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March 19, 2025

City of Concord Planning Board Attention: Richard S. Woodfin, Chair 41 Green Street Concord, NH 03301

#### Re: Major Site Plan Review & Conditional Use Permit Application City of Concord Landfill 5.0 MW AC Solar PV Development 77 Old Turnpike Road, Concord, NH 03301

To Whom it may Concern:

Weston & Sampson Engineers, Inc. (Weston & Sampson), on behalf of the City of Concord, NH and Kearsarge Energy (d/b/a Kearsarge Old Turnpike Road LLC) is hereby enclosing the combined Major Site Plan Review and Conditional Use Permit Application Package and supporting documentation for the proposed solar photovoltaic (PV) development at the Concord Municipal Landfill for your review.

The project parcel is located on an approximately 52.92-acre parcel of City-owned land located at address 77 Old Turnpike Road (Map 751Z, Lot 21) in Concord, New Hampshire. This parcel is zoned in the Industrial Zoning District and is not located within any overlay districts. The development of a solar PV array is an allowable use in the Industrial Zoning District with receipt of a Conditional Use Permit identified by use K14 in the Table of Accessory Uses located in the City of Concord Code of Ordinances in Article 28-2-4(k).

The narrative included with this application package meets the criteria set forth in the Zoning Ordinance for the Conditional Use Permit requested and the general criteria for the issuance of Conditional Use Permits in Article 28-9-4(b). The project also requires a major site plan review, thus according to Article 28-9-4(b), "Where other development approvals including subdivision or site plan approval by the Planning Board are required for the use for which a conditional use permit is sought, the application review procedure for a conditional use permit may be made concurrently with the application for subdivision or site plan approval, and in accordance with the procedures specified in the... Site Plan Regulations, as applicable to the particular development.". This application package is a combined Conditional Use Permit and Major Site Plan Review Application Package.

The site has met the threshold for Major Site Plan Review as the proposed solar use involves the installation of more than 10,000 square feet of impervious surface which includes the new gravel access road, concrete equipment pads, and the area covered by the solar panels (as required by NHDES Alteration of Terrain regulations). The project does not include the construction of any residential units, buildings, or structures, or parking / loading areas.

Below are applicable dimensional requirements and tabulations required by the Conditional Use Permit Application Checklist and Major Site Plan Checklist which are included with this combined application package.

Dimensional Requirement	Required	Existing	Proposed
Minimum Lot Area	40,000 sf	52.92 ac	52.92 ac
Frontage	200 ft	1405 ft	1405 ft
Building Setback (Front)	50 ft	N/A	N/A
Building Setback (Back)	30 ft	N/A	N/A
Building Setback (Side)	25 ft	N/A	N/A
Buildable Land Area		27.62 ac (non-forested	23.36 ac (for solar
		area)	array)

Steep Slopes Greater than	 43.0%	43.0%
15%		
Steep Slopes greater than	 29.9%	29.9%
25%		
Impervious Surface Area	 110,717 sf	356,199 sf
Parking Lot Area (including	 N/A	N/A
aisles and driveways)		
Required Open Space	 N/A	N/A
Number of Dwelling Units	 N/A	N/A
Residential Density	 N/A	N/A
Square Footage of Non-	 52.92 ac (whole site as	23.36 ac (for solar
Residential Uses	landfill use)	array)

The project will not disturb wetland resource areas or wetland buffers located on site. The site does not contain any bluffs or ravines or associated setbacks. The project site is not zoned within a shoreland protection (SP) district thus does not include any shoreland protection district buffers (see zoning district map included in **Attachment A**). The project parcel is not located near any aquifer protection areas (see **Attachment A**). The project does not involve the disturbance of the landfill cap thus no site slopes will be changed due to the solar use proposed.

#### **Tabulations**

52.92 ac	Gross acreage (Gross Land Area)
23.36 ac	Square feet or acres devoted to the various uses. (Limit of Work Area for solar use)
N/A	Ground coverage of buildings and structures in square feet and percent. (No existing or proposed
	buildings on site)
N/A	Ground coverage for parking and loading areas including aisles and internal landscaping in
	square feet and percent. (No parking or loading areas proposed)
N/A	Internal parking lot landscaping in square feet and percent. (None proposed)
_356,199 sf_	Impervious surface coverage in square feet (Including area underneath panels)
_12.96%	Impervious surface coverage in percent (Including area underneath panels)
N/A	Useable land area calculations for residential development and net land area calculations for
	non-residential development.
N/A	Total number of dwelling units, and total numbers of dwelling units by type and number of
	bedrooms.
N/A	Square feet of floor area by type of use for all non-residential uses.
N/A	Projected number of employees by shift if necessary for calculating required parking.
N/A	Building occupancy or fixed seating if necessary for calculating required parking.
N/A	Calculations of required parking and loading areas, including handicapped and compact
	spaces.
N/A	Parking and loading areas provided including handicapped and compact spaces.

