



Commonwealth of Massachusetts  
Executive Office of Energy & Environmental Affairs

## Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

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**May 20, 2013**

Bernard F. Lynch, City Manager  
City of Lowell  
375 Merrimack Street, 2<sup>nd</sup> Floor, Room 43  
Lowell, Massachusetts 01852

RE: LOWELL – Solid Waste/COR  
1020 Westford Street  
Westford Street Landfill  
FMF # 39434  
Post-Closure Use – Solar Power Generating Facility  
Approval and Authorization to Construct  
Transmittal Number: X254169

Dear Mr. Lynch:

The Massachusetts Department of Environmental Protection, Northeast Regional Office, Bureau of Waste Prevention, Solid Waste Section ("MassDEP ") has reviewed the City of Lowell's (the "City") application for the post-closure use of the closed Westford Street Landfill (the "Landfill") located at 1020 Westford Street, Lowell, Massachusetts. The application (category BWPSW36, "Post-Closure Use – Major", Transmittal Number X254169) was prepared and submitted to MassDEP on behalf of the City by AMEC Environment & Infrastructure, Inc., Westford, Massachusetts ("AMEC").

The application includes preliminary design plans for the installation of a 1.5 megawatt (MW) solar photovoltaic power generating facility ("PV Facility") on the Landfill. The City has entered a contract with Lowell Solar Landfill LLC of Framingham, Massachusetts for the installation and operation of the PV Facility.

The proposed PV Facility will consist of approximately 5,016 solar modules attached to aluminum frames. Three inverters will convert the DC power from the modules to AC power for connection to the regional electric power grid at Stedman Street.

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Within the area in which the solar panels will be placed the existing topsoil will be covered by crushed stone. The solar panel support frames will be supported on metal trays set on the surface of the crushed stone and ballasted with concrete blocks. The trays will be further secured against movement by twelve inch long galvanized steel spikes set through the crushed stone. The solar arrays will be placed on slopes with a surface gradient of less than nine percent (9%). Where necessary to reduce existing landfill gradients to maintain the maximum surface gradient to less than nine percent (9%), additional soil (gravel borrow) will be placed to regrade limited areas of slope.

Installation of two (2) groups of arrays will require removal/relocation of materials storage bunkers/structures at the DPW operations area adjacent to the salt shed. The plans provided with this application do not include provisions for the relocation or replacement of the bunkers/structures. The City has not applied to MassDEP for approval of modifications to the DPW operations area to relocate/reconstruct the bunkers/structures. MassDEP approval of relocation/replacement plans is necessary prior to any reconstruction/replacement of the bunkers/structures.

MassDEP has determined that the application is administratively and technically complete and that, subject to the terms and conditions of this decision and permit, the proposed post-closure use complies with the applicable requirements of 310 CMR 19.000, the Massachusetts Solid Waste Regulations (the “Solid Waste Regulations”),. The application demonstrates pursuant to 310 CMR 19.143(3) that the installation of the solar PV arrays as proposed and approved by this decision:

- Will not result in a disturbance of the Landfill cap that could cause an adverse impact to public health, safety or the environment;
- Will not impair the integrity or functioning of the final cover, the components of the containment system, the landfill gas control system, and the environmental monitoring systems; and
- Provides for the maintenance of the Landfill cap’s storm water drainage facilities, basins, swales, and other erosion/sedimentation controls.

Therefore, in accordance with M.G.L. Chapter 111, § 150A and 310 CMR 19.143, MassDEP approves the application and issues this Post-Closure Use Permit subject to the City’s compliance with 310 CMR 19.000 and the following conditions, imposed by MassDEP pursuant to 310 CMR 19.043(1) *Items Subject to Conditions* and 310 CMR 19.142(7) *Additional Measures*. This decision is a Post-Closure Use Permit pursuant to 310 CMR 19.143 *Post-Closure Use of Landfills*.

