



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Western Regional Office • 436 Dwight Street, Springfield MA 01103 • 413-784-1100

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

This approval was date-stamped January 5, 2012

Tecta Solar Quantum, LLC
220 Commerce Drive
Fort Washington, PA 19034
Attention: Samir Dube, Managing Director

RE: Adams-DSWM-11-004-001
Adams Landfill
Post Closure Use – Solar Power
Permit Approval
BWPSW36
Transmittal #239197

Dear Mr. Dube:

The Massachusetts Department of Environmental Protection (the MassDEP) is issuing this permit approval to Tecta Solar Quantum, LLC (Tecta Solar) for the post closure use of the Town of Adams' (the Town's) capped landfill located off East Road (the landfill), as a solar power farm. On October 26, 2011 the MassDEP received from Tecta Solar the BWPSW36 Major Post Closure Use permit application, under transmittal #X239197). The application was completed on behalf of Tecta Solar by Woodard & Curran Inc, (Woodard) and the application was signed by Alan Benevides, Massachusetts-registered Professional Engineer (P.E.) #37893. The application consists of the completed transmittal form, application form, text describing the proposed use, engineering calculations, and ten engineering drawings (the engineering drawings were signed and stamped by Alan Benevides, P.E. #37893). On December 22, 2011, MassDEP received additional supporting information for the application, including a permit application form signed by Samir Dube, Managing Director of Tecta Solar, and additional engineering drawings.

Summary of Proposal

The Town is the owner of the 20-acre inactive, capped landfill, which is located on a 31-acre Town-owned parcel along the west side of East Road. The northern and southern portions of the landfill were capped with two-feet of soil cover in 1976 & 1979, and the central portion of the landfill was capped in 1996 according to a MassDEP-approved engineered closure plan, with an impermeable geomembrane, 12 inches of drainage sand and 12 inches of topsoil. A Comprehensive Site Assessment (CSA) for the landfill was completed by the Town's consultant and approved by MassDEP on November 19, 1994; the CSA evaluated any groundwater, surface water, sediment or landfill gas impacts from the landfill. The Town has completed annual groundwater, surface water and landfill gas monitoring at the landfill since the completion of the CSA, as required by MassDEP.

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Tecta Solar is the permittee for the Post-Closure use permit, and will lease a portion of the landfill from the Town for the project. Tecta Solar will construct and operate the solar farm. The application proposes the construction and maintenance of a 1.1 megawatt (MW) photovoltaic solar farm on approximately 5 acres of the capped landfill, as follows:

- The solar array will be placed over 5 acres of the top of the landfill, in areas with slopes not exceeding 15%;
- 3.7 acres of the solar array will be constructed over the modern geomembrane cap area, and 1.3 acres of the solar array will be constructed over the older soil cap area;
- A geotextile fabric will be placed over the grass cover of the vegetative support layer of the cap, and then 6 inches of crushed stone will be placed over the geotextile, in the entire solar array area;
- Low ground pressure equipment (less than 7 pounds per square inch, or PSI) will be used to distribute solar array materials across the site;
- Approximately 1,785 pre-cast concrete foundation footings will be placed directly on the top of the crushed stone, each footing will be 3' x 3' x 1' in size;
- 4" x 4" steel tubing will be installed on the foundation footings, both in a North-South and East-West direction;
- 3,927 solar panels (PV modules) will be attached to racks on the steel tubing, in strings of 11 modules;
- The panels will be tilted at a 20-degree angle from horizontal and will face due south, with the lower edge of the panels 1.5 feet above the surface, and the upper edge at 4 feet above the surface;
- The electrical equipment for the solar array will be installed at the southeast corner of the array, in the soil cap area there;
- Electrical power from the solar panels will be conveyed from the solar panels to the electrical equipment via above-ground electrical cables on the panel racks, in above-ground, galvanized steel conduits running on and between the foundation footings, and in above-ground cable trays, supported by rubber block feet; and
- Electrical power will be conveyed from the switchgear on the electrical equipment pad in rigid galvanized steel conduit to the National Grid utility grid at two, new utility poles to be installed adjacent to the electrical equipment pad, along East Road.

