HILLSBOROUGH MUNICIPAL LANDFILL
TYPE IB PERMIT
NHDES Site No. 198704088
NHDES Permit No. AO #WMD 00-17

March 9, 2015

Prepared for

Hillsboro Town Solar, LLC

74 Union Street

Statham, New Hampshire 03885

Loureiro

Engineering • Construction • EH&S • Energy • Waste

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An Employee-Owned Company

Comm. No. 40HM4.01

Table of Contents

1. INTRODUCTION

Loureiro Engineering Associates, Inc. (Loureiro) prepared this Solid Waste Type IB Permit application and supplemental report (application) at the request of the Hillsboro Town Solar, LLC to modify the post-closure use of the Town of Hillsborough (Town) municipal landfill (NHDES Site No. 198704088, Permit No. AO #WMD 00-17) located at 45 Municipal Drive in Hillsborough, New Hampshire (the Site).

Hillsboro Town Solar, LLC in corporation with the Town wishes to install a 4.3 acre, 861 kilowatt solar array at the landfill. This document describes the proposed modifications and operations including the design, construction and post-closure activities and maintenance required to achieve compliance with the existing permit and post closure plan.

1.1 **Background**

1.1.1 Site Description

The Site is an approximately 16-acre former municipal solid waste landfill owned and operated by the Town. The property is identified as Lot 174 on the Town of Hillsborough's Assessor's Map 11-O. The landfill is located within the Town's Central Business District zone and is shown on Figure 1 (Site Location Map). The Site is bounded by the Hillsborough-Deering Regional High School to the north and east, by the Town police station building and commercial properties to the south and by undeveloped woodlands to the west and northwest. On-cap stormwater management systems include drainage swales on the west and east sides of the landfill. Stormwater in general drains into a detention pond on the south side of the landfill. Stormwater from the detention pond drain through a culvert at the southern end and into a wetland area on the south side of the property. The nearest surface water body is the Contoocook River located approximately 1,000 feet south/southwest of the Site. The location of the Site is presented on the cover sheet of the attached plan set. Refer to Drawing 2 for a plan of the Site.

1.1.2 Historical Site Operations

In 1974 the Site was approved to operate as a municipal solid waste landfill and accepted municipal solid waste until 1989; only construction and demolition material was accepted after 1989. Disposal of municipal construction and demolition (C&D) material continued to November 2000. Following cessation of waste the Site's cap was constructed reaching substantial completion in December 2002. However, the NHDES identified some deficiencies in slopes which required alteration; repairs were completed in mid-2006 with closure by late 2006.

1.1.3 Current Conditions and Structures

Since closure, the Site has not change significantly. The Town operates a transfer station and recycling center at the Site but at off-cap area. The transfer station is located on the western side of the landfill. There are no current uses on the capped portion of the landfill. The Town currently maintains the vegetated surface of the landfill by performing mowing on a bi-annual basis and maintains the swales and other cap appurtenances as needed.

1.2 Statement of Need

New Hampshire recently passed Senate Bill 98 referred to as "Group Net Metering" which allows for the development of a solar array to power one location and share the value of the excess power to another location as long as they are serviced by the same utility company.

The ***Community Solar Garden*** proposed here at the Hillsborough municipal landfill provides the reuse of a "Greyfield land" that is otherwise underused town-owned land. This proposed modification use will support the State of New Hampshire 25 x '25 Renewable Energy Initiative whose goal is for New Hampshire to obtain 25% of its energy from clean, renewable sources by the year 2025.

Another key benefit and need for this use is to create "Groups" that share the value of the solar electricity from the solar garden. By signing up for a group, homeowners, businesses, schools and/or towns will benefit by receiving a bi-annual payment (i.e., a Solar Rebate*) w*ith an equivalent of 1 cent off their current electric kilowatt-hour rate.

2. DESCRIPTION OF PROPOSED MODIFICAITONS

2.1 **Solar Array**

Hillsboro Town Solar, LLC proposes to install a 4.3-acre, 861 kilowatt fixed tilt racking solar array. The solar array will be located on the top portion of the landfill generally on areas with slopes no greater than 10 percent. Refer to Drawing No. 3 for the proposed conditions. The solar array will be ballasted with an above-cap-surface, pour-in-place concrete ballast block. The concrete ballast will be poured into a high molecular weight polyethylene (HMWPE) plastic tub that will remain in place after the concrete cures. Refer to Drawing No. 4 for the details.

Prior to placement of the ballast block, the 9-inch vegetated layer will be removed and replaced with a layer of non-woven geotextile overlain by 15 inches of compacted, crushed gravel meeting the specifications of NHDOT item 304.4. The crushed gravel will be used to create a level pad approximately 8 feet long and 2.5 feet wide beneath each ballast block (1-foot offset from edge of tub). Refer to Drawing No. 4 for the details.

The self-leveling racking system that supports the solar panels are cast in the ballast block. The racking system consists of a series of rail supports constructed from G90 galvanized steel and panel mounting rails constructed from 6005 aluminum. Stiffing members will be installed on the racking system constructed of 304 stainless steel. The racking system will be connected using 3/8-inch Magnacoat® bolts and serrated flange nuts. Refer to Drawings in Appendix A.

All electric wiring and cabling will be aboveground and mounted to the solar array racking system and/or within aboveground conduit supported with steel pipe supports embedded in concrete ballast blocks that will be placed above the capping system similar to the solar array ballasts.