The project is proposed to begin construction in July 2025 and be completed by the end of 2025. The start of construction will not begin before receipt of the City Major Site Plan Review Application Approval and Conditional Use Permit as well as the applicable State permit approvals. The project has also required multiple State Applications which are listed below:

- NHDES Alteration of Terrain Application
  - Date of submittal: October 25, 2024
  - Date of RFMI Comment Response Submittal: February 7, 2024
- NHDES Solid Waste Management Bureau Type 1-B Permit Modification
  - o Date of Submittal: January 31, 2025
- New Hampshire Fish & Game Consultation Request
  - o Date of Submittal: January 7, 2025
  - o Date of RFAI Comment Response Submittal: February 28, 2025



The City should have record (either physical or electronic) of all of these permit applications. Please let us know if physical or digital copies need to be resent.

The project is not expected to require any waivers from the Site Plan Regulations. The project has not required any variances or special exceptions from the Zoning Board of Adjustment.

As part of the filing, we have attached the following:

- Major Site Plan Review and Conditional Use Permit Narrative
- Major Site Plan Review Checklist
- Conditional Use Permit Application Checklist
- Major Site Plan Review Fee Check:
- Conditional Use Permit Fee Check:
- Attachment A Maps & Figures
- Attachment B Design Plans
- Attachment C One-Line Diagram and Electrical Specifications
- Attachment D Photo Log
- Attachment E Owner Authorization Form
- Attachment F Abutter List
- Attachment G New Hampshire Natural Heritage Bureau Datacheck Results Letter
- Attachment H NRCS Web Soil Survey and Rainfall Data
- Attachment I Stormwater Calculations
- Attachment J Stormwater Inspection & Maintenance Manual
- Attachment K Closure Plan

Should you have any questions, please contact Rob Bukowski at (978) 532-1900 or Bukowski.Rob@wseinc.com.

Sincerely, WESTON & SAMPSON ENGINEERS, INC.

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Robert J. Bukowski, PE Principal Engineer/Project Manager







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# REPORT

March 2025

# Kearsarge Old Turnpike Road LLC City of Concord, NH

Major Site Plan Review & Conditional Use Permit Application Package Concord Municipal Landfill 5.0 MW AC Solar PV Development



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#### EXECUTIVE SUMMARY

Weston & Sampson Engineers, Inc. (Weston & Sampson), on behalf of Kearsarge Old Turnpike Road LLC (Kearsarge) and the City of Concord, NH, is hereby submitting this report describing the development of a ground-mounted solar photovoltaic (PV) array on the Concord Municipal Landfill. The City of Concord, through a public Request for Proposal (RFP) procurement process, selected Kearsarge Energy LLC (d/b/a Kearsarge Old Turnpike Road LLC) to design, permit, construct, own, operate, and maintain a ground-mounted solar PV array on the landfill.

The proposed project includes deploying ground-mounted solar on the existing impermeable landfill cover system (landfill cap). Concrete equipment pads for the electrical equipment will be located off the landfill cap. The total capacity of the proposed solar installation is approximately 5.0 megawatt (MW) alternating current (AC).

The solar PV array is to be supported on concrete ballasted foundations and will have a low bearing pressure that is designed to maintain the integrity of the impermeable landfill cap. Each block will be placed based on the foundation manufacturer's requirements, with dense-graded crushed stone or recycled concrete aggregate (RCA) used to level the blocks as required. Panel racking will be installed above the ballasted foundations and solar PV modules will be attached to the racking. The series of PV panels will be connected using above ground cables, cable trays, and conduits that would bring the wiring to a central equipment pad located off the landfill cap.

The existing chain link fence will be upgraded and used to provide security and separation of any unqualified personnel from any electrical conductors, as required by the National Electric Code. Where the existing fence is not available, new fence sections will be installed supported by either driven posts (off-cap) or concrete ballasts (on-cap). The project is expected to begin in July 2025, and to be completed by the end of 2025.