The grass cover of the solar array area will be mowed, then a non-woven, needle-punched, permeable geotextile (AASHTO M288 Class 1) fabric will be placed over the vegetative support layer, and 6 inches of 1.5-inch diameter crushed stone will be placed over the geotextile. The crushed stone will initially be placed in 3-foot thick temporary roads, and 10-wheel dump trucks will drive on these temporary roads to deliver the crushed stone to areas of the array. Other than these trucks used for delivery of crushed stone on these temporary roads, only low-ground pressure equipment of 7 pounds per square inch (PSI) or less ground pressure will operate on the landfill, for spreading of crushed stone, and delivery of materials, including precast footings, panel racks, photovoltaic panels, and wiring.

The concrete foundations (footings) for the photovoltaic racks will be pre-cast off-site, and will be 3 feet wide, 3 feet long, and 1 foot thick, each weighing 1,300 pounds. The footings will be transported and placed using low-ground pressure tracked equipment, and will be placed directly on the surface of the crushed stone, following the topography of the landfill surface. The photovoltaic racks (Solar Backbone model) will be bolted to the footings, with 4-inch square steel tubing connecting the footings in both a North-South and East-West grid assembly. Suntech STP280 24/Vd solar panels will be attached to the racks, in strings of 11 panels; each panel is 77 inches high by 39 inches wide. Electrical transmission wiring from the panels will be mounted on the rack assemblies, will run to combiner boxes, then in

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above-ground conduits from the combiner boxes to the inverters at the electrical equipment pad. Wiring runs between the racks will be in conduits within metal struts/channels. All photovoltaic rack assemblies and above-ground wiring will be kept at least 10 feet from any landfill gas vents.

The electrical equipment area will be located in the Southeast corner of the solar array, off the edge of the geomembrane cap area, on the 1976 soil cap area of the landfill. Three inches of sand and three inches of gravel will be placed over the 2-foot thick soil cap in the electrical equipment area; grounding cables will first be laid in a grid at the base of the sand layer, and the grounding cable grid will be connected to three 10-foot long grounding rods driven into the ground outside the landfill boundary, between the landfill gas perimeter trench and the road. The electrical equipment will include two inverters, one switchboard, one transformer, and one switchgear box; each with its own, individual footing pad. The inverters and transformer will have poured-in place, concrete pads a minimum of 1-foot thick, containing steel reinforcing bars. The inverter pads will measure 10 feet by 4.5 feet, and the transformer pad will measure 8.5 feet by 6.5 feet. The switchgear, which is much lighter than the inverters and transformer, will be placed on either a concrete or fiberglass pad; the switchboard metering equipment will be placed on a nearby telephone pole. The inverters will be Solectria 500 KW inverters, with ventilation at their base and also positive ventilation by cooling fans. Specifications included in the application show that the electrical equipment, including the inverters and transformers, will be contained in metal boxes with no opportunity for worker entry, and electrical lines will enter the sides of the boxes, with no electrical line penetrations of the base of the boxes needed. The amended application states that the inverters will not include a landfill gas (LFG) monitor and alarm system.