3. DESIGN CRITERIA

3.1 General Design Requirements

The solar array was evaluated to determine compliance with the design requirements outlined in Env-SW 1103.5. Specifically, the design was prepared to demonstrate that solar array structures or uses above the landfill capping system is not anticipated to impact or cause damage to the existing capping system. As part of this evaluation, the solar array design was analyzed using American Society of Civil Engineers (ASCE) Structural Engineering Institute (SEI) Standard No. 7-10 – *Minimum Design Loads for Buildings and Other Structures* to determine the uplift, overturning, slide loads on the solar array and the corresponding soil pressure from each of the ballast blocks. Calculations prepared by GameChange Racking, LLC and approved by a New Hampshire licensed professional engineer is included in Appendix A Calculations of the allowable soil bearing capacity and slope stability of the cap system was prepared by Loureiro Engineering Associates, Inc. and approved by a New Hampshire licensed professional engineer is included in Appendix B.

3.2 Impact Evaluation

In accordance with Section VI of the Type IB permit application the following impact evaluation was performed of the proposed solar array.

(1) The effect the modification will have on facility function, capacity, life expectancy, service type and service area.

The design and analysis of the solar array took into account the potential impact on the capping system. The system was evaluated for both short term impacts occurring during construction of the array as well as long term impacts once the array is constructed.

<u>Short Term Impacts</u>

During construction, impacts to the cap could occur due to machine loads and general construction activities. To protect against these impacts, use of low ground pressure equipment will be used to transport the solar array system parts on the cap surface. The equipment will use the existing gravel road for the majority of travel and enter the vegetated cap area at points closest and perpendicular to the gravel road to limit travel on the vegetated surface. Turning of equipment will be limited and will be performed in large sweeping arcs to limit impacts to the vegetated surface and capping system layers. If necessary, temporary gravel roads will be constructed on vegetated surfaces to support equipment and then removed and the vegetated surface restored after use.

Removal of the 9-inch vegetated layer will be performed with a low ground pressure mini-excavator using an experienced operator. The operator will be assisted, as necessary, by a laborer to limit the disturbance of the underlying 12-inch drainage layer and flexible membrane liner.

All gas vents in the vicinity of the solar array will be flagged and protected from equipment and construction activities.

All equipment and solar array parts will be stored and staged off the landfill cap area and transported using the gravel road as needed. Temporary storage of equipment and solar array parts will be limited to the gravel road.

Temporary erosion controls (e.g., compost wattles) will be used to minimize erosion and sedimentation of disturbed areas. All disturbed vegetated areas will be temporarily stabilized using erosion matting or similar temporary stabilization products. All disturbed vegetated areas will be restored following the completion of construction activities.

<u>Long Term Impacts</u>

The location of the solar array and ballast blocks will be along the flatter portions (10% or less slopes) of the landfill cap, limiting the potential for slope instability. The factor of safety (FS) against sliding for a 10% slope was determined to be 4.66 for unsaturated conditions and 4.1 for a saturated drainage layer condition; both values exceed the 1.5 minimum FS. Refer to Appendix B for the calculations supporting this finding.

The concrete ballast blocks will be constructed on 15 inches of crushed gravel resulting in approximately 27 inches of separation between the bottom of the ballast block and the flexible membrane liner, limiting the soil pressure on the flexible membrane liner system. The maximum soil pressure predicted by the GameChange Racking, LLC analysis is 530 pounds per square foot (psf). The soil pressure resulting from the weight of the solar array system and the weight of the concrete ballast block without wind or snow loads is 283.6 psf. The bearing capacity of the soil beneath the ballast block was determined to be 1,846.6 psf or 615 psf using a FS of 3. Refer to Appendix A and Appendix B for calculations supporting this finding.

Hillsboro Town Solar, LLC will provide routine inspections and maintenance of the solar array system and the surrounding cap area. Hillsboro Town Solar, LLC will perform bi-annual mowing and maintenance of the vegetated area within the solar array footprint. The Town will still be responsible for mowing and maintaining the other portions of the vegetated cap surface. Additionally, snow removal will be performed around the perimeter of the panels to allow shedding of snow from the panels and to prevent snow drifting and piling over the panels.

At the end of the contract with the Town, Hillsboro Town Solar, LLC is responsible for removing all equipment and ballast blocks (including crushed gravel) and restoring the landfill capping surface to its original conditions. At that time, the Town will resume maintenance of the restored vegetated cap area.

(2) The effect the modification will have on the environment, public health and safety.

The design and construction practices proposed herein will provide for protection of the capping system which will support the protection of the environment, public health and safety.

(3) The effect the modification will have on the state's ability to achieve goals and objectives specified in RSA 149-M:2, namely achieving 40% minimum weight reduction in the solid waste stream on a per capita basis by the year 2000 and avoiding the disposal of recyclable materials in a lined landfill with a leachate collection system.

This consideration is not applicable to this modification request as the landfill is closed and no longer accepting solid waste.

(4) The effect the modification will have on establishing and maintaining integrated waste management systems consistent with the hierarchy of waste management methods in RSA 149-M:3 [the methods, in descending order of preference as specified in RSA 149-M:3, are: source reduction; recycling and reusing; composting; waste-to-energy technologies (including incineration), incineration without resource recovery; and landfilling].

This consideration is not applicable to this modification request as the landfill is closed and no longer accepting solid waste.

(5) Consistency with the state solid waste management plan and the applicable district plan, pursuant to RSA 149-M:12, l(b).

This consideration is not applicable to this modification request as the landfill is closed and no longer accepting solid waste.

4. POST-CLOSURE MONITORING & MAINTENANCE PLAN

The post-closure monitoring plan as provided in the 2006 Weston & Sampson Closure Report will be supplemented by the efforts outlined below for the solar array area.

4.1 **Capping System Monitoring & Maintenance**

4.1.1 Settlement

Hillsboro Town Solar, LLC will perform bi-annual inspections of the cap area beneath and within the vicinity of the solar array for signs of irregular settlement. This inspection will be documented using the inspection form provided in Appendix C. The forms will be sent to the Town and its engineer within 24 hours of the inspection event.