The proposed project involves the construction of a solar array that is comprised of more than 100,000 square feet and thus an Alteration of Terrain Permit Application has been submitted to NHDES as well as a Type 1-B Permit Modification Application due to the new use proposed on the landfill. A consultation request with New Hampshire Fish & Game has also been initiated at the request of the NHDES AOT Bureau.



# 1.0 INTRODUCTION

#### 1.1 Project Description

Weston & Sampson has prepared this report on behalf of Kearsarge Old Turnpike Road LLC (Kearsarge) and the City of Concord, NH to develop a ground mounted solar PV array atop the landfill located at 77 Old Turnpike Road in Concord, NH (the project). The City of Concord selected Kearsarge to design, permit, construct, own, operate, and maintain a ground-mounted solar photovoltaic (PV) array on the landfill.

The landfill will continue to be owned by the City of Concord and operated under contract by Casella Waste Systems Inc, where Kearsarge, its successors, or assigns, will own, operate, and maintain the solar generating asset. The landfill has been covered with an impermeable final cover system (landfill cap). The long-term monitoring and care for the landfill is provided by the City of Concord. The City of Concord has engaged CMA Engineers, Inc. as its environmental consultant to assist with the monitoring and post-closure reporting requirements of the site.

Interconnection service will be provided in accordance with agreement and standards established by electrical tariff by Unitil Corporation, the local utility.

#### 1.2 Background & Site Regulatory History

According to the November 1993 Post-Closure Maintenance and Monitoring Plan, the Concord Municipal Landfill ended operations in 1993. The landfill was capped with an impermeable landfill cover system (landfill cap) in 1994. The cap reportedly includes the following components:

#### Landfill Cover System (Landfill Top) (From the Ground Surface Down)

6-inches Topsoil (Vegetative Support Soil)
24-inches Compacted Soil (Ordinary Fill)
Drainage Net with Overlying Nonwoven Needlepunched
Geotextile
40-MIL PVC Geomembrane
12-inches Bedding Sand
Compacted Refuse and Soil Cover

#### Landfill Cover System (Landfill Sideslopes) (From the Ground Surface Down)

6-inches Topsoil (Vegetative Support Soil)
36-inches Compacted Soil (Ordinary Fill)
Drainage Composite
40-MIL PVC Geomembrane
12-inches Bedding Sand
Compacted Refuse and Soil Cover

The landfill has 13 groundwater monitoring wells, 4 Surface Water stations, and 1 leachate seep for sampling. The Inspection Schedule included in the Post-Closure Maintenance and Monitoring Plan from November 1994 indicated testing for the groundwater monitoring wells was to be conducted in April,



July, and November each year for parameters including specific conductance, pH, Chloride, Nitrate, TKN, Iron, Manganese, and Static Water Elevation. The groundwater monitoring wells were to be sampled annually in July for VOCs. The current monitoring plan indicated in the 2018 Groundwater Summary Report "includes the analysis of indicator parameters, iron, and manganese during each year in April and analysis of per and polyfluoroalkyl substances at three locations in April". The proposed Type 1-B modification will not affect or alter the landfill's monitoring, inspection, or maintenance schedules or methods.

The landfill has an existing surface runoff management system including two (2) riprap lined drainage swales located around the north and south perimeters of the landfill at the toe of the slope. The swales include a 6" PVC underdrain pipe. The swale on the north and northwest side of the landfill has periodic underdrain downpipes which discharge runoff to riprap aprons downslope of the landfill cap. The swale on the east and southeast side of the landfill discharges to a detention basin on the southwest corner of the landfill parcel near Old Turnpike Road.

#### 1.3 Site Location and Description

The landfill is located on an approximately 52.92-acre parcel of City-owned land identified by Map 751Z, Lot 21. The proposed solar PV array will be located entirely within this parcel. To the south of the landfill is another parcel owned by the City of Concord at Map 754Z, Lot 1 with an approximate land area of 5.5 acres. Access to the landfill and solar PV array from Old Turnpike Road will be by an access easement through this parcel. This parcel includes the active Solid Waste Transfer Station.

The landfill is bordered largely by undeveloped wooded land to the north and west. Old Turnpike Road runs along the south and eastern boundaries of the landfill. There are multiple commercial buildings located between the landfill and Old Turnpike Road including the Solid Waste Transfer Station and an automotive repair store. One nontidal freshwater wetland was identified approximately 200 feet northwest of the landfill, and one intermittent stream exists in the wooded area approximately 150 to 200 feet to the north and northwest.

