
4 SUMMER ST
HAVERHILL, MA 01830

585-431-20
J + M REALTY TRUST
FOUNDRY INDUSTRIAL PK
LOWELL, MA 01852

585-431-22
DIXIELAND, LLC
69 WILDWOOD ST
WILMINGTON, MA 01887

585-431-26
LAZOS NICHOLAS
466 MAIN ST
HAVERHILL, MA 01830

585-431-27
THE CATHOLIC CEMETERY ASSOC
175 BROADWAY
MALDEN, MA 02148

586-431-18A
CHOOLJIAN MARTIN A-ETALI
63 WINFIELD RD
PRINCETON, NJ 08540

585-430-1
SRYBNY KATHLEEN H ETAL
843 HILLDALE AVE
HAVERHILL, MA 01832

585-430-2
HILLDALE INDUSTRIAL PROPERTIES
325 N MAIN ST STE #B
MIDDLETON, MA 01949

585-430-2F
WBC EXTRUSION PRODUCTS, INC.
60 FONDI ROAD
HAVERHILL, MA 01832

585-431-22A
BIG BEND II, LLC
304 VICTORY RD
NORTH QUINCY, MA 02169

587-427-5
SRYBNY KATHLEEN H ETALI
843 HILLDALE AVE
HAVERHILL, MA 01832

City of Haverhill, MA

08/06/2021

CCSP-21-10

Fire2 Department Review

City Council Special Permit

Status: Complete

Assignee: Michael Picard

Became Active: 06/04/2021

Completed: 06/04/2021

Applicant

Caroline Booth
cbooth@bealsandthomas.com
144 Turnpike Road
Southborough, Massachusetts 01772-2104
5083660560

Location

1050 HILLDALE AVE
Haverhill, MA 01832

Owner:

DIXIELAND, LLC
69 WILDWOOD ST WILMINGTON, MA 01887

Comments

Michael Picard, Jun 4, 2021 at 8:48am

The planning, design and construction of new buildings, renovation of existing buildings and structures to provide egress facilities, fire protection and built-in fire protection equipment shall be in accordance with 780 CMR; and any alterations, additions or changes in buildings required by the provisions of 527 CMR which in the scope of 780 CMR, 9th edition, shall be made in accordance therewith. (527 CMR 1.04(4) and 780 CMR 101.2). Additionally, 780 CMR (901.2.1) Document Submittal Process will be required.

Plans approved by the fire department are approved with the intent they comply in all respects to MSBC, 780 CMR 527 CMR 1.00, MGL Chapter 148 and any City of Haverhill ordinance. Any omissions or errors on the plans do not relieve the applicant of complying with applicable requirements.

Project must comply with the City of Haverhill rules and regulations regarding zoning for solar fields

Required on site plan:

Fire Department access
Turnarounds
Road width

Grade of road

Special considerations:

Battery storage location
Suppression system for battery storage location Permitted
Remote shutoff locations
Key boxes
Emergency contact information

City of Haverhill, MA

08/06/2021

CCSP-21-10

Wastewater Review

City Council Special Permit

Status: Complete

Assignee: Robert Ward

Became Active: 06/04/2021

Completed: 06/07/2021

Applicant

Caroline Booth
cbooth@bealsandthomas.com
144 Turnpike Road
Southborough, Massachusetts 01772-2104
5083660560

Location

1050 HILLDALE AVE
Haverhill, MA 01832

Owner:

DIXIELAND, LLC
69 WILDWOOD ST WILMINGTON, MA 01887

Comments

Robert Ward, Jun 7, 2021 at 12:31pm

The proposed solar facility does not require a sewer connection.

City of Haverhill, MA

08/06/2021

CCSP-21-10

Water Supply Review

City Council Special Permit

Status: Complete

Assignee: Robert Ward

Became Active: 06/04/2021

Completed: 06/17/2021

Applicant

Caroline Booth
cbooth@bealsandthomas.com
144 Turnpike Road
Southborough, Massachusetts 01772-2104
5083660560

Location

1050 HILLDALE AVE
Haverhill, MA 01832

Owner:

DIXIELAND, LLC
69 WILDWOOD ST WILMINGTON, MA 01887

Comments

Robert Ward, Jun 17, 2021 at 11:13am

The proposed solar facility is not within any of the City's drinking water supply watersheds.

City of Haverhill, MA

08/06/2021

CCSP-21-10

Planning Director Review

City Council Special Permit

Status: Complete

Assignee: Orlando Pacheco

Became Active: 06/04/2021

Completed: 06/21/2021

Applicant

Caroline Booth
cbooth@bealsandthomas.com
144 Turnpike Road
Southborough, Massachusetts 01772-2104
5083660560

Location

1050 HILLDALE AVE
Haverhill, MA 01832

Owner:

DIXIELAND, LLC
69 WILDWOOD ST WILMINGTON, MA 01887

Comments

Orlando Pacheco, Jun 21, 2021 at 8:52am

N/A-Will work with Mayor's Office on the PILOT Agreement now that project has been approved

City of Haverhill, MA

08/06/2021

CCSP-21-10

Health Department Review

City Council Special Permit

Status: Complete

Assignee: Mark Tolman

Became Active: 06/04/2021

Completed: 08/03/2021

Applicant

Caroline Booth
cbooth@bealsandthomas.com
144 Turnpike Road
Southborough, Massachusetts 01772-2104
5083660560

Location

1050 HILLDALE AVE
Haverhill, MA 01832

Owner:

DIXIELAND, LLC
69 WILDWOOD ST WILMINGTON, MA 01887

Comments

Mark Tolman, Aug 3, 2021 at 8:51am

Currently no concerns at this point. No wells or Septic Systems.

If concerns do arise it will be dealt with appropriately.

Porta Pottie must be placed on site during construction.

City of Haverhill, MA

08/06/2021

CCSP-21-10

Storm Water Review

City Council Special Permit

Status: Active

Assignee: Robert Moore

Became Active: 06/04/2021

Completed:

Applicant

Caroline Booth
cbooth@bealsandthomas.com
144 Turnpike Road
Southborough, Massachusetts 01772-2104
5083660560

Location

1050 HILLDALE AVE
Haverhill, MA 01832

Owner:

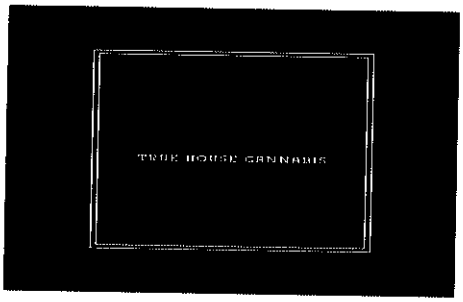
DIXIELAND, LLC
69 WILDWOOD ST WILMINGTON, MA 01887

Comments

Robert Moore, Aug 2, 2021 at 3:55pm

Applicant has filed a Notice of Intent application with the Conservation Commission. Public Hearing is scheduled to be opened August 5th. Commission is awaiting applicant's posting escrow funds for stormwater and wetland boundary peer reviews.

Council Hearing October 19, 2021



(1)

True House Cannabis LLC.

Andre Colon CEO

978-305-3868

6/23/2021

To Haverhill, City Council:

Hello my name is Andre Colon, CEO of True House Cannabis LLC also known as THC. True House Cannabis, respectfully requests a zoning amendment for 25 Bond st. Haverhill, Ma. an industrial location in the Ward Hill section of the city of Haverhill. True House Cannabis, request amendment to include cannabis cultivation, for the production of cannabis, not to be sold to the public only to licensed cannabis establishments.
Thank you for your consideration.

Best regards,

Andre Colon 599 Canal St, Lawrence, MA 01840
True House Cannabis LLC.