Additionally, the Town and/or its engineer will perform an inspection of the solar array area during its biannual cap inspections and document the findings as part of its annual solid waste report.

4.1.2 General Maintenance and Erosion Control

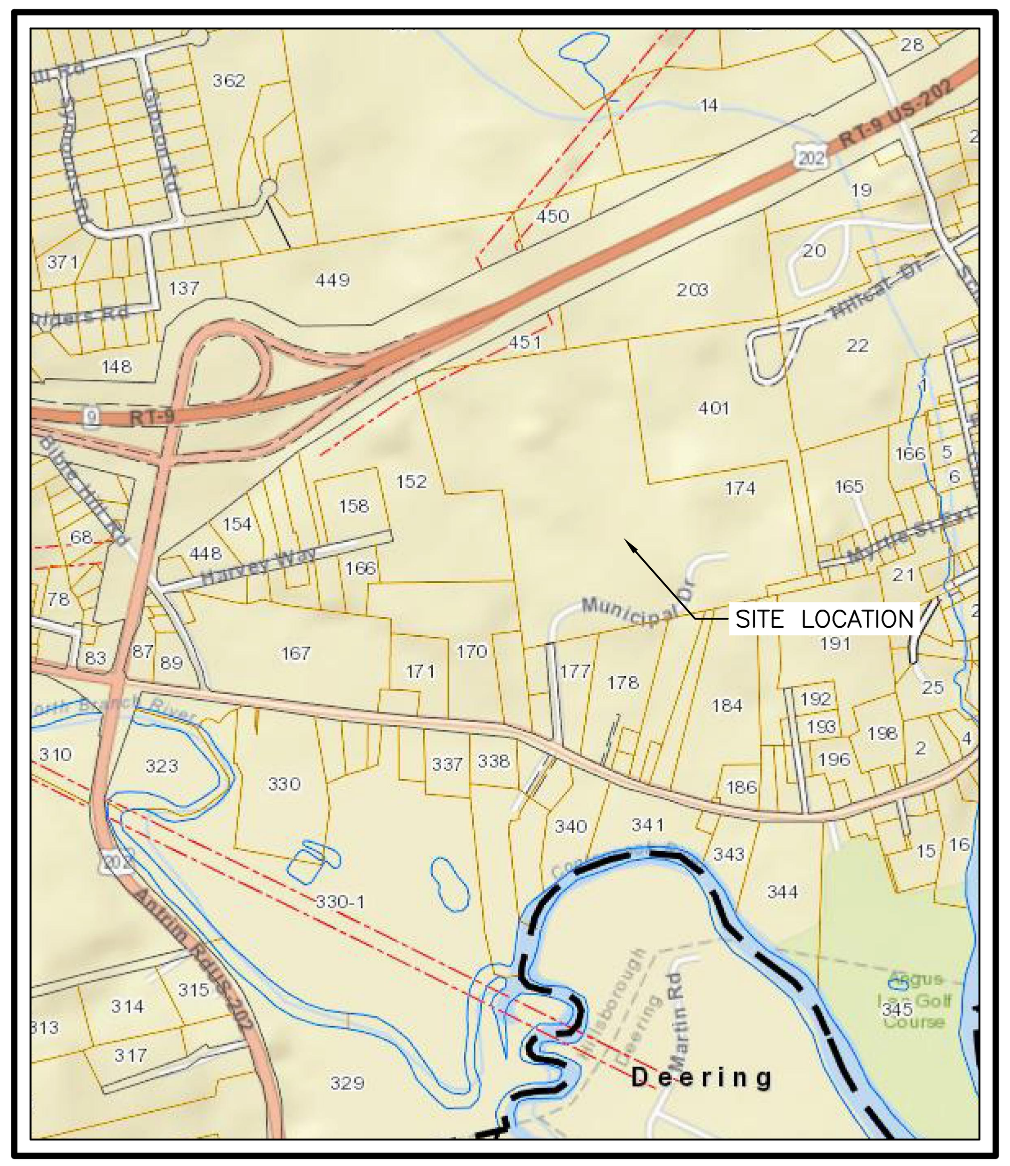
Hillsboro Town Solar, LLC will perform bi-annual mowing and maintenance of the vegetated surfaces surrounding and in the vicinity of the solar array system. These activities will be completed in a manner to support a healthy and erosion resistant vegetated surface.

5. CONSTRUCTION SCHEDULE

The following is an anticipated schedule for the construction of the solar array:

ACTIVITY	START DATE	END DATE
Type IB Permit Review and Approval by NHDES	March 9, 2015	April 10, 2015
Contractor/Subcontractor Coordination	April 13, 2015	April 24, 2015
Mobilization and Site Preparation	April 27, 2015	May 8, 2015
Receipt of Solar Array Equipment	May 11, 2015	May 15, 2015
Installation of Ballast Blocks and Racking System	May 18, 2015	June 5, 2015
Installation of Panels, Wiring and Conduit	June 8, 2015	June 12, 2015
Connection to Grid, Startup Testing	June 15, 2015	June 26, 2015
Site Restoration and Demobilization	June 29, 2015	July 10, 2015

HILLSBORO TOWN SOLAR,LLC
HILLSBOROUGH MUNICIPAL LANDFILL
TYPE IB PERMIT MODIFICAITON
HILLSBOROUGH, NEW HAMPSHIRE



SITE LOCATION MAP
SCALE: 1" = 1000'

DRAWING INDEX

DRAWING NO.	TITLE
1	COVER SHEET
2	EXISTING CONDITIONS SITE PLAN
3	PROPOSED CONDITIONS
4	PROPOSED CONDITIONS DETAILS

AERIAL LOCATION MAP
SCALE: 1" = 500'

PRELIMINARY PLAN SET
NOT FOR CONSTRUCTION

MAP REFERENCES:

BASE MAP INFORMATION USED FOR THE PREPARATION OF THIS DRAWING SET WAS COMPILED FROM:

1. TOWN OF HILLSBOROUGH, NEW HAMPSHIRE DEPARTMENT OF PUBLIC WORKS, LANDFILL CLOSURE SITE PLAN," SCALE: 1"=50' SHEET C-1 DATED 5/12/06 PREPARED BY WESTON & SAMPSON ENGINEERS, INC.