A Unitil Corporation 40-foot-wide easement runs from southeast to northwest across the site and directly over the landfill cap. The electric utility includes poles and overhead electric wires. The electric utility has separately engaged with the City to relocate the easement off the landfill – the poles and wires will be relocated off the landfill cap before the solar array construction begins.

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# 2.0 PROPOSED PROJECT

#### 2.1 Proposed Solar Project

The proposed landfill use includes deploying ground-mounted solar on the existing landfill cap. The total capacity of the proposed solar installation is approximately 5.0 MW alternating current (AC).

The solar PV array will be mounted on pre-cast concrete ballasted foundations. The solar modules will be connected using above ground cable trays or conduits that will lead to equipment pads. From the equipment pads, cabling will run above ground until off cap and will then run underground, along the gravel access road until rising above ground to be connected to the electric utility via above ground poles running in parallel with the proposed gravel access road out to Old Turnpike Road. The general layout of the solar PV array and interconnection route is depicted on Sheet C101 of the attached plans (Attachment B).

The solar PV array supported on concrete ballasts will have a low bearing pressure that will not damage or compromise the integrity of the landfill cap. Each block will be placed on dense-graded crushed stone to level the blocks to meet the foundation manufacturer's requirements.

The existing chain link fence will be upgraded and used to provide security and separation of any unqualified personnel from any electrical conductors, as required by the National Electric Code. Where the existing fence is not available, new fence sections will be installed and supported by either driven posts (off-cap) or concrete ballasts (on-cap). The project is expected to be completed by the end of 2025.

The access road will be constructed near the southwestern corner of the parcel running across Map 754Z, Lot 1 and intersecting with Old Turnpike Road. Existing access ways on the landfill cap will be used, and improved as necessary, for construction vehicles and equipment during construction. Temporary access roads may also be used during construction as shown on the drawings. Any temporary access roads will be removed and the ground surface will be restored to pre-construction conditions following completion of construction. A stabilized construction vehicles prior to leaving the site. This construction entrance/exit will be maintained by the contractor throughout construction. Construction vehicles will include (but are not limited to) delivery trucks, utility vehicles and construction equipment (excavator, skid steer, etc.).

Access to the landfill from the temporary access drive during construction will be by low ground pressure construction equipment with a maximum allowable ground pressure of 10 pounds per square inch (psi). The contractor will be required to submit equipment specification sheets showing applied ground pressure for review prior to bringing equipment on-site. Site inspections during construction will include settlement monitoring. Site inspections will also ensure that construction activities are not causing unintended erosion of the landfill cap surface.

The project is expected to be completed by the end of 2025. Notice will be provided to NHDES prior to start of construction and documentation of construction completion will be filed following completion. Prior to commencement of construction of the Solar Array, the Utility will be completing the relocation of the existing wires and poles that currently traverse the cap. As requested by the NHDES, the Utility was

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consulted to confirm the approach that will be taken during removal of the poles and wires. We anticipate the work to be done under the following process as described to us by the utility:

- Decommissioning and removal of the conductors can be completed using walk on teams with hand tool.
- Linesmen will climb poles or use low-ground pressure lifts to complete disconnection work.
- The poles themselves will be cut flush with the landfill surface and overtopped with bentonite or gravel.
- Poles can be deconstructed in sections with hand tools, with sections lowered to the ground in a controlled fashion to avoid any surface impact, with transportation of post sections off the cap using low ground pressure equipment.

#### 2.2 Project Schedule

The anticipated project milestones are as follows:

Table 1. Project Schedule			
Project Milestone	Date		
Concord Planning Board Submittal	March 2025		
Concord Planning Board Approval	April 2025		
Start of Construction	July 2025		
Substantial Completion	November 2025		
Commercial Operation Date (COD)	December 2025		

This schedule is contingent upon Concord local approval and NHDES approvals, construction schedule, weather, and the availability of all materials including the modules, rack assemblies, ballast blocks, and medium voltage equipment.

#### 2.3 PV Electrical Generation Equipment

The proposed solar PV module strings will feed into one inverter. Aside from the PV modules and inverter, the major site equipment includes the alternating current (AC) electrical panel, transformer, and data acquisition systems (DAS) mounted on the equipment pad.