11.1

KAN LLC
600 Osgood Street
North Andover MA 01845

June 22, 2021

To: TRUE HOUSE CANNABIS LLC
c/o Andre Colon

Dear Mr. Colon,

As you requested, I am granting you permission file with the city of Haverhill Massachusetts, a marijuana establishment application on behalf of True House Cannabis, LLC as it relates to a certain portion of the property located at 25 Bond Street, Haverhill, Massachusetts owned by KAN LLC.

Yours Truly

Mark Mollica – Manager of KAN LLC

File 10 days

DOCUMENT

CITY OF HAVERHILL

In Municipal Council

11,1,1

ORDERED:

MUNICIPAL ORDINANCE **CHAPTER 255**

AN ORDINANCE RELATING TO ZONING
Licensed Marijuana Establishments Overlay Zone (LMEOZ)

BE IT ORDAINED by the City Council of the City of Haverhill that the Code of the City of Haverhill, Chapter 255, Zoning, § 9.7.4 Designated Locations of Marijuana Establishments, as amended, be and is hereby further amended by adding the following:

"The City Engineer's Map entitled "Licensed Marijuana Establishments Overlay Zone with Street Index" dated December 7, 2018, shall include 25 Bond Street to permit Licensed Marijuana Establishments - No Retail Sales."

APPROVED AS TO LEGALITY:

_____
City Solicitor

For Hearing October 19 - 2021

Document

CITY OF HAVERHILL

In Municipal Council

12,1

Ordered:

That the City transfer the sum of $12,000 from Salary Reserve to Library Salaries to fund position upgrades.

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
HAVERHILL, MA 01830
PHONE 978-374-2300
FAX 978-373-7544
MAYOR@CITYOFHAVERHILL.COM
WWW.CI.HAVERHILL.MA.US

August 5, 2021

City Council President Melinda Barrett and Members of the Haverhill City Council

RE: Order to transfer $12,000.00 from Salary Reserve to Library Salaries Account

Dear Madame President and Members of the Haverhill City Council:

Please see attached an order to transfer $12,000.00 from Salary Reserve Account to Library Salaries Account to fund position upgrades. I recommend approval.

Very truly yours,

James J. Fiorentini
Mayor

JJF/lyf

Document

CITY OF HAVERHILL

In Municipal Council

12.2

Ordered:

That the City transfer the sum of $177,024 from the Whittier Asbestos Removal capital account into the Hunking Middle School capital account to closeout the Hunking school project and cover all final costs, per MSBA

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
HAVERHILL, MA 01830
PHONE 978-374-2300
FAX 978-373-7544
MAYOR@CITYOFHAVERHILL.COM
WWW.CI.HAVERHILL.MA.US

August 5, 2021

City Council President Melinda Barrett and Members of the Haverhill City Council

RE: Order to transfer $177,024.00 from Whittier Asbestos Removal Account to the Hunking Middle School Capital Account

Dear Madame President and Members of the Haverhill City Council:

Per MSBA, please see attached an order to transfer $177,024.00 from Whittier Asbestos Removal Account to the Hunking Middle School Capital Account to cover close-out costs from the Hunking Middle School Building project. I recommend approval.

Very truly yours,

James J. Fiorentini
Mayor

JJF/lyf

Document

CITY OF HAVERHILL

In Municipal Council

12.3

Ordered:

That the City transfer the sum of $55,000 from the Capital Budget to the Capital account:

Fire Vehicle Replacement Plan

CITY OF HAVERHILL

Capital Project Request

1. Department Fire	2. Date: 7/28/2020
3. Contact Person & Title: Fire Chief William Laliberty	4. Phone: (978) 373-8460
5. Project Title: Fire Vehicle Replacement	6. Reference # (to be assigned):
7. Type of Project (check): ( ) New ( ) Improvement (X) Replacement	8. Department Priority: Necessary
	9. Form of Acquisition (check): (X) Purchase ( ) Lease ( ) Lease/Purchase

10. Project Category (check one):
( ) Land ( ) Equipment ( ) Improvements ( ) Infrastructure ( ) Buildings (X) Vehicles

11. Basis for Estimate (check one):
(X) Vendor Quote ( ) Apppraisal ( ) Previous Purchase ( ) Other (specify):

12. Description/Justification (attach any additional pages or relevant background information):

Replacing the Car 2 Suppression Command vehicle as planned for in the 25-year Fire Apparut Replacement Plan
https://www.mapc.org/our-work/services-for-cities-towns/public-works-collective-purchasing-program/

Price includes additional costs associated with communication, lights and siren package excluding markup prices

13. Estimated Capital Costs:	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	TOTAL
Planning & Design						$ -
Land Acquisition						$ -
Site Development						$ -
Construction						$ -
Other (specify):		$ 55,000				$ 55,000
TOTAL	$ -	$ 55,000	$ -	$ -	$ -	$ 55,000

14. Funding Source (check one):
( ) Bond (X) Capital Budget ( ) Donation ( )Free Cash ( ) Grant ( ) Stablization ( ) Other (specify):

15. Signature:

Mayor Rating (this box for Mayor's office only)
( ) Fiscal Impact ( ) Legal Obligation & Compliance ( ) Impact on Service to the Public ( ) Urgency of Maintenance
( ) Prior Phases ( ) Department Priority
Project Total Score:

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
HAVERHILL, MA 01830
PHONE 978-374-2300
FAX 978-373-7544
MAYOR@CITYOFHAVERHILL.COM
WWW.CI.HAVERHILL.MA.US

August 5, 2021

City Council President Melinda Barrett and Members of the Haverhill City Council

RE: Order to transfer $55,000.00 from Capital Budget to Capital Account

Dear Madame President and Members of the Haverhill City Council:

Please see attached an order to transfer $55,000.00 from Capital Budget to Capital Account to purchase a Fire Department vehicle. I recommend approval.

Very truly yours,

James J. Fiorentini
Mayor

JJF/lyf

Document

CITY OF HAVERHILL

In Municipal Council

12.4

Ordered:

That in accordance with General Laws, Chapter 44, Section 64, authorize the payment of bill(s) of the previous years and to further authorize the payment from current year departmental appropriations as listed below:

Vendor	Amount	Account
North Mechanical Services	$ 712.40	Public Property
North Mechanical Services	$ 190.00	Police Department
Telelanguage Inc	$ 80.11	Police Department
Aramark	$ 82.75	Police Department
Nardone Electrical Corp	$ 275.00	Police Department
Priority Dispatch	$ 365.00	Police Department
CommonWealth Resource Mgmt	$ 2,640.00	Refuse & Recycling
Covanta Energy	$82,995.60	Refuse & Recycling

Invoice

NORTH MECHANICAL SERVICES, INC.
25 MULBERRY STREET HAVERHILL, MA 01830
PHONE: (978) 374-3030 * FAX: (978) 374-9726

Date: 7/26/2021
Invoice # 13767
Due Date: 8/25/2021
Terms: Net 30

Bill To:

Steve Bucuzzo
4 Summer Street
Haverhill, MA 01830

Project:	Service

Ord...	Serviced	Description	Item Code	Hrs/...	Rate	Amount
	5/14/2021	Tech Mathevis - Unit in the water department not running properly. - Charged with 11 lbs. of R22. Service Labor	Service Labor	2	89.95	179.90
			Service Truck Charge		31.00	31.00
			Service Materials		472.00	472.00T

Sales Tax ... $29.50 **Subtotal** $682.90 **Total** $712.40

All material is guaranteed to be as specified. All work to be completed in a professional manner according to standard practices. Any alteration or deviation from the above specifications involving extra costs will be executed only upon written orders and will become an extra charge over and above the estimate. All agreements contigent upon delays beyond our control. Purchaser agrees to pay all costs of collection, including attorney's fees.