Woodard performed geotechnical analyses for the loading and settlement of the footings, using the 7 PSI (equivalent to 1,000 pounds per square foot, or PSF) low-ground pressure standard as the criteria for maximum allowable loading on the geomembrane cap. Woodard concluded that the total weight of the the array footings, racks, panels, and snow loading was 5,582 pounds per footing, for a loading (bearing pressure) of 620 PSF at the surface of the vegetative support layer. Calculation of settlement based on the array loading showed that the maximum settlement was expected at a depth of 7 feet below the surface of the vegetative support layer, with a maximum settlement of 2.3 inches (range of 0.5 to 4.0 inches of settlement) at that depth. Woodard calculated that the landfill has settled approximately 2.34 feet since it was closed in 1996, and that the remaining settlement (without the solar array loading) will be approximately 8 inches. Woodard calculated that the loading of the inverters and transformer will be approximately 2.6 PSI and 2.7 PSI, respectively. Woodard concluded that all analyses, for both the solar array foundations and the electrical equipment foundations, showed minimal loading and settlement, and no stresses or settlement which would damage the impermeable layer of the landfill cap, or the soil cap areas.

Woodard performed updated stormwater analyses for changes to stormwater runoff from the proposed work, and concluded that there will be no increases in stormwater runoff, and that the existing stormwater control system can handle the flows. Using the HydroCad model, Woodard calculated that the peak stormwater flow to the existing retention/sedimentation basin is 30.73 cubic feet per second (CFS) without the array, which is reduced to 26.47 CFS with the addition of the array (the calculated decrease is due to the water retention capacity of the crushed stone added to the array area surface).

Woodard states that the proposed solar array construction will not alter or damage the existing landfill gas (LFG) venting systems at the landfill, which include passive LFG vents and piping within the landfill, and a passive LFG venting (interceptor) trench along the eastern perimeter of the landfill, between the landfill and East Road.

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Woodard states that the proposed construction and operation of the solar farm will not alter the conclusions of the previous Qualitative Risk Assessment for the landfill (completed as part of the Comprehensive Site Assessment); i.e. that there are no significant risks to human health and the environment posed by the landfill, or by the presence of the solar farm on the landfill.

There are no proposed changes to the existing, long-term monitoring program for the landfill. Tecta will be responsible for at least 15 years (the duration of the Power Purchase Agreement with the Town) for the inspection, operation, maintenance and repair of the solar array and the solar array cap area. The remaining portions of the landfill will continue to be inspected semi-annually and mowed annually, by the City. The landfill perimeter is partially surrounded by chain-link fence on the eastern perimeter. Tecta Solar will install additional chain link fencing around the electrical equipment area, and extending west from both ends of the existing fence, with fenceposts attached to panel stands placed at the base of the crushed stone layer. MassDEP notes that, as proposed, the solar array would not be fully fenced, as the western perimeter of the array would be open. Decommissioning of the solar farm, if required in the future, would consist of removal of all structures, including foundations, and restoration of the landfill cap to its original condition, except that the crushed stone would be left on the cap.

MassDEP Determinations

Personnel of MassDEP have reviewed the Post-Closure Use permit application for the Adams Municipal Landfill in accordance with MGL c. 111 s. 150A, MGL c. 30A, 310 CMR 19.000, and MassDEP's publication Landfill Technical Guidance Manual (the LAC), revised in May, 1997. MassDEP has determined that the application is approved in accordance with MGL c. 111, s. 150A and MGL c. 30A, subject to the conditions outlined below.

1. Tecta Solar is the permittee for this post-closure use permit for the construction and operation of the solar farm on the landfill, and is responsible to comply with the conditions of this permit, as the permittee. The Town of Adams (the Town), as the owner of the landfill, is also responsible for continued maintenance of the landfill, and for continued monitoring of the landfill in accordance with the requirements of the March 4, 1996 Closure Certification approval.
2. A third-party, qualified engineering consultant (the on-site engineer) shall be present on-site at all times when any construction work is taking place on the cap. The on-site engineer shall have sufficient staff on-site to provide quality assurance/quality control (QA/QC) oversight for all construction work at the site, and shall submit monthly construction progress reports to the MassDEP and the Town, which shall summarize the work performed during the month. At the end of construction work, the third-party engineering consultant shall submit a completion report, signed and sealed by a Massachusetts-registered P.E., certifying that the work was completed in accordance with the application and the conditions of this permit.
3. Tecta Solar is responsible to ensure that all necessary precautions are taken to protect the health and safety of workers and the general public during both construction and maintenance of the solar farm. A copy of the site-specific Health & Safety Plan for the construction and maintenance of the solar farm shall be submitted to the MassDEP prior to the beginning of any construction work, which shall include protocols for monitoring of landfill gas as needed, and protocols for modifying work practices if landfill gas is detected at levels deemed unsuitable.