COMM. NO.: 40HM4.01
DATE: MARCH 9, 2015

PREPARED FOR:

HILLSBORO TOWN SOLAR, LLC
74 UNION STREET
STRATHAM, NEW HAMPSHIRE

PREPARED BY:

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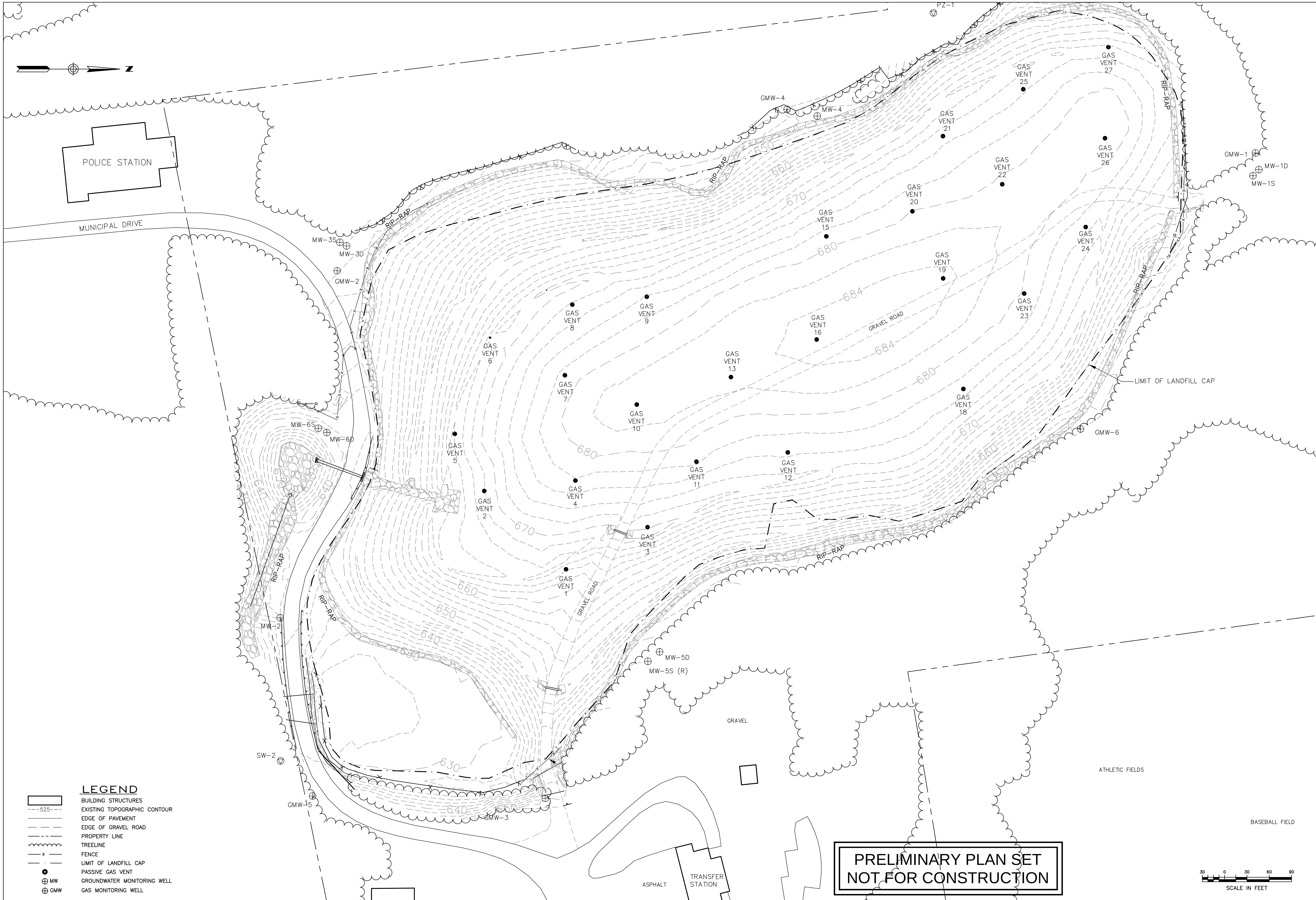

REV. | DESCRIPTION OF REVISION | DATE | APPR.