THANK YOU FOR YOUR BUSINESS

Invoice

NORTH MECHANICAL SERVICES, INC.
25 MULBERRY STREET HAVERHILL, MA 01830
PHONE: (978) 374-3030 * FAX: (978) 374-9726

Date: 7/14/2021
Invoice # 13718
Due Date: 8/13/2021
Terms: Net 30

Bill To:

Officer Scott Ziminski
Haverhill Police Department
40 Bailey Blvd.
Haverhill, MA 01830

Project:

Req# 2200239 PO# 220152

Ord...	Serviced	Description	Item Code	Hrs/...	Rate	Amount
	6/30/2021	Tech Matt - Third floor ac down. - Found broken connection outside. - Rewired and verified proper operation.				
		Service Labor	Service Labor	1.5	106.00	159.00
			Service Truck Charge		31.00	31.00

needs a FY21 PO or it has to go to council for approval.

Sales Tax ...	$0.00	Subtotal	$190.00	Total	$190.00

All material is guaranteed to be as specified. All work to be completed in a professional manner according to standard practices. Any alteration or deviation from the above specifications involving extra costs will be executed only upon written orders and will become an extra charge over and above the estimate. All agreements contigent upon delays beyond our control. Purchaser agrees to pay all costs of collection, including attorney's fees.

THANK YOU FOR YOUR BUSINESS

Telelanguage Inc.
610 SW Broadway Suite 200
Portland, OR 97205

Phone # 888-983-5352 billing@telelanguage.com
Fax # 503-246-6002 www.telelanguage.com

DATE	INVOICE #
7/9/21	TL129535

BILL TO

Haverhill Police Department
Attn: Lt. John Barbieri
40 Bailey Blvd.
Haverhill, MA 01830

Rep	TERMS	DUE DATE	PO No.
MV	Net 30	8/8/21	

DESCRIPTION	QTY	RATE	AMOUNT
Telephonic Interpretation - April to June 2021		80.11	80.11

needs a FY'21 PO or it needs council approval

Payments can now be made on our website via credit card. You can type in the following link, www.telelanguage.com/payment, in your browser and it will take you directly to our payment form. Should you have any questions, please feel free to reach out via email or by phone.

Total $80.11

TELELANGUAGE

Customer Report

PRF63 - Haverhill Police Department [95671]

301660330	9783731212	95671	04/10/21 06:47 AM	8.00	Dispatcher Cesail	Portuguese	0.890	7.12
301806307	9789677930	95671	04/27/21 08:13 PM	16.00	Sgt Glenn Fogarty	Spanish	0.670	10.72
301806345	9783731212	95671	04/27/21 08:50 PM	18.00	Officer Kevin O'Brian	Spanish	0.670	12.06
301833507	9788726239	95671	04/30/21 11:04 AM	7.00	Detective Caitlin Brady	Spanish	0.670	4.69
301859937	9783731212	95671	05/04/21 09:31 AM	4.00	Dispatcher Cesati	Spanish	0.670	2.68
301886213	9783731212	95671	05/06/21 03:04 PM	6.00	Dispatcher Morelle	Spanish	0.670	4.02
301897293	9783731212	95671	05/07/21 08:26 PM	4.00	Jennifer Morelle	Spanish	0.670	2.68
302046499	9783731212	95671	05/26/21 11:38 AM	3.00	Dispatcher Cesati	Spanish	0.670	2.01
302052004	9783731212	95671	05/27/21 06:32 AM	4.00	Dispatcher Cesati	Spanish	0.670	2.68
302162418	9789145506	95671	06/10/21 04:41 PM	12.00	Zachary Phair	Mandarin	0.890	10.68
302174494	9783731212	95671	06/12/21 03:56 PM	8.00	Jennifer Marden	Spanish	0.670	5.36
302251157	9783731212	95671	06/22/21 06:52 PM	3.00	Melanie Blanchet	Spanish	0.670	2.01
302270269	9783731212	95671	06/24/21 08:17 PM	3.00	Dispatch Society	Spanish	0.670	2.01
302281126	9783731212	95671	06/26/21 10:15 PM	12.00	Ruoleau	Spanish	0.670	8.04
302281234	9783731212	95671	06/26/21 11:58 PM	5.00	Rouleau	Spanish	0.670	3.35
			Total minutes:	113.00	**Total calls:**	15	**Total**	80.11

aramark

2680 Palumbo Drive
Lexington, KY 40509

Visit us at www.aramarkuniform.com

INVOICE

BILLING INQUIRIES	(800) 504-0328
CUSTOMER SERVICE	(800) ARAMARK
ACCOUNT NUMBER	860001181
CUSTOMER NUMBER	2859319
INVOICE NUMBER	301000066953
INVOICE DATE	06/23/2021
TERMS	NET 10 EOM
PO #	
NAID	
MARKET CENTER	301
ROUTE NUMBER	16

WENDY DUFF
HAVERHILL POLICE DEPT.
40 BAILEY BLVD
HAVERHILL MA 01830

Ship
To: HAVERHILL POLICE DEPT.
40 BAILEY BLVD
HAVERHILL MA 01830

A/R BALANCES AS OF 06/23/2021						
TOTAL DUE	CURRENT	1-30 DAYS	31-60 DAYS	61-90 DAYS	91-120 DAYS	OVER 120 DAYS
327.91	248.25	0.00	39.83	39.83	0.00	0.00

WEARER#	WEARER NAME	ITEM	ITEM DESCRIPTION	SIZE	TYPE	BILL QTY	RATE	TOTAL
			RESTROOM SERVICE					25.82
6	PAUL REYNOLDS	GO0218NAVY	JACKET HIP MLS 65	2XLR	Rent	2	0.745	1.49
6	PAUL REYNOLDS	GP0002NAVY	PANT WORK TWILL	42X30	Rent	11	0.495	5.45
6	PAUL REYNOLDS	GS0019NAVY	SHRT WORK SS	2XLR	Rent	11	0.460	5.06
		CE0102BLAK	DUST MOP HANDLE	X	Rent	2	0.113	0.23
		CE0104BLAK	WET MOP HANDLE	X	Rent	1	0.075	0.08
		CE0112XXXX	AC MOP FRAME	18	Rent	0	0.000	0.00
		DP0018BLUE	MOP SYNTHETIC BLN	18	Rent	2	2.438	4.88
		DP0025GREN	WET MOP NYLON	LGER	Rent	2	2.438	4.88
		OW1481BLAK	MASK REUSABLE	X	Sales	0	0.000	0.00
		OW1481NAVY	MASK REUSABLE	X	Sales	0	0.000	0.00
		XX0257BLAK	LNDRY BAG ERGO	X	Rent	0	0.000	0.00
			EASYCARE					4.58
			SERVICE CHARGE					30.28

SUBTOTAL (ALL PAGES)	82.75
FREIGHT	0.00
TAX	0.00
TOTAL	**$82.75**

THANK YOU FOR YOUR BUSINESS

Delivery received by: PAUL

Signature from handheld acknowledging delivery

To ensure proper payment application, please write your invoice number on your check, and include the attached coupon with your payment

aramark

PAYMENT DUE	July 10, 2021
TOTAL DUE	$82.75
INVOICE NUMBER	**301000066953**

INVOICE DATE 06/23/2021
ACCOUNT NUMBER 860001181

Bill To:

HAVERHILL POLICE DEPT.
40 BAILEY BLVD
HAVERHILL MA 01830

Payable
To: **ARAMARK**
PO BOX 28050
NEW YORK NY 10087-8050

1 000000732796 0301000066953 0 0000008275 0000008275 6

NARDONE
Electrical Corporation
160 Olympia Avenue, Woburn, MA 01801
T: 781-935-2727 F: 781-939-3100
www.nardoneelectric.com