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4. All disturbance of the landfill cap shall be limited to the proposed installations on top of the vegetative support layer of the cap, i.e. - no excavations or other penetrations shall be performed into the vegetative support layer or sand drainage layer of the cap without separate written approval from the MassDEP. All disturbance of the cap shall extend only a maximum of 6 inches into the vegetative support layer of the cap, unless otherwise approved by the MassDEP. There shall be no penetrations (utility, conduit or other) at the base of any concrete footings or foundations, unless otherwise approved by the MassDEP. There shall be no penetrations of any kind of the impermeable layer of the cap.

5. Tecta Solar is responsible to ensure that the inverter, transformer and other electrical equipment boxes on the landfill cap area will not accumulate landfill gas within the boxes during the construction and operation of the solar farm. Any landfill gas levels exceeding 10% of the Lower Explosive Limit (% LEL) within any electrical equipment box shall trigger the requirements of 310 CMR 19.132(4)(g), for notification and action. The additional requirements for the electrical equipment area includes the following:
 - A. The maximum size of the electrical equipment concrete footings shall not exceed the dimensions proposed in the application;
 - B. Each electrical equipment box shall be ventilated as proposed, and the floor of each box shall be solid, with no openings for landfill gas to enter at the floor level, other than required utility penetrations as outlined below;
 - C. There shall be no utility, conduit or any other penetrations through the base of the electrical equipment boxes or the base of the concrete footings, except as may be required by electrical codes, i.e. - all other utility penetrations shall enter only through the side of the boxes, not the bottom, and these penetrations shall be fully sealed (both outside and within each conduit). Any required electrical line penetrations through the bottom of the concrete footings shall be fully sealed to prevent landfill gas entry into the electrical boxes, and electrical lines and conduits associated with these penetrations shall not extend down into the vegetative support layer of the cap;
 - D. The electrical equipment boxes and equipment shall meet all electrical code requirements, including any for fencing;
 - E. As part of the site-specific H&S Plan, a written protocol shall be prepared and submitted for the maintenance of the electrical equipment area, including provisions for landfill gas monitoring during maintenance of any electrical equipment box, and for regular calibration and maintenance of the landfill gas monitors used by maintenance workers on the site.

6. All necessary precautions shall be taken to ensure that the proposed construction and maintenance work associated with the solar farm shall not in any way damage the impermeable layer of the landfill cap, landfill stormwater control structures, landfill monitoring wells, or landfill gas venting wells. If any damage occurs to any of the above-listed landfill components, Tecta Solar shall notify MassDEP immediately (within 24 hours maximum), a written plan for repair of the components shall be submitted to MassDEP within 48 hours, and any repair work shall be completed on the schedule determined by MassDEP. Additional stone rip-rap shall be added to the upper terminus of the stormwater downchute swale at the western perimeter of the solar array, to prohibit potential erosion at that location.

7. Prior to the commencement of construction activities, the entire solar array area shall be mowed, and

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all landfill gas vents, landfill gas monitoring wells, groundwater monitoring wells, and other existing, above-ground structures of the landfill cap and appurtenances in the area of the solar array shall be flagged for visibility, and protective barriers shall be placed around such structures as needed to prevent damage by vehicles accessing the cap area, including the riser pipes of the landfill gas vent trench along the eastern perimeter of the landfill, and the riser pipes of the landfill gas vent trench at the top of the landfill cap.