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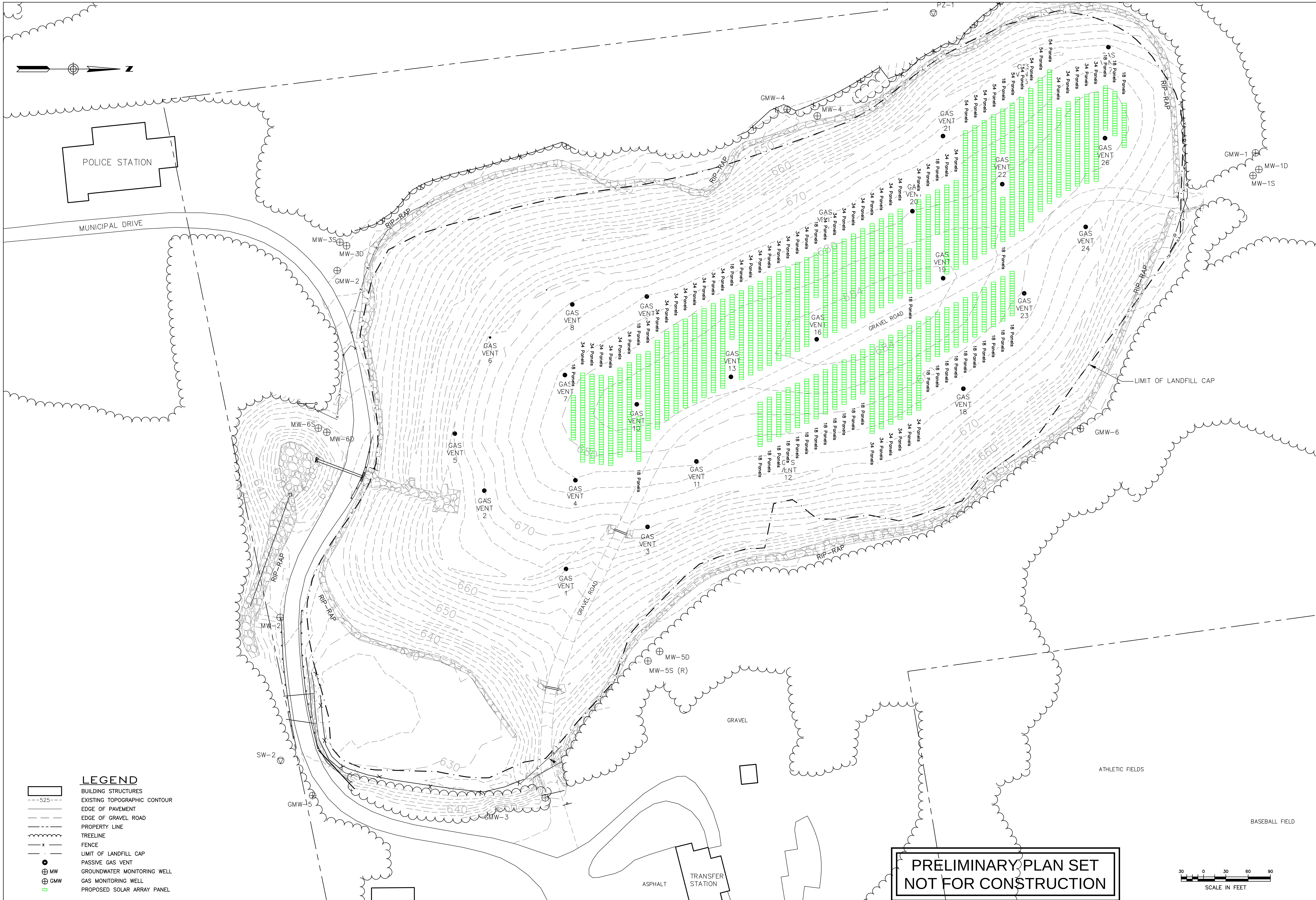
SCALE: 1" = 60'
COMM NO.: 40HM4.01
DRAWN BY: MJR DATE: 3/9/15
APPROVED BY: MJR DATE: 3/9/15

HILLSBOROUGH MUNICIPAL LANDFILL
HILLSBORO TOWN SOLAR, LLC

EXISTING CONDITIONS
SITE PLAN

DRAWING 2
SHEET NO. 2 NO. OF SHEETS 4



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APPROVED BY MJR | DATE 3/9/15