INVOICE

BILL TO: HAVERHILL POLICE STATION
40 BAILEY BOULEVARD
HAVERHILL MA 01830

INVOICE# 37849

WORK DONE AT: HAVERHILL POLICE STATION
40 BAILEY BOULEVARD
HAVERHILL, MA 01830

CUST# 36997

WO# 00022695 SERV.LOC. 40BAIL-00

JOB NO.	TERMS	INVOICE NUMBER	DATE
022695-000	ONRECEIPT	37849	7/12/21

QUANTITY	DESCRIPTION	UNIT PRICE	AMOUNT
	6/24/21 RESPONDED TO CALL FOR LOUD BANG WHEN GENERATOR TURNED ON. UPON ARRIVAL FOUND NO PROBLEMS WITH GENERATOR. DID A LOADED TEST AND HAD NO PROBLEMS. WORKING THEORY WAS A BROWN OUT JUST LONG ENOUGH TO START GEN BUT NOT TRANSFER OVER. AT THE SAME TIME THE BROWN OUT CAUSED THE HEAT CONTACTOR TO CHATTER.		
2.00	GENERATOR TECHNICIAN	125.00	250.00
	VEHICLE CHARGE		25.00
	INVOICE TOTAL		**275.00**

INVOICE

Medical Priority Consultants, Inc.
dba Priority Dispatch Corp
110 South Regent Street, Suite 500, Salt Lake City, Utah, 84111, United States
Phone: (801) 363-9127 Fax: (801) 746-5879
www.prioritydispatch.net
accounting@prioritydispatch.net

Invoice Number	SIN286978
Invoice Date	**06/30/2021**
Agency ID	10747

Billing Address
Haverhill Police Department
40 BAILEY BLVD
Haverhill, MA 01830-6106
United States

Shipping Address
Haverhill Police Department
40 BAILEY BLVD
Haverhill, MA 01830-6106
United States

Customer Reference	Quote #	PO #	Invoice Currency	Due Date
EMD		Will follow	USD	Net 30

Product Name	Quantity	Total
Course Training and Certification *Josue Martinez (Haverhill Police Department) Course No. 29875:null (6/16/2021-6/18/2021)*	1	$ 365.00
	Net Total	$ 365.00
	Tax Total	$ 0.00
	Invoice Total	$ 365.00

Payment Detail

FEDERAL TAX ID# 87-0447422

To pay this invoice via Credit Card online please visit:
https://payment.prioritydispatch.net

Alternatively, please pay this invoice in US DOLLARS by wire transfer to Zions First National Bank: ABA# 1240-00054, Account# 002226546, Routing# 124000054, Swift Code ZFNBUS55

E-mail Remittance Advice to Finance@prioritydispatch.net

Contact Accounting@prioritydispatch.net with any questions regarding this invoice.

City Council

CommonWealth

Resource Management Corporation

INVOICE

TO:		City of Haverhill c/o Gunther Wellenstein		gwellenstein@cityofhaverhill.com
Copied		Michael Leon, Esq., Nutter, McLennan & Fish, LLP		MLeon@nutter.com
PROJECT:		Host Fee Agreement Negotiation Support		
INVOICE NO.:		279-21-26		
DATE:		28-May-21		
BILLING PERIOD:		Through May 2021		
DESCRIPTION:		Review updated host fee counteroffer alternatives; spreadsheet analysis;		
		calls on May 6,10,14, review host fee agreement draft language		
CHARGES:				
Current	Direct Labor charges		$2,640.00	
	Other costs		-	
	Courtesy discount			
	Monthly Total		$2,640.00	
Previous				
	Invoice 279-2112 dated 31 Mar 2021		$480.00	
	Invoice 279-2121 dated 30 Apr 2021		$480.00	
	Payment received, thank you		($2,160.00)	
	Outstanding balance (credit), prior invoices		$ (1,200.00)	*credit for overpayment*
TOTAL BALANCE DUE:			**$ 1,440.00**	**PAY THIS AMOUNT**
TERMS:			NET 30 DAYS	
TAX ID:			04-313-6247	

LABOR COST ITEMIZATION

Personnel	Rate $/hour	Labor Hours	Total
G. Aronson	240	11.0	$2,640
T. Yeransian	240		$0
A. Finelli	240		$0
			$0
Total			$2,640

OTHER COST ITEMIZATION

Item	
Total	-

TOTAL, this invoice	$2,640.00	
TOTAL CONTRACT TO DATE	**$19,440.00**	
Total budget	$20,000.00	as amended
Budget remaining, full contract	$560.00	
% of contract budget remaining	2.80%	
% of contract budget invoiced	97.20%	

Please send check to CommonWealth Resource Management Corporation, 229 Billings St, Sharon, MA 02067.

Direct questions to George H. Aronson, Principal, CRMC 781-784-8835 or garonson@crmcx.com

City Council

INVOICE

COVANTA
Powering Today. Protecting Tomorrow.

Invoice:	**352632HAVAS**
Invoice Date:	**6/30/21**
Page:	1 of 13

Remit Via Check: COVANTA ENERGY, LLC
PO Box 28893
New York, NY 10087-8893

Business Unit:	COVPL
Customer No:	COV13053
Payment Terms:	Net 30
Due Date:	7/30/21

Customer: City of Haverhill
500 Primrose St.
Department of Public Works
Haverhill MA 01830
United States

Amount Due: **129,508.60 USD**

Please detach here and mail the above portion with your payment.
For billing questions, please call Customer Service at 1-800-950-8749

Invoice Summary

Type of Charges	Qty	UOM	Amount
Municipal Solid Waste	1,992.440	TON	129,508.60
Total Amount:			**129,508.60**

FY21 - 46,513 paid

82,995.60

REFUSE
1010000.1.0430 . 5303

Refuse - Disposal

SWellenstein

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
HAVERHILL, MA 01830
PHONE 978-374-2300
FAX 978-373-7544
MAYOR@CITYOFHAVERHILL.COM
WWW.CI.HAVERHILL.MA.US

August 6, 2021

City Council President Barrett and Members of the Haverhill City Council

RE: FY2021 Bills

Dear Madame President and Members of the Haverhill City Council:

Attached, please find an order to pay bills from the previous fiscal year:

Vendor	Amount	Account
North Mechanical Services	$ 712.40	Public Property
North Mechanical Services	$ 190.00	Police Department
Telelanguage Inc.	$ 80.11	Police Department
Aramark	$ 82.75	Police Department
Nardone Electrical Corp.	$ 275.00	Police Department
Priority Dispatch	$ 365.00	Police Department
Common Wealth Resource Mgmt.	$ 2,640.00	Refuse & Recycling
Covanta Energy	$82,995.60	Refuse & Recycling
TOTAL	**$ 87,340.86**	

I recommend approval.

Very truly yours,

James J. Fiorentini (LYF)

James J. Fiorentini, Mayor

JJF/lyf

CITY COUNCIL

MELINDA E. BARRETT
PRESIDENT
COLIN F. LEPAGE
VICE PRESIDENT
JOSEPH J. BEVILACQUA
JOHN A. MICHITSON
THOMAS J. SULLIVAN
TIMOTHY J. JORDAN
MICHAEL S. MCGONAGLE
MARY ELLEN DALY O'BRIEN
WILLIAM J. MACEK

13.1

CITY OF HAVERHILL

HAVERHILL, MASSACHUSETTS 01830-5843

CITY HALL, ROOM 204
4 SUMMER STREET
TELEPHONE: 978 374-2328
FACSIMILE: 978 374-2329
www.cityofhaverhill.com
citycncl@cityofhaverhill.com

August 5, 2021

To: President and Members of the City Council:

Council President Barrett and Councillors LePage and Michitson request a discussion to change the current at-large electoral voting system for City Council and School Committee to include ward based representation along with the creation of a Charter Commission for a full Charter review.