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### Permit Conditions

1. The City and Lowell Solar Landfill LLC shall comply with this permit and the requirements of 310 CMR 19.000, including, but not limited to, the requirements established at 310 CMR 19.043(5) *Standard Conditions*.
2. The City and Lowell Solar Landfill LLC shall assure persons conducting activities<sup>1</sup> at the PV Facility and Landfill are familiar with the applicable provisions of this permit and the approved plans, and that all work performed at the Landfill complies with 310 CMR 19.000 and the applicable requirements of this permit.
3. Pursuant to 310 CMR 19.043(5)(a) *Duty to Comply*, this decision does not relieve the City and Lowell Solar Landfill LLC, or others, from their obligations to comply with all other applicable federal and state laws and regulations including, but not limited acquiring applicable permits and approvals, including local permits.
4. New areas of loam placed pursuant to regrading of the landfill [re: “Typical Fill Section Detail (>1’ Thick)”]; drawing number C-9, sheet 10 of 12] shall be a minimum of 8 inches in depth and shall have an organic content<sup>2</sup> of not less than 8%.
5. Bunkers or other structures to be removed/relocated from the DPW operations area shall not be relocated/replaced unless and until application by the City has been made to and approved by MassDEP for the relocation/replacement of the bunkers/structures.
6. Not less than thirty (30) days prior to commencing construction pursuant to the application and this permit, the City shall submit to MassDEP (1) complete, detailed, construction ready plans for the facility, and (2) an O&M plan for the continuing care and maintenance of the landfill and the PV facility. Construction ready plans shall include amendments as applicable pursuant to condition 4 above.
7. Not less than seven (7) days prior to commencing construction pursuant to the application and this permit, the City shall notify MassDEP in writing of the scheduled date of the commencement of construction at the site. In addition, the notification shall include:
  - a. The projected schedule for completion of the major construction milestones and the PV Facility;
  - b. The name and contact information of an on-site contact for the construction;
  - c. A health and safety plan for MassDEP’s files that includes, but is not limited to:
    - i. protocols for monitoring for landfill gas (methane, hydrogen sulfide, etc.) as needed;
    - ii. protocols for modifying work practices if landfill gas is detected at levels of concern (action levels);

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<sup>1</sup> Activities include, but are not limited to, the construction, installation, operation, and maintenance of the PV Facility and the Landfill.

<sup>2</sup> As calculated by loss on ignition.

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- iii. instruction and training of all personnel working on the site regarding the potential health and safety hazards at the Landfill including, but not limited to those associated with landfill gas; and
  - iv. instruction and training of all personnel in compliance with the conditions of this permit and how to perform authorized activities in a manner that is not hazardous to public health, safety, and the environment.
8. The City and Lowell Solar Landfill LLC shall not commence construction of the PV Facility until it has provided the plans and notification to MassDEP and the City of Lowell Board of Health pursuant to Condition 6 and 7 above.
9. All construction work shall be completed and conducted under the supervision of an independent Massachusetts Registered Professional Engineer (“Engineer of Record”) who shall have sufficient qualified staff on-site to provide field supervision and quality assurance/quality control for all construction activities.
10. The City, Lowell Solar Landfill LLC, and the appertaining Engineer of Record, are responsible to ensure that all necessary precautions are taken to protect the health and safety of workers and the general public during the construction and operation of the PV Facility and during its decommissioning.
11. All disturbance of the Landfill shall be limited to the proposed excavations and installations as depicted and described in the application and the approved plans and this permit. Lowell Solar Landfill LLC and any other contractors performing work at the Landfill shall without delay notify the Engineer of Record or his/her on-site representative upon encountering or damaging the FML of the landfill cap
12. If the FML of the cap is damaged the City shall notify MassDEP without delay and in no case later than the close of business of the next business day after it becomes aware of the incident. This notification requirement is in addition to any other notification requirements required by statute or regulation including, but not limited to, 310 CMR 19.000 and 310 CMR 40.0000.
13. The City and Lowell Solar Landfill LLC shall maintain copies of this decision and permit, the application, the health and safety plan, and documentation that site personnel have been trained pursuant to the health and safety plan at the site during construction of the PV Facility.
14. Pursuant to 310 CMR 19.043 Standard Conditions MassDEP and its agents and employees shall have the right to inspect the Landfill, any equipment, structure or land located thereon, to take samples, to perform tests, and have access to and photocopy records, and to otherwise monitor compliance with this permit and all environmental laws and regulations administered by MassDEP.
15. Notice of the landfill located on this site, including this approval, shall be recorded in the applicable Registry of Deeds and/or the Registry Section of the Land, as appropriate, pursuant to the requirements of M.G.L. Chapter 111, § 150A and 310 CMR 19.141.