HILLSBOROUGH MUNICIPAL LANDFILL
HILLSBORO TOWN SOLAR, LLC

PROPOSED CONDITIONS
SITE PLAN

Loureiro

DRAWING 3

SHEET NO. 3 NO. OF SHEETS 4

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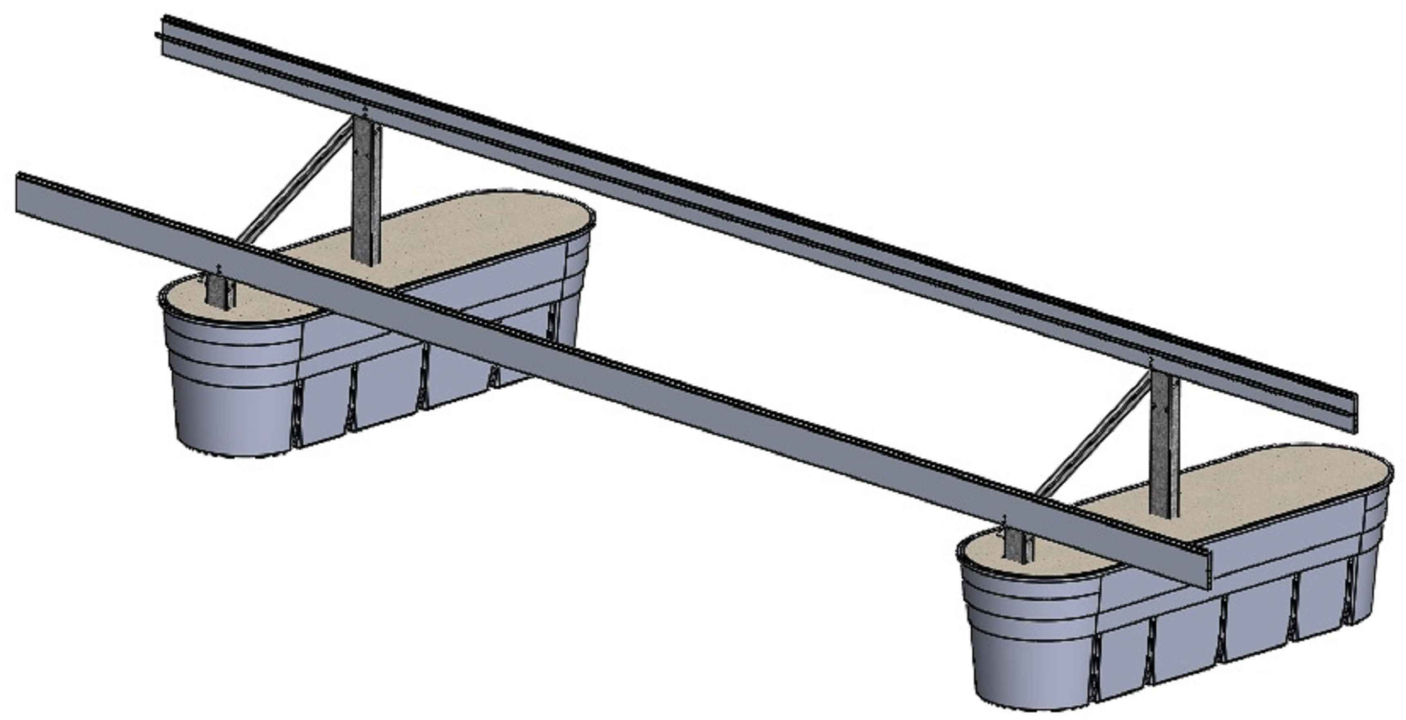
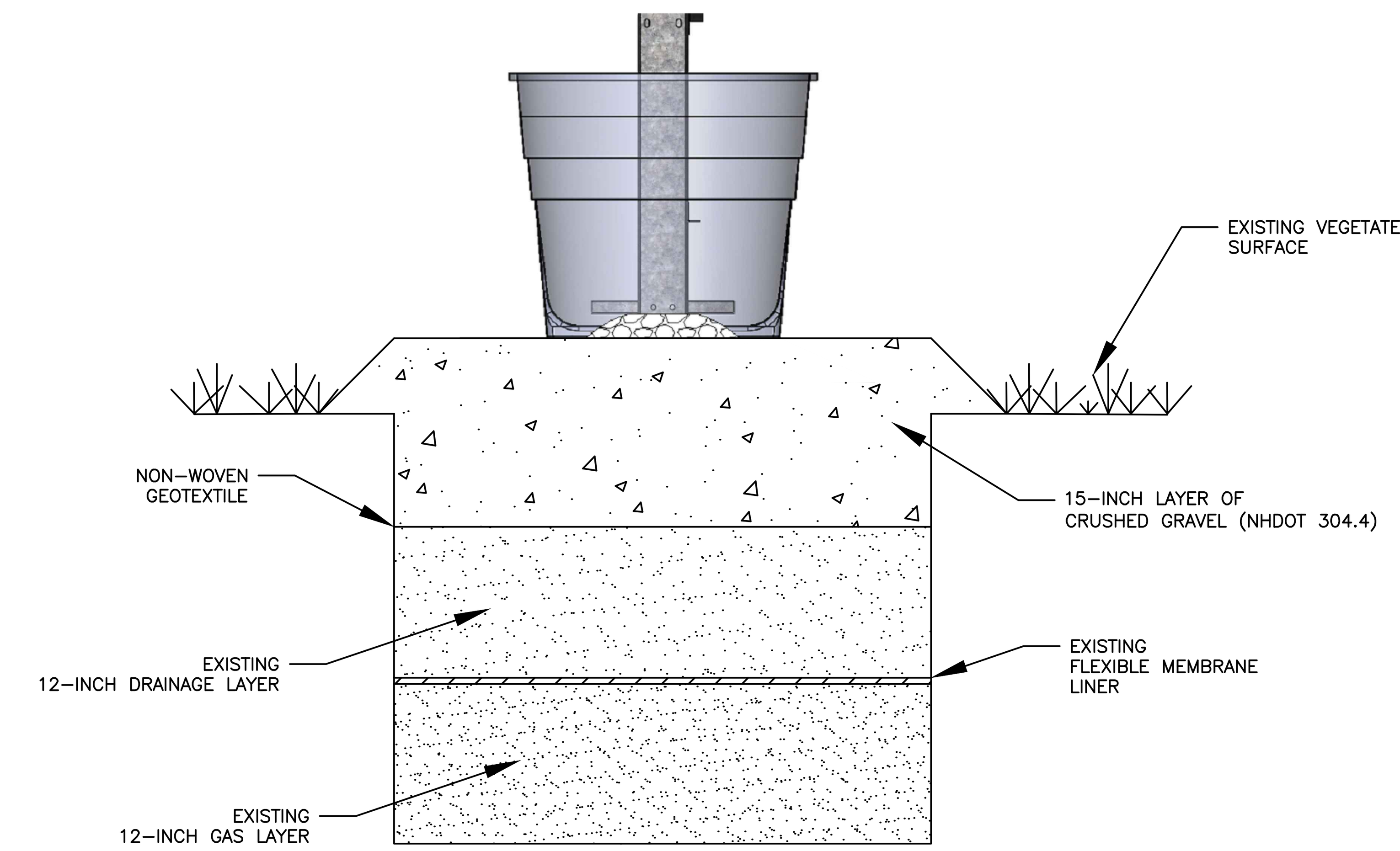
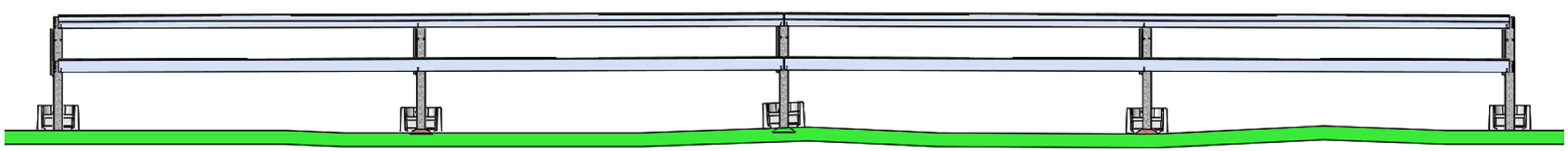


TYPICAL ISOMETRIC PROFILE OF BALLAST AND RACKING SYSTEM
NOT TO SCALE



TYPICAL CAP COVER LAYERS
NOT TO SCALE



TYPICAL ROW PROFILE OF BALLAST AND RACKING SYSTEM (WEST TO EAST)
NOT TO SCALE

PRELIMINARY PLAN SET
NOT FOR CONSTRUCTION

REV.	DESCRIPTION OF REVISION	DATE	APPR.