Melinda Barrett /lab

City Council President Melinda Barrett

Colin LePage /lab

City Council Vice President Colin LePage

John Michitson /lab

City Councillor John Michitson

2021AUG05AM09:54HAVCITYC

LCR | LAWYERS FOR CIVIL RIGHTS BOSTON

July 19, 2021

Mayor James J. Fiorentini
Haverhill City Council
Haverhill City Hall
4 Summer Street,
Haverhill MA, 01830

Re: At-Large Method of Electing Haverhill's City Council and School Committee

Dear Mayor Fiorentini and City Councilors:

Cities across Massachusetts have been steadily moving away from all "at-large" electoral systems for electing their city councils and school committees. Haverhill is one of a dwindling number of cities that maintains such a system. In addition to other policy reasons why a change from an all at-large electoral system is necessary, we write today to highlight that this feature of Haverhill's current electoral system dilutes the vote of Haverhill's communities of color in a way that makes it vulnerable to a challenge under the federal Voting Rights Act. For that reason, we encourage the City to immediately take concrete steps to voluntarily change its method of electing the City Council and School Committee.

Lawyers for Civil Rights (LCR) is a non-profit legal organization that fosters equal opportunity and fights discrimination on behalf of people of color and immigrants. As part of that work, we regularly engage in litigation and other advocacy to protect equal voting rights on behalf of our client communities. In Haverhill, we work closely with organizations and individuals representing communities of color, especially the Latino Coalition, an organization whose mission is to inspire and empower Haverhill's Latinx residents to be active members of the local community.

Prior to the pandemic, we were engaged in critical discussions about Haverhill's electoral system, including at a well-attended Neighborhood Representation Meeting held at Harbor Place on January 23, 2020. At that time, there was a growing consensus that voluntary change was advisable – with several of you voicing support for such a move. While those conversations were paused when the pandemic hit, now is the time for the City Council to take concrete steps to address this issue.

61 BATTERYMARCH STREET • 5TH FLOOR • BOSTON, MA 02110
(617) 482-1145 (TELEPHONE) • (617) 482-4392 (FACSIMILE)
WWW.LAWYERSFORCIVILRIGHTS.ORG

Background

As you know, Haverhill's nine-member City Council and seven-member School Committee (six elected to School Committee, plus the Mayor) are both currently elected all at-large. CITY OF HAVERHILL, CHARTER, § C-50; § C-31. This type of electoral system is vulnerable to challenge under the federal Voting Rights Act. 52 U.S.C. § 10301(a). Courts have consistently found that when all of a public body's seats are elected city-wide, that can dilute the vote of communities of color, allowing a majority voting bloc to win 100% of the seats in 100% of the elections and depriving communities of color of equal voting opportunity. *See, e.g., Metts v. Murphy*, 363 F.3d 8, 10 (1st Cir. 2004) (noting that such a system has "an obvious potential to submerge the electoral power of even a substantial and cohesive minority bloc.").

As a result, elected bodies under such systems often fail to reflect the diversity of the community, and issues of importance to communities of color are neglected or ignored.

Evidence That Haverhill's Electoral System Is Diluting the Vote of Communities of Color

There is strong evidence to indicate that this is exactly what is occurring in Haverhill. The City is extremely diverse – and becoming more so with each successive year. Census estimates show that communities of color account for nearly 30% of the City's population, with significant numbers of Latinx residents (23%) in particular – numbers that are likely to increase even further when Census 2020 data is released later this year. The Haverhill Public Schools are even more diverse than the City as a whole, with approximately 50% students of color (40% Latinx).

By contrast, the City Council and School Committee do not remotely reflect this diversity; both bodies are all white and have been so for virtually all of Haverhill's history. Moreover, voting patterns indicate that, were candidates of color allowed to run in ward- or district- based as opposed to city-wide elections, such candidates would win. This in turn would enhance diversity on Haverhill's elected bodies and help ensure the accountability and responsiveness to Haverhill's communities of color that are currently lacking.

As you may know, the City of Lowell, Massachusetts recently settled a federal Voting Rights Act lawsuit brought by our organization on behalf of Asian-American and Latinx voters, which raised nearly identical issues. *Huot et al. v. City of Lowell et al.*, 1:17-cv-10895 (D. Mass. 2017). Like Haverhill, Lowell had an electoral system in which all candidates ran city-wide. Also like Haverhill, Lowell is extremely diverse yet had not seen that diversity reflected in its elected bodies over the years. Although Lowell had been presented with many opportunities to voluntarily change its system, it consistently refused to do so, ultimately forcing communities of color to bring a lawsuit to compel change. After years of costly litigation, the City settled the case in May 2019 and is now in the process of changing to a more fair and inclusive electoral system that will begin with the November 2021 elections. *See* WBUR, *A Lawsuit Challenged Lowell's Voting System. 2 Years Later, the City Agreed to Change It*, May 29, 2019 (available at https://www.wbur.org/news/2019/05/29/lowell-voting-rights-lawsuit-at-large-system).

Similarly, the City of Worcester is currently facing a Voting Rights Act lawsuit brought by our organization earlier this year on behalf of Latinx and Black residents regarding its method of electing its School Committee. *Worcester Interfaith et al. v. City of Worcester*, 4:21-cv-40015 TSH (D. Mass.).

Other municipalities have learned from the mistakes of Lowell and have taken proactive steps to change their electoral systems voluntarily. For example, after our organization raised similar concerns to the City of Everett about its at-large electoral system, the City Council voted to change the system without the need for a lawsuit. *See* BOSTON GLOBE, *How Underrepresented Candidates in Mass. Communities Can Be Squelched By Electoral Systems*, Jan. 26, 2021 (available at https://www.bostonglobe.com/2021/01/26/metro/how-underrepresented-candidates-mass-communities-can-be-squelched-by-electoral-systems/). We encourage Haverhill to similarly enact voluntary change. Over time, a more fair and equitable system would be expected to increase the diversity of Haverhill's City Council and School Committee as well as the responsiveness of those bodies to the City's communities of color, thereby strengthening the City as a whole.

In other instances where our organization has sent a demand letter such as this one, we and community allies have subsequently met and spoken with city officials and/or counsel to further discuss our concerns; the potential legal liability; and what concrete steps can be taken towards an acceptable alternative system. If you are interested in having that discussion to explore an expedited and amicable resolution, please let us know by August 6, 2021. We can be contacted by email at osellstrom@lawyersforcivilrights.org or by phone at (617) 988-0608.

Sincerely,

/s/ Ivan Espinoza-Madrigal

IVÁN ESPINOZA-MADRIGAL
Executive Director
OREN M. SELLSTROM
Litigation Director

cc: William Cox, City Solicitor
The Latino Coalition of Haverhill
Representative Andy Vargas

CITY COUNCIL

MELINDA E. BARRETT
PRESIDENT
COLIN F. LEPAGE
VICE PRESIDENT
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CITY OF HAVERHILL
HAVERHILL, MASSACHUSETTS 01830-5843

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4 SUMMER STREET
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www.cityofhaverhill.com
citycncl@cityofhaverhill.com

MINUTES OF THE CITIZENS OUTREACH COMMITTEE MEETING HELD ON FEBRUARY 20, 2020

A Citizens Outreach Committee meeting was held on Thursday, February 20, 2020 at 6:00PM in the City Council office, Room 204.

Committee Members: Committee Chairperson John Michitson, Vice President LePage, Councillors Sullivan and Jordan.
President Barrett and Councillor Macek also atended.