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16. Prior to commencing operation of the PV Facility, and in no event on or before ninety (90) days after the date of completion of the construction of the PV Facility, the City shall submit for review and approval by MassDEP a construction certification report, as an application category BWP SW45 Alternative Review Process, that includes, but is not limited to:
  - a. As-built plans for the final as constructed PV Facility amended to incorporate all modifications and alterations, if any, made during construction;
  - b. A narrative, prepared by the Engineer of Record that discusses in part, any modifications made to the design of the PV Facility;
  - c. A final O&M plan that consolidates inspection and maintenance activities at the Landfill into a consolidated comprehensive plan including any necessary revisions; and
  - d. Certifications by the City and the Engineer of Record pursuant to 310 CMR 19.011.
17. On or before 30 days after the date the PV Facility ceases operation, the City shall submit to MassDEP an application pursuant to 310 CMR 4.00 and 310 CMR 19.000 for the decommissioning of the PV Facility and the restoration of the landfill cap and appurtenances thereto. The application shall include, but not be limited to, a narrative, plans and schedule for the decommissioning of the PV Facility and the restoration of the Landfill's cap and appurtenances<sup>3</sup>
18. MassDEP reserves the right to amend, modify, suspend or revoke this permit pursuant to 310 CMR 19.040 Department's Modification, Suspension, or Revocation of a Permit. This does not limit or restrict MassDEP from implementing any other applicable authority at the Landfill including, but not limited to authority pursuant to 310 CMR 40.0000.
19. This permit is effective on the date signed by MassDEP below, except as provided by the Notice of Appeal Rights below and 310 CMR 19.037(4)(b).
20. This permit shall expire on December 31, 2033, provided that MassDEP may amend the term of permit in accordance with a modification pursuant to 310 CMR 19.039 or 310 CMR 19.040. The City shall submit to MassDEP on or before August 30, 2032 either an application to renew the permit or notice of its intent to close the PV Facility. Wherein the City elects to close the facility, the City shall submit an application for the decommissioning of the PV Facility and the restoration of the landfill cap and appurtenances thereto pursuant to 15, above.
21. The City and Lowell Solar Landfill LLC shall not deviate from this permit and the approved design plans. The City shall notify MassDEP prior to any modification(s) of the design and of any significant changes in the project schedule. MassDEP may, at its sole discretion, require the City to submit an application to MassDEP for review and approval for any modification/alteration to the design. In the event that MassDEP determines that a permit application is required for a modification; the City shall submit such application to the MassDEP in accordance with the schedule specified by MassDEP.
22. The City shall continue to perform post-closure activities at the Landfill pursuant to 310 CMR 19.142 *Landfill Post-closure Requirements* including, but not limited to, maintenance of the

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<sup>3</sup> Appurtenances include, but are not limited to storm water controls, landfill gas control structures, landfill gas and groundwater monitoring wells.

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Landfill's cap to prevent growth of trees, brush and other vegetation with root systems that could be detrimental to the cap, and to prevent erosion of the cap.

### **RIGHT OF APPEAL**

The City of Lowell (the "City") is hereby notified that it may within twenty-one (21) days file a request that this decision be deemed a provisional decision under 310 CMR 19.037(4)(b), by submitting a written statement of the basis on which the City believes it is aggrieved, together with any supporting materials. Upon timely filing of such a request, the decision shall be deemed a provisional decision with an effective date twenty-one (21) days after the Department's receipt of the request. Such a request shall reopen the administrative record, and the Department may rescind, supplement, modify, or reaffirm its decision. Failure by the City to exercise the right provided in this section shall constitute a waiver of City's right to appeal.