Preliminary specifications are as follows:

Table 2. Typical Generation Equipment Specifications			
Equipment	Specification	Count	
Photovoltaic Modules	Q.PEAK DUO XL-G11S	11,976	
String Inverters	Solectria XGI 1500-250 (250kW)	20	
Transformer	PAD MOUNTED	2	

This equipment is subject to final design and may change based on market availability at the time of construction. An electrical one-line diagram for the project, manufacturer specifications, and cut sheets for the above listed equipment are included in **Attachment C**.



The solar array design will utilize equipment and enclosures, appropriate to the environmental conditions associated with the landfill, and in accordance with the National Electrical Code (NEC).

#### 2.4 Cable Trays and Conduits

DC conductors are typically routed along integrated open cable trays within the racking of each row within the solar PV array. As the conductors run between array rows and traverse the landfill to the inverters and equipment pads, they will be installed above grade in open cable trays, either mounted to the solar PV array ballasts, racking structure or independent ballasts as applicable.

From the inverter(s), the low voltage conductors will be routed to centrally located equipment pads that will typically support he AC Switchboards, Data Acquisition Systems and Transformer(s). The purpose of the Switchboard is to aggregate the feeds from the inverters before routing to a Transformer that steps up the system voltage to match the voltage of the existing electric utility lines and allow interconnection with the Unitil grid. From the transformer pad, the conductors will run (above ground until off cap and then underground) to a riser pole where they will proceed overhead via additional poles (subject to final utility requirements) running parallel with the proposed gravel access road to the point of interconnection on Old Turnpike Road.

#### 2.5 Array Area

The total area of the solar PV array within the fence limits is approximately 21.4 acres. The racks will be oriented to face south. The distance between the edge of linear set of racks will be approximately 17 feet. The solar PV array layout is subject to final design but will remain within the proposed limits of work.

#### 2.6 Site Security

For security purposes and to comply with the NEC, the existing chain link fence, modified as required, will enclose the solar PV array and equipment pad areas. Any new areas of fence, installed on cap areas, will be supported by precast concrete ballast blocks.

#### 2.7 Interconnection

Kearsarge Old Turnpike Road LLC has secured an interconnection service agreement with Unitil Corporation, the local electrical utility. The interconnection service agreement primarily addresses the following three conditions:

- 1. Distributed generation (DG) operation does not cause harm or damage to the utility.
- 2. DG operation does not cause problems for other customers on the distribution system.
- 3. Safety of personnel and the public is not jeopardized by operation of the DG.

#### 2.8 Construction / Constructability

During construction, equipment distance will be maintained from all above ground existing features associated with the landfill (e.g., gas vents, monitoring wells, gas, probes, extraction wells, ground control markers, settlement points, and any other aboveground features) in order to allow for continued landfill inspection, monitoring, and maintenance. A 10-foot buffer around monitoring wells, vents, and above ground features must be maintained at all times to allow access. In addition, construction contractors and workers will be made aware of the gas hazards associated with solar array construction and operation on landfills.

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Any damage to the landfill cap that occurs during construction will be promptly repaired by the contractor and reported to NHDES. During the construction period bi-weekly reports will be sent to NHDES that include identification of damage and the measures taken to repair it.

Erosion and sedimentation (E&S) controls will be installed at the site prior to start of construction. Sediment barriers will be installed along the down gradient sides of the limits of disturbance to collect loose sediments during storm events. Support posts or stakes will be prohibited for use to secure barriers in place due to the existing landfill cap with impermeable liner, instead sandbags will be used to secure sediment barriers in place. Further detail on construction E&S controls is provided on the drawings included in **Attachment B**.

The access road will be constructed near the southwestern corner of the parcel running across Map 754Z, Lot 1 and intersecting with Old Turnpike Road. Temporary access onto the landfill cap will be installed as required for construction vehicles and equipment to use as needed during construction.

A stabilized construction entrance/exit will be installed along the first 50 feet of the site entrance to capture sediments from construction vehicles prior to leaving the site. This construction entrance/exit will be maintained by the contractor throughout construction. Construction vehicles will include (but are not limited to) delivery trucks, utility vehicles and construction equipment (excavator, skid steer, etc.).

Access to the landfill from the temporary access drive during construction will be by low ground pressure construction equipment with a maximum allowable ground pressure of less than 10 psi. The contractor will be required to submit equipment specification sheets showing applied ground pressure for review prior to bringing equipment on-site. Site inspections during construction will include settlement monitoring. Site inspections will also ensure that construction activities are not causing unintended erosion of the landfill cap surface.

#### 2.9 Pollution Prevention

Environmental concerns including air emissions, noise, transient lighting, and glare have been reviewed for the project.