8. The on-site engineer shall ensure that trucks delivering crushed stone to the array area only operate strictly on temporary roads of a minimum 3-foot thickness of crushed stone. Other than these delivery trucks operating on the subject 3-foot thick crushed stone temporary roads, all vehicles/equipment operating on the landfill cap shall only be low-pressure construction equipment, with ground pressures of 7 PSI or less, which may only operate on the landfill cap in accordance with the remaining conditions of this permit. Tecta Solar shall submit written documentation to MassDEP of the ground pressure (unloaded and fully loaded) of all equipment, prior to its use on the landfill cap. All operators of vehicles entering the cap area shall be clearly instructed by the on-site engineer and Tecta Solar of the requirements of this permit prior to arrival, to avoid damage to the landfill cap components.
9. The on-site engineer is responsible to ensure that there is no significant rutting or other damage to the vegetative support layer of the cap. If the engineer observes significant rutting or other damage, MassDEP shall be notified immediately and steps shall be taken to eliminate or avoid such damage. In no case shall rutting or other damage greater than 6 inches deep into the vegetative support layer be allowed to occur. Low-pressure construction equipment shall limit turning by tracks on the vegetative support layer as much as possible. If MassDEP determines that the use of any equipment is creating the potential for damage to the impermeable cap layer, the usage of such equipment shall cease immediately upon notification by MassDEP, or be modified as required by MassDEP.
10. Prior to the start of construction, Tecta Solar shall submit to MassDEP a written protocol for the use of concrete trucks or cranes on the cap, including restriction of use only to areas of the soil cap with sufficient overlying fill, and a restriction on the use of outriggers or stabilizers unless specifically approved by MassDEP. If concrete trucks or cranes will be used, sufficiently large pads shall be placed beneath outriggers/stabilizers to avoid damage to the cap. Concrete pumpers or cranes shall not be used on the geomembrane portion of the cap unless specifically approved by MassDEP.
11. MassDEP specifically reserves the right to restrict or prohibit heavy vehicular loads from the landfill cap, either as a weight restriction or a usage restriction, should inspections or other information reveal the potential for damage to the cap from heavy vehicle loads. MassDEP also specifically reserves the right to impose, at any time deemed necessary by MassDEP, additional requirements for construction on the cap, should construction activities pose a danger to the integrity of the landfill cap or appurtenances. Prior to the start of construction, Tecta Solar shall provide the actual ground pressure of all equipment to be used on the cap, at fully loaded capacity (i.e. including full loads of crushed stone or concrete ballast), and document that the loaded ground pressure is less than 7 PSI.
12. Tecta Solar is responsible to ensure that the proposed work complies with all applicable local, state and federal electrical codes and permits, including the National Electrical Code (NEC), 2011 Edition, Article 690 – “Solar Photovoltaic (PV) Systems”. MassDEP notes that Article 690.31(a) – “Wiring Systems” of the NEC states that “Where PV source output circuits operating at maximum system voltage greater than 30 volts are installed in readily accessible locations, circuit conductors shall be

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installed in a raceway". As noted previously, the existing and proposed fence at the landfill will not surround the western perimeter of the landfill, therefore the proposed solar farm array would not be fully fenced, and would therefore be considered "readily accessible".