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SCALE	AS SHOWN
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DATE	3/9/15

HILLSBOROUGH MUNICIPAL LANDFILL
HILLSBORO TOWN SOLAR, LLC.

PROPOSED CONDITIONS
DETAILS

DRAWING 4

SHEET NO. 4 NO. OF SHEETS 4

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APPENDIX A

GameChange Racking, LLC Ballast Calculations and Drawings

GAMECHANGE RACKING
STRONG. SIMPLE.

Calculation package for GameChange Racking PIP system

Project : NH solar
Address: Hills boro NH landfill

General information:

PIP	1UP	
Setup	Continuous	
Tilt	25	degree
Clearance	30	in
Loading code	ASCE7-10	
Risk category	I	
Exopsure Category	C	
Site Class	D	
Assumed load bearing capacity of soil	1	KSF
Dead load:	3	PSF
ground Snow load (Pg)	80	PSF
Basic Wind Speed	105	mph
Panel length	77.01	in
Panel width	39.06	in
panels supported per post (mid)	3.50	
panels supported per post (edges)	2.50	

STATE OF NEW HAMPSHIRE - PROFESSIONAL ENGINEER - MINGQIAO ZHU No. 10792 LICENSED

2/25/2015

1. Loading calculations

1.1 Snow load

Pg (psf)	80.00
Ce	0.90
Ct	1.20
Is	0.80
Cs	0.82

Ps=Cs*Pf = 39.59 psf

1.2 Wind load

V (MPH)	105.00
Kd	0.85
Kz	0.85
Kzt	1.00

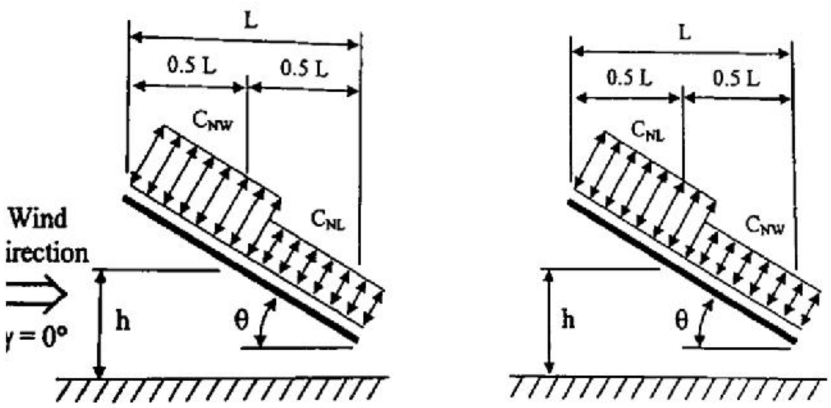
qh = 20.39

Wind pressure on the open roof according to ASCE7-5:

$P=q_hGC_N$

G	0.85
Iw	1.00

CN are given in the following Fig.



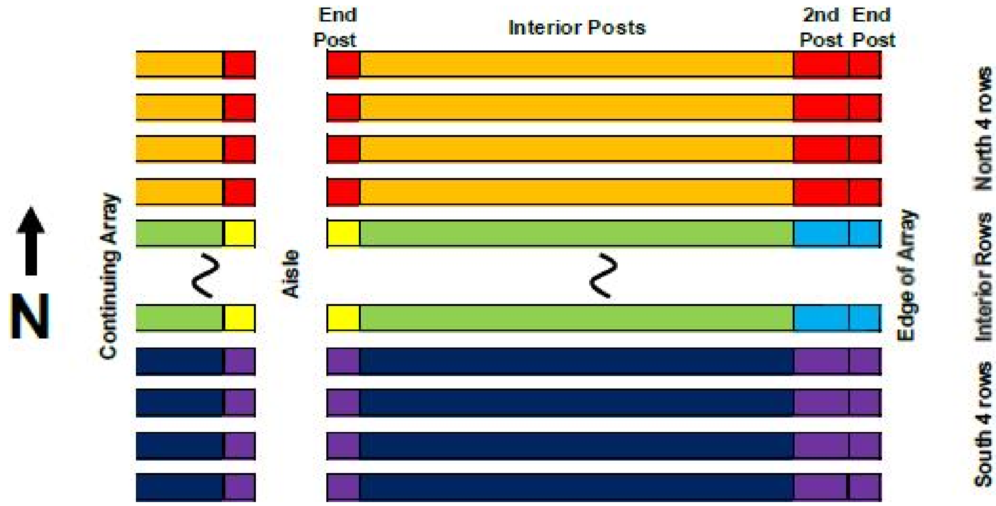
	CASE B		CASE A	
Windward	GCW	2.33	GCW	1.83
	GCN	0.80	GCN	1.90
Leeward	GCW	-2.43	GCW	-1.60
	GCN	-0.37	GCN	-1.67