#### 2.9.1 Air emissions

As power generation equipment is concerned, PV panels do not emit NO<sub>x</sub>, SO<sub>x</sub>, CO, CO<sub>2</sub>, particulates, or any other contaminants of concern.

#### 2.9.2 Noise

The PV panels themselves do not make any noise; the inverter units contain small fans to keep the equipment within its required operational temperature range and the transformer(s) emit a mild humming sound unique to that type of equipment. The inverters will be mounted within the array footprint on the backside of the racking and operate during the daylight production hours. The transformer(s) will be mounted on the equipment pad(s) located in the southwestern corner of the landfill parcel outside the limits of the landfill. The transformers are of a similar size to those typically used in urban and residential settings.

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#### 2.9.3 Transient Light and Glare

PV panels are designed to absorb as much light as possible in order to increase the efficiency with which the photocells convert solar radiation into electricity.

#### 2.10 Environmental Monitoring

The project shall maintain the following environmental monitoring:

- The current environmental monitoring program will not be changed.
- The current maintenance plan will not be changed.

The Lease Agreement outlines operation and maintenance responsibilities between the City of Concord and Kearsarge Old Turnpike Road LLC (the system owner). The City of Concord is not authorized to operate the PV system, except in case of emergency. The City of Concord will continue to be responsible for the operation and maintenance of the landfill cap. Kearsarge Old Turnpike Road LLC will be responsible for vegetation maintenance within the solar PV array area. A copy of the Operation and Maintenance Manual for the Solar PV array is included in the Closure Plan in **Attachment K**.

#### 2.11 Project Decommissioning

Decommissioning and site restoration will include dismantling and removal of all panels and supporting equipment, transformers, overhead cables, foundations, and restoration of the roads and module sites to substantially the same physical condition that existed immediately before construction of the facility. The landfill cap should not be excavated at any point and the drainage net/geomembrane should never be exposed during the construction process. Disturbed landfill cap will be graded with more ordinary fill and topsoil to restore conditions to existing grade and reseeded.

### 3.0 STORMWATER ANALYSIS

Stormwater runoff patterns for the Concord Municipal Landfill will not be significantly altered as part of the proposed project. Existing and proposed peak design flows were assessed using the National Resources Conservation Service (NRCS) Technical Release 55 (TR-55) methodology. HydroCAD<sup>®</sup> version 10.10-3a stormwater modeling software was used to analyze stormwater conditions. It is a comprehensive hydrodynamic modeling program which analyzes and designs site hydrology, surface drainage systems, and storm drains. It can manage a variety of flow situations such as overland flow, drainage swales, ponds, and piping systems. The precipitation estimates for the design storms were sourced from the Northeast Regional Climate Center (NRCC).

A summary of the analysis is provided below, the stormwater models, soils maps, and drainage area maps are included in **Attachment I.** 

#### 3.1 Existing Stormwater Flow

The Concord Municipal Landfill has an existing stormwater management system which includes 2 riprap perimeter drainage swales and a stormwater detention basin. The stormwater analysis for this project was modeled using the parcel property lines to the north, east, and west as a delineation for the watershed. The southern boundary of the watershed was based on the property line at Old Turnpike Road and captures the area of the proposed gravel access roadway which spans the area between the landfill and Old Turnpike Road.

The landfill has a peak in the middle of the property. Runoff flows off the cap in each direction and is captured by the riprap perimeter swales at the toe of the landfill slope. The riprap swales converge in the southwest corner of the parcel where culverts direct stormwater into a detention basin southwest of the cap. The detention basin includes two broad crested overflow weirs and a concrete outlet control structure which discharges runoff to a riprap swale within the City-owned wooded area in the southwest corner of the property. This swale ultimately discharges runoff to the Merrimack River west of the wooded area.

The model of the stormwater detention basin was based on available information provided to Weston & Sampson, including a drawing set entitled "Construction Plans for Closure of Municipal Landfill Old Turnpike Road Concord New Hampshire" prepared by Weston Designers & Consultants in November 1993. The parcel to the south of the landfill that houses the transfer station is assumed to flow south towards Old Turnpike Road, and eventually southwest along the road to the southwestern point of analysis. The area north of the riprap swales generally has topography that directs runoff away from the landfill cap to the stream located to the north of the landfill.