13. In accordance with 310 CMR 19.130(23) the owner and operator of the landfill are responsible to provide sufficient fencing and other barriers to prevent access to the landfill except at designated points of entry and all points of entry shall be equipped with locking gates that are secured when the operator is not onsite.
14. All grounding of the solar array shall be performed in accordance with the applicable portions of the NEC and state/local electrical codes. Any grounding equipment shall not penetrate the landfill cap (geomembrane or soil cap), unless specifically approved by MassDEP. Grounding wires and grounding rods shall not damage the landfill gas venting trench along the eastern perimeter of the landfill. Tecta Solar is responsible to ensure that the proposed work complies with other applicable local, state and federal regulations, including local building permits and electrical permits, as may be required.
15. Following completion of the Solar Farm installation, inspections of the Solar Farm shall be performed on a quarterly basis by Tecta Solar, and quarterly inspection reports shall be submitted to MassDEP by the fifteenth day of the following month. After one year of quarterly inspections, Tecta Solar may petition MassDEP in writing to reduce the frequency of inspections. Any erosion problems, settlement problems, or other issues observed on the Solar Farm shall be reported to MassDEP and repaired immediately.
16. This post-closure use permit shall be valid for a period of 20 years from the date of this permit, provided that MassDEP may amend the term of the permit in accordance with an approved modification pursuant to either 310 CMR 19.039 or 19.040. If Tecta Solar intends to operate the Solar Farm after the expiration of this permit, Tecta Solar is required to submit a request for a renewal of the permit at least 90 days prior to the expiration of the permit. If Tecta Solar intends to transfer this permit to any other entity for operation of the Solar Farm, the requirements at 310 CMR 19.044, Transfer of Permits, shall be satisfactorily completed. If the permittee (Tecta Solar or other) discontinues operation of the Solar Farm, the permittee is responsible to perform decommissioning activities as outlined in the permit application, including removal of the solar array equipment and ballasts. MassDEP specifically reserves the right to require removal of the crushed stone layer as part of decommissioning, if deemed necessary.
17. MassDEP and its agents and employees shall have the right to enter upon the landfill at all reasonable times, to inspect the landfill and any equipment, structure or land located thereon, take samples, recover materials or discharges, have access to and photocopy records, to perform tests and to otherwise monitor compliance with this Permit and all environmental laws and regulations. This right of entry and inspection shall be in addition to MassDEP's access authorities and rights under applicable federal and states laws and regulations, as well as any permits or other agreements between Tecta Solar, the Town, and MassDEP.
18. MasDEP reserves the right to require additional or increased monitoring or maintenance activities in the event that the post-closure use is or may be having a detrimental effect on the landfill cap or appurtenances. MassDEP reserves all rights to suspend, modify or rescind this permit, should the conditions of this permit not be met, should the Solar Farm create nuisance conditions or

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threats to public health, safety or the environment, or should MassDEP otherwise determine that continued post-closure use is negatively impacting the landfill cap or appurtenances.

Pursuant to 310 CMR 19.037(5), any person aggrieved by the issuance or denial of this permit 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 c. 30A not later than thirty [30] days following the receipt of the final permit. 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. 30 A. Unless the person requesting an appeal requests and is granted a stay of the terms and conditions of the permit by a court of competent jurisdiction, the permit decision shall remain effective or become effective at the conclusion of the 30 day period.

Any aggrieved person intending to appeal the decision to the superior court shall provide notice to MassDEP of said intention to commence such action. Said Notice of Intention shall include the MassDEP File Number (12-236-001) and shall identify with particularity the issues and reason(s) why it is believed the approval decision was not proper. Such notice shall be provided to the Office of General Counsel of MassDEP and the Regional Director for the regional office which made the decision. The appropriate addresses to which to send such notices are:

General Counsel
Department of Environmental Protection
One Winter Street-Third floor
Boston, 02108

Regional Director
Department of Environmental Protection
436 Dwight Street - Fifth Floor
Springfield, MA 01103

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 regulations, provided that matter may be raised upon a 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.

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This approval pertains only to the Solid Waste Management aspects of the proposal and does not negate the responsibilities of the owners or operators to comply with any other local, state or federal laws and regulations now or in the future. If you have any questions about this matter, please contact Larry Hanson of this office at 413-755-2287.

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.

Daniel Hall

Section Chief, Solid Waste Management

cc: Adams Town Manager
Adams Board of Selectmen
Adams Board of Health
Adams – Electrical Inspector
Adams Conservation Commission
Tecta Solar – Sharon Barr, Esq.
Woodard & Curran – Alan Benevides, P.E, Paul Porada, P.E.