Attendees: Mayor Fiorentini, State Representative Vargas, School Committee Member Wood and 30 citizens attended *

The following Document Item #11-R was discussed:

1. Communication from Councillor John Michitson requesting to propose Citizens Outreach Committee meeting to enable citizens to address options and provide feedback on ways to study Haverhill's Charter, including but not limited to Ward Representation on City Council, in preparation for related Administration and Finance Committee meeting.

   Three themes emerged from Citizens Outreach Committee meeting on possible Charter changes. Here are the three major themes:

   a. Ballot question this Fall - for change to Ward & At Large Councillors only (hybrid option); rationale: simplify process with single question, do full blown Charter Commission in future; many favored 11 Councillors (7 Ward, 4 At Large) but some did not want to change number of City Councillors (7 Ward, 2 At Large.) Many said that Ward representation would ensure that every neighborhood has a voice. Some noted that that current barriers to run for office would be lowered if new candidates could focus solely on one ward instead of a city-wide campaign. It was stated that the City of Lowell had a law suit that forced the City to change to Ward and At Large City Councilors and School Committee members (hybrid option);
   b. Ballot question this Fall - for both Ward & At Large Councillors and School Committee; rationale: schools can benefit as well;
   c. Ballot question for full blown Charter Review. Some citizens favored a longer but deeper process. Rationale: not enough time to properly inform citizens on pros and cons for options a. and b. above for this Fall. Many cited other related issues in City to consider, such as term limits, longer terms of office (e.g. 4 years for Mayor and City Council), and alternatives to the current strong Mayor form of government in Haverhill to better balance power between Mayor and City Council.

CITY COUNCIL

MELINDA E. BARRETT
PRESIDENT
COLIN F. LEPAGE
VICE PRESIDENT
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WILLIAM J. MACEK

CITY OF HAVERHILL
HAVERHILL, MASSACHUSETTS 01830-5843

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Mayor Fiorentini stated that he preferred only a single ballot question on Ward & At Large Councillors (hybrid option,) but he left open the possibility of an additional ballot question on the School Committee hybrid option. He also supported a full blown Charter Review following this November's election if that is what citizens preferred. Mayor Fiorentini stated that he would be submitting an order for a ballot question on an upcoming the City Council agenda. State Representative Vargas wanted to add a second ballot question this Fall on the School Committee hybrid option, to ensure that all neighborhoods have a voice. School Committee member Wood did not want to change the current School Committee structure.

A motion was subsequently made, seconded and voted in favor by all Committee members to adjourn.

Respectfully submitted,

John Michitson

John Michitson, Chairperson
Citizens Outreach Committee
Haverhill City Council

March 2, 2020

JAM/bsa

c: Mayor Fiorentini
Councillors

*Attendees: Milton Taylor, Dana Lovell, Susan Kane, Lee Kane, Penelope Davis, Jon Goldfield, Ken Quimby, Gary Huber, Dee O'Neil, Richard Katsiare, Christine Kwitchoff, Amy Maciel, Karen McNamara, Stephen Costa, Graciela Trilla, Porfirio Matias, Ismael Matias, Fermin De La Crus, Mike Anasi, John Bachmann, Demet Haksever, Jon & Alison Campell, Stephen Gordon, Bill Luz, Jeff Grassie, Joanna Dix, Jean Sanders, Kathy Rurak, John Grant

MINUTES OF THE CITIZENS OUTREACH COMMITTEE MEETING
HELD ON FEBRUARY 20, 2020

A Citizens Outreach Committee meeting was held on Thursday, February 20, 2020 at 6:00PM in the City Council office, Room 204.

Committee Members: Committee Chairperson John Michitson, Vice President LePage, Councillors Sullivan and Jordan.
President Barrett and Councillor Macek also atended.
Attendees: Mayor Fiorentini, State Representative Vargas, School Committee Member Wood and 30 citizens attended *

The following Document Item #11-R was discussed:

1. Communication from Councillor John Michitson requesting to propose Citizens Outreach Committee meeting to enable citizens to address options and provide feedback on ways to study Haverhill's Charter, including but not limited to Ward Representation on City Council, in preparation for related Administration and Finance Committee meeting.

   Three themes emerged from Citizens Outreach Committee meeting on possible Charter changes. Here are the three major themes:

   a. Ballot question this Fall - for change to Ward & At Large Councillors only (hybrid option); rationale: simplify process with single question, do full blown Charter Commission in future; many favored 11 Councillors (7 Ward, 4 At Large) but some did not want to change number of City Councillors (7 Ward, 2 At Large.) Many said that Ward representation would ensure that every neighborhood has a voice. Some noted that that current barriers to run for office would be lowered if new candidates could focus solely on one ward instead of a city-wide campaign. It was stated that the City of Lowell had a law suit that forced the City to change to Ward and At Large City Councilors and School Committee members (hybrid option);
   b. Ballot question this Fall - for both Ward & At Large Councillors and School Committee; rationale: schools can benefit as well;
   c. Ballot question for full blown Charter Review. Some citizens favored a longer but deeper process. Rationale: not enough time to properly inform citizens on pros and cons for options a. and b. above for this Fall. Many cited other related issues in City to consider, such as term limits, longer terms of office (e.g. 4 years for Mayor and City Council), and alternatives to the current strong Mayor form of government in Haverhill to better balance power between Mayor and City Council.

   Mayor Fiorentini stated that he preferred only a single ballot question on Ward & At Large Councillors (hybrid option,) but he left open the possibility of an additional ballot question on the School Committee hybrid option. He also supported a full blown Charter Review following this November's election if that is what citizens preferred. Mayor Fiorentini stated that he would be submitting an order for a ballot question on an upcoming the City Council agenda. State Representative Vargas wanted to add a second ballot question this Fall on the School Committee hybrid option, to ensure that all neighborhoods have a voice. School Committee member Wood did not want to change the current School Committee structure.

A motion was subsequently made, seconded and voted in favor by all Committee members to adjourn.

Respectfully submitted,

John Michitson

John Michitson, Chairperson
Citizens Outreach Committee
Haverhill City Council

March 2, 2020

JAM/bsa

c: Mayor Fiorentini
Councillors

*Attendees: Milton Taylor, Dana Lovell, Susan Kane, Lee Kane, Penelope Davis, Jon Goldfield, Ken Quimby, Gary Huber, Dee O'Neil, Richard Katsiare, Christine Kwitchoff, Amy Maciel, Karen McNamara, Stephen Costa, Graciela Trilla, Porfirio Matias, Ismael Matias, Fermin De La Crus, Mike Anasi, John Bachmann, Demet Haksever, Jon & Alison Campell, Stephen Gordon, Bill Luz, Jeff Grassie, Joanna Dix, Jean Sanders, Kathy Rurak, John Grant

13.2

CITY COUNCIL

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August 5, 2021

To: President and Members of the City Council:

Councillor Jordan and Councillor Michitson wish to propose a Housing Forum to address affordable housing crisis, preservation of open space and data-driven impact of proposed residential developments on City's infrastructure and services

Timothy Jordan /lae

City Councillor Timothy Jordan

John Michitson /lae

City Councillor John Michitson

5-X

JAMES J. FIORENTINI
MAYOR

CITY OF HAVERHILL
MASSACHUSETTS

CITY HALL, ROOM 100
FOUR SUMMER STREET
HAVERHILL, MA 01830
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WWW.CI.HAVERHILL.MA.US

July 23, 2021

City Council President Melinda Barrett and Members of the Haverhill City Council

RE: MSBA – Haverhill High School Roof Project

Dear Madame President and Members of the Haverhill City Council:

Please see attached order regarding MSBA funding for the Haverhill High School Roof replacement project. The Haverhill City Council is required to approve the HHS Gym Roof Funding as outlined in the attached documents. While the City Council must approve the funding for the full cost of the project, the MSBA will be reimbursing the City 76.84%. I recommend approval.