The model assumes a hydrologic soil group (HSG) C for both existing and proposed models within the limits of waste for the landfill, which were assumed to extend to the riprap perimeter swales. This HSG was selected based on the *Rhode Island Method for Determining Hydrologic Soil Group* and accounts for storage capacity in the 2.5 to 3.5 feet of cover soils overlying the geomembrane liner. NRCS soil types were used for areas outside of the landfill limits. **Figure 1** and **Figure 2** of **Attachment I** displays the boundaries of NRCS soil types in pre- and post-development conditions respectively. The existing land cover is made up of meadow, woods, gravel, and pavement. There is approximately 66,791 square feet of impervious cover in the existing watershed made up of pavement.

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Figure 3 of Attachment I displays the limit of the watershed, flow path, and existing ground covers. The existing conditions subcatchments include:

- Drainage Area E10 (E10) The portion of the site which surrounds the landfill on the north, east, and west sides. Generally drains away from the landfill towards the stream to the north of the landfill which eventually flows westerly offsite at the western boundary.
- Drainage Area E20 (E20) The southern portion of the landfill which drains south to the riprap perimeter swale. The southern perimeter swale runs northeast to southwest to the southwestern corner of the parcel. The runoff is directed to the detention basin.
- Drainage Area E21 (E21) The northern portion of the landfill which drains north to the riprap perimeter swale. The northern perimeter swale runs westerly then curves around the landfill and drains southerly to the southwestern corner of the parcel. The runoff is then directed to the detention basin.
- Drainage Area E22 (E22) The southern portion of the site beyond the southern landfill perimeter swale. Runoff is assumed to generally flow south away from the landfill, towards the parcel boundary at Old Turnpike Road, and then westerly toward the Merrimack River.

#### 3.2 Proposed Stormwater Flow

The proposed solar development does not significantly alter the stormwater flow patterns of the site. The existing landfill vegetative cover will be maintained to the maximum extent practicable. The postdevelopment watershed includes meadow, woods, gravel swales and roads, pavement, concrete equipment pads, and gravel levelling pads on which impervious concrete ballast blocks sit. The proposed gravel access road covers approximately 26,660 square feet of previously pasture and paved areas in existing conditions. The concrete equipment pads make up approximately 949 square feet, and the gravel levelling pads underneath the concrete ballast blocks make up approximately 25,326 square feet. Solar PV panels, which are modeled as impervious according to Alteration of Terrain (AOT) regulations, make up approximately 169,839 square feet of impervious (with varying cover numbers based on AOT Terrain Regulations).

The Alteration of Terrain regulation Env-Wq 1511.06(c) requires proposed condition land covers to be modeled as pasture in good condition. However, the landfill vegetative cover will not be changed as part of the development, with the exception of proposed site features which are modeled separately in the post-development hydrologic analysis (i.e. ballast block foundations, equipment pads, gravel access road, PV panels). The vegetated landfill surface within the solar facility will be maintained, and grassed areas disturbed during construction will be restored to match pre-construction conditions. Based on this information, the proposed condition land coverage for the grassed landfill cap will be the same as existing.

The proposed stormwater analysis uses a revised curve number (CN) accounting for the void space in the gravel levelling pad and vegetative support layer beneath the ballast blocks. The CN calculation is included in **Attachment I**, and uses 35% void space for the 6 inch thick gravel levelling pad and 30% void space for the 24 inch thick vegetative support layer.

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The proposed PV facility was evaluated to determine areas where stormwater runoff will emanate from panel drip edges as sheet flow in accordance with regulation Env-Wq 1511.05. The facility is designed such that the panel drip edges are more than 1.5 feet and less than 10 feet above the land surface, and the flow path distance between panels is equal to or greater than the flow path length over the panels. Additionally, greater than 85% vegetative cover will be maintained in the rows between panels. Runoff from the panels is assumed not to discharge as sheet flow where the panel drip edges are more than 60 degrees from parallel to the post-construction land contour lines. The CN for the panels was selected based on this sheet flow analysis and land slopes in accordance with Env-Wq 1511.06. CN values are indicated on **Figure 4** of **Attachment I**.

There is no proposed tree clearing for the project. There are minor grading changes associated with the construction of the gravel access road. The design does not require the installation of Best Management Practices (BMPs) as the stormwater runoff characteristics will remain largely the same for the majority of the site.

#### 3.3 Peak Discharge Summary

As summarized in Table 3 below, the proposed project shows minor increases in peak runoff rates from pre- to post- development conditions.