**Appeal** - Any person aggrieved by the issuance of this decision, except as provided for under 310 CMR 19.037(4)(b), may file an appeal for judicial review of said decision in accordance with the provisions of M.G.L. c. 111, s. 150A, and M.G.L. c. 30A, not later than thirty (30) days following the receipt of the final decision. The standing of a person to file an appeal and the procedures for filing such appeal shall be governed by the provisions of M.G.L. c. 30A. Unless the person requesting an appeal requests and is granted a stay of the terms and conditions of the decision by a court of competent jurisdiction, the decision shall remain effective.

**Notice of Appeal** – Any aggrieved person intending to appeal the decision to the superior court shall provide notice to the Department of intention to commence such action. Said notice of intention shall identify with particularity the issues and reason(s) why it believed the approval decision was not proper. Such notice shall be provided to the Office of General Counsel of the Department and the Regional Director for the regional office that made the decision. The appropriate addresses to send such notices are:

Office of General Counsel  
Department of Environmental Protection  
One Winter Street  
Boston, Massachusetts 02108

Regional Director  
Department of Environmental Protection  
Regional Office  
205A Lowell Street  
Wilmington, MA 01887

No allegation shall be made in any judicial appeal of this decision unless the matter complained of was raised at the appropriate point in the administrative review procedures established in those

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regulations, provided that matter may be raised upon showing that it is material and that it was not reasonably possible with due diligence to have been raised during such procedures, or that matter sought to be raised is of critical importance to the public health or environmental impact of the permitted activity.

Should you have any questions relative to this application, please contact David Adams at phone number 978-694-3295.

Sincerely,

Sincerely,

This final document copy is being provided to you electronically by the  
Department of Environmental Protection. A signed copy of this document  
is on file at the DEP office listed on the letterhead.

**DCA**

David C. Adams  
Environmental Engineer  
Solid Waste Management

**JAC**

John A. Carrigan  
Section Chief  
Solid Waste Management

JAC/DCA/dca

Cc:

Lowell Board of Health  
[FSingleton@ci.lowell.ma.us](mailto:FSingleton@ci.lowell.ma.us)

Robert J. Bukowski, P.E.  
AMEC Environment & Infrastructure, Inc.  
2 Robbins Road  
Westford, Massachusetts 01886

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### **Project Identification**

Facility: Westford Street Landfill  
Address: 1020 Westford Street  
Lowell, Massachusetts 01851

Site Owner: City of Lowell  
Address: 375 Merrimack Street, 2<sup>nd</sup> Floor, Room 43  
Lowell, Massachusetts 01852  
Contact: Bernard F. Lynch, City Manager

PV Operator: Lowell Solar Landfill LLC  
Address: 111 Speen Street  
Framingham, Massachusetts 01701

Facility Number: 39434  
Regulated Object Number: 330323  
Permit Number: none

Location<sup>4</sup>: Latitude/Longitude 71°21'15" West Longitude 42°37' 35" North Latitude  
MSPCS: 211,963 mE 930,656 mN Mainland Zone NAD83  
UTM: 306,952 mE 4,722,013 mN Zone 19

Size of property: 42 acres<sup>5</sup>

MEPA: Project does not trigger MEPA review thresholds.  
Secretaries Decision: December 10, 2012

Current Application: Post-Closure Use - Major BWPSW36  
Transmittal Number: X254169  
Date: January 17, 2013  
Received: January 18, 2013

Engineer of Record: AMEC Environment & Infrastructure, Inc.  
2 Robbins Road  
Westford, Massachusetts 01886  
Robert J. Bukowski, P.E.

Array Capacity: 1.5048 MW DC<sup>6</sup>

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<sup>4</sup> For reference only. As provided in application.

<sup>5</sup> Does not include portions of the landfill currently owned by others.

<sup>6</sup> Under Standard Test Conditions (STC).