Very truly yours,

James J. Fiorentini
Mayor

JJF/lyf

IN CITY COUNCIL: July 27 2021
TO COME BACK AUGUST 10 2021 WITH LOAN ORDER
Attest:
_____City Clerk

Roll Loan order 36-D

Related communication

Massachusetts School Building Authority

Deborah B. Goldberg
Chairman, State Treasurer

James A. MacDonald
Chief Executive Officer

John K. McCarthy
Executive Director / Deputy CEO

June 23, 2021

The Honorable James J. Fiorentini, Mayor
City of Haverhill
The Office of the Mayor
4 Summer Street, Room 100
Haverhill, MA 01830

Re: City of Haverhill, Haverhill High School

Dear Mayor Fiorentini:

I am pleased to report that the Board of the Massachusetts School Building Authority (the "MSBA") voted to approve the Proposed Accelerated Repair Project (the "Proposed Project") in the City of Haverhill (the "City") for a partial roof replacement project at the Haverhill High School.

The Board approved an Estimated Maximum Total Facilities Grant of $928,828, which does not include any funds for potentially eligible Owner's or Construction Contingency Expenditures. In the event that the MSBA determines that any Owner's and/or Construction Contingency Expenditures are eligible for reimbursement, the Maximum Total Facilities Grant for the Haverhill High School Project may increase to $971,417. The final grant amount will be determined by the MSBA based on a review and audit of all project costs incurred by the City, in accordance with the MSBA's regulations, policies, and guidelines and the Project Funding Agreement. The final grant amount may be an amount less than $928,828.

Pursuant to the terms of the MSBA's Accelerated Repair Program, the City has 90 days to acquire and certify local approval for an appropriation and all other necessary local votes or approvals showing acceptance of the cost, site, type, scope and timeline for the Haverhill High School Project. Upon receipt of the certified votes demonstrating local approval, the MSBA and the City will execute a Project Funding Agreement, which will set forth the terms and conditions pursuant to which the City will receive its grant from the MSBA. Once the Project Funding Agreement has been executed by both parties, the City will be eligible to submit requests for reimbursement for Proposed Project costs to the MSBA.

We will be contacting you soon to discuss these next steps in more detail, but in the meantime, I wanted to share with you the Board's approval of the Haverhill High School Project in the City of Haverhill for the partial roof replacement at the Haverhill High School, and the Board's authorization to execute a Project Funding Agreement for this Proposed Project.

Sincerely,

John K. McCarthy
Executive Director

Cc: Legislative Delegation
Melinda E. Barrett, President, Haverhill City Council
Scott Wood, Jr., Vice-Chair, Haverhill School Committee
Dr. Margaret Marotta, Superintendent, Haverhill Public Schools
Gregory Walsh, Owner's Project Manager, PCA360
Rick Ames, Designer, Next Phase Studios
File: 10.2 Letters

Document 26-D

CITY OF HAVERHILL

In Municipal Council July 27 2021

Ordered:

That the City of Haverhill appropriate the amount of One Million Three Hundred Forty-Three Thousand Two Hundred Eighty-Three ($1,343,283.00) Dollar for the purpose of paying costs of the roof replacement project at the Haverhill High School Gymnasium, 137 Monument Street, Haverhill, MA, including the payment of all costs incidental or related thereto (the "Project"), which proposed repair project would materially extend the useful life of the school and preserve an asset that otherwise is capable of supporting the required educational program [and for which the City of Haverhill may be eligible for a grant from the Massachusetts School Building Authority ("MSBA"), said amount to be expended under the direction of Haverhill Public Schools. To meet this appropriation the Haverhill City Council, is authorized to borrow said amount under M.G.L. Chapter 44, or pursuant to any other enabling authority. The City of Haverhill acknowledges that the MSBA 's grant program is a non-entitlement, discretionary program based on need, as determined by the MSBA, and any project costs the City of Haverhill incurs in excess of any grant approved by and received from the MSBA shall be the sole responsibility of the City of Haverhill]; provided further that any grant that City of Haverhill may receive from the MSBA for the Project shall not exceed the lesser of Seventy-Six and Eighty-Four one hundredths percent (76.84%) of eligible, approved project costs, as determined by the MSBA, or (2) the total maximum grant amount determined by the MSBA;; and that the amount of borrowing authorized pursuant to this vote shall be reduced by any grant amount set forth in the Project Funding Agreement that may be executed between the City of Haverhill and the MSBA.

Loan Order

PLACED ON FILE for at least 10 days
Attest:

_____City Clerk

ARTICLE

To see if the City of Haverhill will vote to appropriate, borrow or transfer from available funds, an amount of money to be expended under the direction of Haverhill Public Schools for the roof replacement project at the Haverhill High School Gymnasium, 137 Monument Street, Haverhill, MA, which proposed repair project would materially extend the useful life of the school and preserve an asset that otherwise is capable of supporting the required educational program and for which the City may be eligible for a school construction grant from the Massachusetts School Building Authority ("MSBA"). The City acknowledges that the MSBA's grant program is a non-entitlement, discretionary program based on need, as determined by the MSBA, and any project costs the City incurs in excess of any grant approved by and received from the MSBA shall be the sole responsibility of the City. Any grant that the City may receive from the MSBA for the Project shall not exceed the lesser of Seventy-Six and Eighty-Four one hundredths percent (76.84%) of eligible, approved project costs. as determined by the MSBA, or (2) the total maximum grant amount determined by the MSBA.

MOTION/VOTE/ORDER

That the City of Haverhill appropriate the amount of One Million Three Hundred Forty-Three Thousand Two Hundred Eighty-Three ($1,343,283.00) Dollar for the purpose of paying costs of the roof replacement project at the Haverhill High School Gymnasium, 137 Monument Street, Haverhill, MA, including the payment of all costs incidental or related thereto (the "Project"), which proposed repair project would materially extend the useful life of the school and preserve an asset that otherwise is capable of supporting the required educational program [and for which the City of Haverhill may be eligible for a grant from the Massachusetts School Building Authority ("MSBA"), said amount to be expended under the direction of Haverhill Public Schools. To meet this appropriation the Haverhill City Council, is authorized to borrow said amount under M.G.L. Chapter 44, or pursuant to any other enabling authority. The City of Haverhill acknowledges that the MSBA 's grant program is a non-entitlement, discretionary program based on need, as determined by the MSBA, and any project costs the City of Haverhill incurs in excess of any grant approved by and received from the MSBA shall be the sole responsibility of the City of Haverhill]; provided further that any grant that City of Haverhill may receive from the MSBA for the Project shall not exceed the lesser of Seventy-Six and Eighty-Four one hundredths percent (76.84%) of eligible, approved project costs, as determined by the MSBA, or (2) the total maximum grant amount determined by the MSBA;; and that the amount of borrowing authorized pursuant to this vote shall be reduced by any grant amount set forth in the Project Funding Agreement that may be executed between the City of Haverhill and the MSBA.