Table 3. Stormwater Peak Discharge Flow Rate Summary				
Analysis	24 Hr Storm	Peak Discharge (cfs)		Difference in Peak
Point		Pre-	Post-	Runoff (cfs)
POA-1 (Merrimack River)	1-yr	0.00	0.00	0.00
	2-yr	0.00	0.02	0.02
	10-yr	5.05	7.44	2.39
	25-yr	16.22	17.84	1.62
	50-yr	20.63	25.20	4.57
	100-yr	43.33	48.85	5.52

Stormwater runoff from the site flows over City-owned property prior to discharging to the Merrimack River.

#### 3.4 Capacity of Existing Stormwater Management Features

The existing stormwater management features at the landfill include the riprap lined swales and a detention basin. The stormwater design includes an evaluation of the peak ponding elevation within these structures under the 100-year storm condition. The purpose of this evaluation is to determine if the existing stormwater BMPs are capable of managing any increased flows from the proposed solar facility.

Attachment I includes tables summarizing the peak ponding elevation within the detention basin, and peak flow depths within the swales. The emergency spillway of the detention basin is not overtopped during the 100-year storm under proposed conditions. Additionally, the swales do not overtop under proposed conditions indicating the existing stormwater BMPs are capable of managing increased flows from the proposed development.

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#### 3.5 Pollutant Removal

BMPs for post-construction water quality are not practicable for the site since it is a landfill and grading for installation of BMPs would compromise the integrity of the existing landfill cap. Infiltration BMPs are generally not constructed on landfill caps to prevent infiltration of stormwater into the vegetative support layers where runoff will be intercepted by the impermeable geomembrane layer.

The NHDES Stormwater Manual water quality standards require the capture and treatment of the water quality volume to prevent off-site transport of contaminants (oils, heavy metals, sediments, etc.). The proposed additional impervious area, including concrete equipment pads, ballast blocks, and solar PV panels, are not a potential source of these contaminants. The proposed gravel access road will be used sparingly, likely only monthly during the first year following construction and annually thereafter.

Based on the modeling results, stormwater runoff patterns and rates are not significantly changed as part of the proposed project. Furthermore, since the site is a closed landfill, post construction stormwater treatment and infiltration BMPs are not proposed.

#### 3.6 Groundwater Recharge Volume

As stated above, the site is an existing landfill and infiltration of stormwater into the vegetative support layers of the landfill cap is not best practice and is to be avoided. Based on this information, stormwater infiltration BMPs are not practical and not warranted. Therefore, groundwater recharge calculations are not provided.

#### 3.7 Construction Phase Stormwater Management

Since the existing landfill cap is well-vegetated, there is lower potential for erosion and sedimentation (E&S). Perimeter E&S controls will consist of compost socks or wattles around the outside of the proposed array to prevent any sedimentation from entering the perimeter swale. A construction entrance/exit will also be placed at the end of the access road to prevent sediment migration onto public roads. Following construction, any disturbed areas will be seeded and, once vegetation is established, the perimeter E&S controls will be removed.

A Stormwater Pollution Prevention Plan (SWPPP) that outlines the proposed construction phase stormwater management will be prepared prior to construction and coverage under EPA's Construction General Permit (CGP) will be obtained through submittal of an electronic Notice of Intent (eNOI).

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# 4.0 NATIONAL HERITAGE BUREAU DATA CHECK

#### 4.1 Critical Habitat Review – National Heritage Bureau

A National Heritage Bureau (NHB) data check was completed for the Concord Municipal Landfill on July 17, 2024. The NHB results letter (NHB24-2209) is included in **Attachment G** of this permit application. It was determined through the online datacheck tool, which references the New Hampshire Natural Heritage Database, that there are currently no recorded occurrences for sensitive species on the project site. However, 2 Special Concern species, a Threatened species and an Endangered Species were noted near the project area. A request for consultation with the NH Fish and Game Department was submitted on January 7, 2025, and their recommendations will be taken into consideration and implemented as applicable prior to construction. It has been confirmed that a series of Grassland Bird Surveys will need to be conducted from May to July to search for presence of species of importance. The Grassland Bird Surveys will be conducted by NH Audubon.



#### 5.0 REFERENCES

- Roy F. Weston, Inc, 1993. Closure of Municipal Landfill Old Turnpike Road Post-Closure Maintenance and Monitoring Plan, City of Concord, New Hampshire. November, 1993.
- CMA Engineers, Inc., 2018. Groundwater Summary Report, Concord City Landfill, City of Concord, New Hampshire. May 29, 2018.

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