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**Prior Documents and Actions Related to this Application**

plan:

Major modification for  
Landfill Gas Management System  
At the Westford Street Sanitary Landfill  
City of Lowell  
Middlesex County, Massachusetts  
Transmittal Number: 95033  
approved: December 21, 1994

plan:

Lowell Landfill  
Closure Plan  
Lowell, Massachusetts  
February, 1995  
Transmittal Number: 51023  
approved: March 31, 1995

report:

Construction Quality Assurance  
Report  
Westford Street Landfill Closure  
Lowell, Massachusetts  
October 1996  
Transmittal Number: none

plan:

As Built Grading and Closure of  
Westford Street Landfill in  
Lowell, Mass.  
Sept. 21, 1996  
Transmittal Number: none

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**Documents Part of this Application**

report:

Massachusetts Department of Environmental Protection  
BWP SW 36 Major Post-Closure Use Application for  
1.502 MW Solar Photovoltaic Installation  
Westford Street Landfill  
City of Lowell, Massachusetts  
January 17, 2013

plan:

City of Lowell  
Westford Street Landfill Solar Development  
Lowell, MA  
January, 2013

letter:

AMEC Environment & Infrastructure, Inc. to MassDEP  
February 8, 2013  
Re: Response to Notice of Technical Deficiency

plan:

Westford Street Landfill  
Solar Development  
Lowell, MA  
January 2013  
Revision: 1/17/2013  
Revision: 2/8/2013

report:

Massachusetts Department of Environmental Protection  
Supplemental Submittal for Post-Closure Use Permit  
Application for 1.502 MW Solar Photovoltaic  
Installation  
Westford Street Landfill  
City of Lowell, Massachusetts  
May 10, 2013

plan:

City of Lowell  
Westford Street Landfill Solar Development

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Lowell, MA  
January, 2013  
Revised – May, 2013

## **Discussion**

### Site Background:

The City of Lowell Westford Street Sanitary Landfill (the “landfill”) is a former municipal solid waste landfill situated between Westford Street and Stedman Street in the Princeton Village/Drum Hill area of the City of Lowell. Closed to waste circa 1996, the landfill was used for the disposal of ash from the City of Lowell municipal waste incinerator; municipal wastes (MSW) consisting of residential, commercial and industrial waste; and oxide box waste including from remediation of the abutting Glenview Sand & Gravel site in Chelmsford, Massachusetts.

The landfill site is currently used for a variety of post closure activities. Originally established by the Brady family (Glenview Sand & Gravel), during its history the site has been subdivided into several separate properties, including the 42 acre parcel currently owned by the City of Lowell and the subject of this application. Other portions of the original landfill site, not currently owned by the City and not subject to this application, include properties currently used as an automobile dealership (Lowell Ford) and residential apartments (Oak Residences Apartments, formally Princeton Properties). The City of Lowell currently uses the portion of the site for a salt shed and a DPW materials storage facility. Combustible gas (LFG) generated by the landfill is currently converted to electrical energy for distribution on the regional grid at an internal combustion engine powered generator located between the landfill and Stedman Street.

With the exception of the access driveway (aka McGregor Street), the portion of the landfill currently owned by the City was capped with a flexible membrane cap (an “FML”) and has an active landfill gas extraction and collection system. Within the portion of the access driveway known as McGregor Street, the roadway pavement serves as the landfill cap. Within other areas of the original landfill site, driveways/parking lots and buildings serve as the landfill cap.

Constructed circa 2000, the flexible membrane cap was designed to consist of a 40 mil HDPE<sup>7</sup> membrane overlain by 30 inches of soil consisting of (bottom to top) 12 inches of drainage sand, and 18 inches of vegetative support soil (consisting of 12 inches of water retaining mineral soil and 6 inches of loam/topsoil). While the landfill cap was generally constructed pursuant to the approved plans, “as-built” information demonstrating that the soil layers meet or exceed design specifications for depth is not available. Piping for the gas extraction and collection system is embedded within the drainage layer of the cap.

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<sup>7</sup> High Density Poly-ethylene

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Storm water from the landfill is directed to two (2) on-site ponds. One, the smaller, the “south pond”, is located at the southerly end of the site (east of the salt shed). The second, the “north pond”, is located at the northerly end of the site, adjacent to the junction of Westford Street and Wood Street. Storm water flows to the “north pond” via detention basins located adjacent to Westford Street north of the landfill. Storm water flows directly to the “south pond” without detention to control the rate of flow. From the ponds, storm water infiltrates to ground water.

#### Proposed Solar Facility:

The City is proposing to install a 1.5 MW photovoltaic (solar) electric power generating facility on the landfill. The City has entered into a 20 year lease with Lowell Solar Landfill LLC for installation and operation of the facility.