(151)

PROCLAMATION

IN HONOR OF THE MILITARY ORDER OF THE PURPLE HEART

WHEREAS, The Purple Heart is the oldest military decoration still in present use and was initially created by George Washington in 1782, as the "Badge of Military Merit"; and,

WHEREAS, The Purple Heart was the first American Service Award made available to the common soldier, and is awarded to any member of the United States Armed Services wounded or killed in combat with a declared enemy of the United States; and,

WHEREAS, The mission of The Military Order of the Purple Heart, chartered by an act of Congress, is to foster an environment of goodwill among the combat-wounded Veteran members and their families; to promote patriotism; to support related legislative initiatives; and, most importantly, to make sure we never forget the sacrifices made by those so decorated; and,

WHEREAS, There have been many former Haverhill residents who made the ultimate sacrifice in giving their lives in the cause of freedom, and there are numerous combat-wounded Veterans who currently reside within the City, and as Purple Heart awardees who contribute to their community in countless ways; and,

WHEREAS, Haverhill falls within the purview of Chapter 875 of the Military Order of the Purple Heart, and wishes to pledge its strong support for this noble organization and for those who put their lives at risk in service of their Country and their fellow citizens.

NOW, THEREFORE I, JAMES J. FIORENTINI MAYOR of the City of Haverhill, Massachusetts, do hereby declare that honor and gratitude be bestowed upon the Military Order of the Purple Heart Chapter 875, recognizing the City of Haverhill as a

"Purple Heart City in the State of Massachusetts"

IN WITNESS WHEREOF, I hereunto Set My Hand And Caused The Seal Of The City Of Haverhill To Be Affixed This 7th Day Of August In The Year Of Our Lord Two Thousand and Twenty-One.

JAMES J. FIORENTINI, MAYOR

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DOCUMENTS REFERRED TO COMMITTEE STUDY

38-W	Communication from Councillor Barrett requesting to give an update on response from MBTA/Keolis & US EPA about idling trains in Bradford	Citizens Outreach	4/5/16 1/31/17
10-B	Communication from President Michitson asking to request from Mayor status of facility improvements to public buildings and parks to comply with American w/ Disabilities Act (ADA)	Citizens Outreach	1/3/17 1/31/17, 8/15/17
10-U	Communication from President Michitson requesting discussion on next steps to provide comprehensive long range plan for Haverhill	Citizens Outreach	1/31/17 8/15/17, 4/23/18
38-D	Communication from Councillors Sullivan and Barrett requesting an update on City's emergency management plan and status of working generators in all public building in City	Public Safety	3/20/18 1/23/19
79-F	Communication from Councillor Sullivan requesting to introduce Kathleen Fitts, Gale Park Assoc. to request the city replace the Gale Park Fountain in fiscal year 20	NRPP	6/25/19
79-T	Communication from Councillors Sullivan and Barrett re: discussion with VINFEN & Haverhill Police Dept. regarding incident in neighborhood of 20 Westland Ter. group home on 7/5 and steps being taken to better supervise residents and reduce police calls to residence	Public Safety	7/23/19
89-K	Communication from Councillor Macek requesting open discussion relative to the process for Establishing a Charter Commission to review the current City of Haverhill Charter	Citizens Outreach	8/6/19
89-U	Communication from Councillor LePage re: applying for Community Compact Best Practices Program grant for benefit of city and its residents	Citizens Outreach	9/17/19
89-V	Communication from Councillor McGonagle requesting a discussion about school bus safety	Public Safety	9/17/19
11	Communication from Councilor Jordan requesting to introduce Steve Costa of Citizens for Haverhill Fire to discuss Mayor's CIP and occupational cancer	Public Safety	1/7/20
34-P	Communication from Councillor Sullivan requesting a discussion regarding the disposal of cremated remains on public property	NRPP	3/17/20
58-M	Communication from Councillors LePage and Daly O'Brien re: the possible use of Hale Hospital Trust Funds for ongoing City health care programs and issues	A & F	4/21/20
69-O	Communication from President Barrett and Councillor Sullivan requesting discussion on illegal fireworks in the City	Public Safety	7/28/20
86-D	Communication from Councillor Michitson requesting to address economic development ideas resulting from the pandemic	Planning & Dev.	8/11/20
86-F	Communication from Council President Barrett and Councillor LePage requesting discussion pertaining to utilization of UV-C disinfection fixtures in public buildings	A & F	8/25/20
89-C	Mayor Fiorentini submits final recommendations of Matrix Company	NRPP	9/15/20

DOCUMENTS REFERRED TO COMMITTEE STUDY

91	Petition from Wady & Jewnifer Grullon requesting to purchase city property that abuts their property at 14 Silver Birch Ln; Assessor's Map 574, Block 1 Lot 7	NRPP	9/15/20
91-B	Petition from the Biggart Family requesting to purchase 2 parcels of land that abuts their property at 30 Belvidere Rd., Assessor's Map 409, Block 114, Lot 9; and Map 409, Block 1A, Lot 1 that includes conservation land, but only the portion zone RMD (Residential Medium Density)	"	9/22/20
86-S	Communication from Councillors LePage, Sullivan and Macek to discuss process for approval of development projects within the Waterfront District Ch. 255, Article XVI	A & F	10/6/20
55-I	Communication from Council President Barrett and Councillor McGonagle requesting to introduce Don Jarvis, Keith Gopsill and Mike Ingham to discuss becoming a Purple Heart Community	NRPP	12/15/20
91-C	Petition of Michael DeLuca requesting to purchase surplus city land on River St., Map 538, Block 419B, Lots 20, 21, 22, 23	NRPP	12/15/20
4-I	Communication from Councillor Michitson requesting to address the rising inequities between high and low paid occupations in the United States	Citizens Outreach	1/12/21
4-Q	Communication from Councillor Macek requesting discussion on parking space requirements per zoning regulations throughout City	A & F	2/2/21
27-E	Communication from Councillor Sullivan requesting to introduce Debbie Lyons, to explain having legal permitting system as it relates to establishing permitting/licensing process to allow for "Bow Hunter Tree Stands" to be placed on trees on City properties when hunting is allowed in season	NRPP	3/2/21
27-J	Communication from Councillor Michitson requesting to re-start discussion on way ahead for residential zoning in Haverhill	Planning & Dev.	3/9/21
50	Councillor Jordan requests on behalf of Tom Riley, 195 Kingsbury Ave., to have city surplus land that abuts his property, Map 768, Block 50, Lot 85A on Lincolnshire Ave.	NRPP	4/6/21
27-X	Councillor Daly O'Brien requests discussion re: cars parking on Concord St. sidewalks and possibility of city providing off-street parking	NRPP	4/6/21
50-U	President Barrett and Vice President LePage request discussion about composting options	Citizens Outreach	5/18/21
50-W	Councillor McGonagle requests to discuss an option to reward first responders and frontline workers to receive bonus for working through pandemic	Public Safety	5/18/21

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LONG TERM MATTERS STUDY LIST

38-F Communication from Councillors Barrett and LePage requesting to discuss double poles in the City
A & F 3/15/16, 9/6/16, 11/3/16, 1/17/17, 5/11/17, 10/24/17, 3/6/19

26E City of Haverhill – Mayor's Recommendations, Capital Improvement Program – 2016-2020
A & F 5/31/16, 11/3/16, 5/11/2017, 7/25/17, 2/15/18, 3/6/19, 4/17/19

93-L Communication from President Michitson requesting to introduce Dave Labrode to discuss street tree plantings
NRPP 8/7/18, 2/28/19, 2/27/20

38-J Communication from Councillor Macek requesting a discussion about reserve parking spaces at City Hall designated for Registry of Motor Vehicles
NRPP 3/19/19, 2/27/20

13-Y Communication from Councillor LePage to discuss accounting of revenue funds received from Licensed Marijuana establishments & their allocation to mitigate costs and impacts to city
A & F 3/12/19, 8/5/19

89-D Communication from Councillors LePage, Michitson, Jordan requesting discussion on reducing exposure of persons under 21 yrs. of age to outdoor advertising (billboards) of marijuana productsand zoning regulations pertaining to smoke and/or vapor stores in Haverhill
A & F 7/23,19, 8/16/19