The system is to consist of approximately 5,016 solar panels (modules) arranged in 15 groups (originally proposed as 6,132 solar panels in 20 groups) connected to three (3) inverters. The solar panels will be distributed on portions of the site with a ground surface gradient of under 9%. The inverters, with associated transformers, will be located adjacent to the solar panel groups within the landfill (i.e. above the landfill’s cap). The facility will connect to the regional grid at Stedman Street (adjacent to the existing).

Two (2) groups of solar panels will be located adjacent to the City of Lowell’s salt shed and will displace current DPW activities in that area, including the removal/relocation of material storage bunkers. As provided in the plans the removal of the bunkers is to be performed by “others” and is not part of the facility installation. The plans included with this application do not include provisions for relocation or replacement of the bunkers. The City has not submitted plans for relocation of the DPW activities.

The area for each group of panels will be prepared by placement of dense graded crushed stone (MassDOT specification M2.01.7) over the existing surface. Where fill is not required to maintain a maximum ground surface gradient of less than 9%, the crushed stone will be a minimum of 6 inches in depth. Where fill is required to maintain a maximum of less than 9% slope at the surface, the crushed stone may be increased to up to 12 inches in depth. Where greater than 12 inches of fill is required, a layer of “gravel borrow” (per MassDOT specification M1.03.3) will be placed under the crushed stone. In all areas the existing layer of vegetative support soil will be left in place.

In areas of fill greater than 12 inches in depth, the fill beyond the limits of solar panels will be covered by a new layer of vegetative support soil (loam) and grassed. As specified in the plan details this new loam is proposed to be 6 inches thick. The specified thickness does not conform to standards as established at 310 CMR 19.112(9)(b) or the approved landfill closure design. As originally approved the vegetative support portion of the landfill cap consists of two (2) layers totaling 18 inches in thickness – a 6 inch layer of loam, overlying a 12 inch layer of water

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retaining mineral soil (incorrectly specified as “ordinary fill” in the plan details). As specified by this application the fill soil does not meet the approved specification for the mineral soil layer.

The panels will be supported on ballasted metal trays placed on the ground surface. Trays will be secured to the ground from slippage by 12 inch long galvanized steel spikes driven into the crushed stone.

Except where necessary to cross roadways, etc., electrical conduits will be located above ground. Where underground conduits are necessary, the conduit will be located within the existing sand drainage layer of the cap. No penetrations of the flexible membrane layer of the cap (the “FML”) will be made.

The design was analyzed for both slope and sliding stability.<sup>8</sup> A minimum Factor of Safety of 1.5 was selected by the engineer for the design. The lowest Factor of Safety (at array groups 5, 14 and 15) calculated for the design was determined to be 1.5 for stability against sliding with the wind from the north.

The installation of the solar panels will result in a small increase in the flow of storm water to the ponds. The additional flow is anticipated to result in less than two tenths (0.2) of a foot increase in water depth in the ponds. Therefore, the impact of the change is not deemed to be significant.

The application includes a “Custom Soil Resource Report” for the site by United States Department of Agriculture Natural Resources Conservation Service (NRCS). The report misidentifies soil types present at the site. The report identifies areas at the southern end of the site as “Deerfield loamy sand” (256B), “Hinckley loamy sand” (253D), and “pits, gravel” (600). The areas depicted consist of principally (256B and 600) or significantly (253B) of capped municipal solid waste landfill (652). Therefore, the soil types identified by the report may not be representative of the storm water run-off potential of these portions of the site. The report also identifies an area on the westerly side of the site as “Urban land” (602). A significant portion of this area (occupied by Lowell Ford and McGregor Street) is also capped municipal solid waste landfill. However, the type of cap on this portion of the landfill has drainage characteristics comparable to “Urban land”.

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<sup>8</sup> Stability calculations were based on static loading conditions. The design was not analyzed for seismic conditions. Stability of the solar facility is dependent on, and limited by, the stability of the underlying landfill cap. Pursuant to design standards applicable at the time of construction, the landfill cap was not designed for seismic loading conditions.