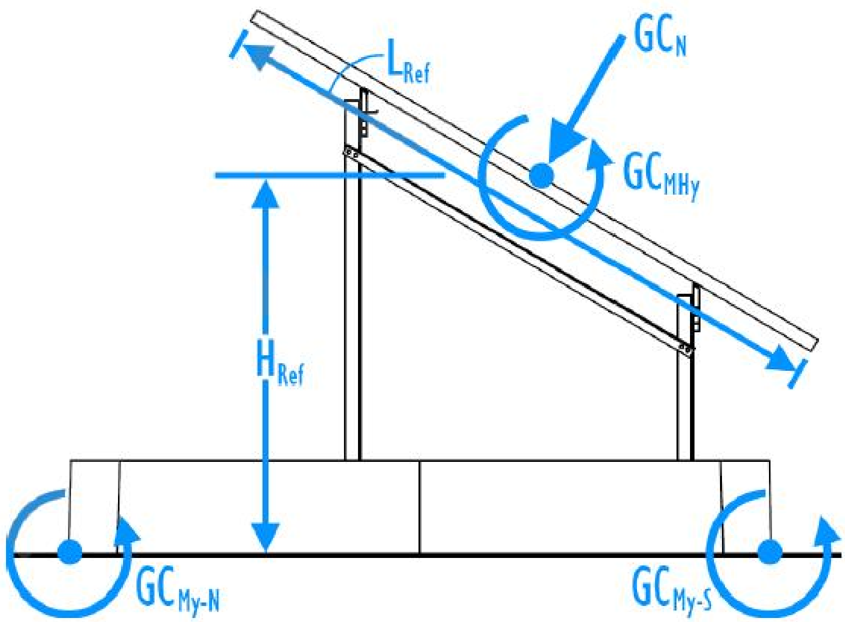
2.0 Foundation

The results of wind load factors including normal and overturning moments provided by CPP are located in the calculation sheets. The results are given for two opposite directions of wind which causes upward and downward wind forces calculated based on worst case design wind loads.

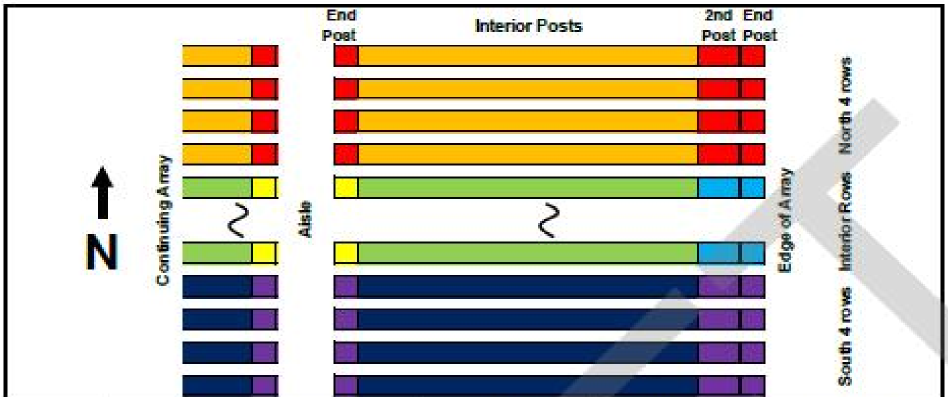
GCN is the normal force factor, GC-My-N is the moments about northern pivot point and GC-My-S is the moment about southern pivot point. As it is apparent and highlighted in worksheets, the overturning moment about the southern point due the wind forces in upward direction is the critical case. Northern interior posts receive the highest upward force.

The factor of safety is calculated based on the worst case scenario, when the dead load and full wind loads are present. The resisting ballast weight and moments (about the southern pivot point) are calculated based on the superstructure and tub weight as given in the worksheet.





Schematic of wind load coefficients – PourInPlace System



Zone	Tilt/height*	GC_N		GC_{MHy}		GC_{My-N}		GC_{My-S}	
		Min	Max	Min	Max	Min	Max	Min	Max
	15° / 0.12	-0.72	0.62	-0.16	0.03	-1.83	1.43	-1.76	0.89
	15° / 0.46	-0.84	0.60	-0.18	0.04	-0.66	0.54	-1.00	0.47
	30° / 0.12	-1.14	1.14	-0.17	0.04	-1.65	1.14	-1.94	1.36
	30° / 0.46	-1.20	1.24	-0.22	0.05	-0.64	0.29	-1.40	1.05
	15° / 0.12	-0.66	0.28	-0.10	0.02	-0.84	1.48	-1.40	0.44
	15° / 0.46	-0.71	0.26	-0.16	0.02	-0.29	0.50	-0.84	0.19
	30° / 0.12	-0.85	0.47	-0.09	0.04	-0.60	0.95	-1.31	0.65
	30° / 0.46	-0.86	0.45	-0.14	0.06	-0.23	0.27	-0.94	0.39
	15° / 0.12	-0.34	0.50	-0.09	0.02	-1.48	0.72	-0.81	0.70
	15° / 0.46	-0.58	0.59	-0.11	0.03	-0.66	0.40	-0.66	0.42
	30° / 0.12	-0.56	0.88	-0.09	0.03	-1.31	0.58	-0.93	1.02
	30° / 0.46	-0.63	1.11	-0.12	0.03	-0.59	0.19	-0.69	0.92
	15° / 0.12	-0.43	0.24	-0.10	0.01	-0.72	0.80	-1.09	0.33
	15° / 0.46	-0.46	0.25	-0.12	0.01	-0.27	0.29	-0.57	0.19
	30° / 0.12	-0.53	0.38	-0.07	0.03	-0.51	0.56	-0.86	0.52
	30° / 0.46	-0.57	0.43	-0.10	0.02	-0.23	0.16	-0.64	0.36
	15° / 0.12	-0.54	0.44	-0.11	0.02	-1.28	1.12	-1.24	0.67
	15° / 0.46	-0.77	0.51	-0.15	0.03	-0.54	0.53	-0.88	0.38
	30° / 0.12	-1.03	0.95	-0.16	0.02	-1.39	0.99	-1.78	1.12
	30° / 0.46	-1.19	1.12	-0.20	0.02	-0.57	0.32	-1.35	0.96
	15° / 0.12	-0.49	0.52	-0.11	0.02	-1.70	0.90	-1.22	0.57
	15° / 0.46	-0.48	0.87	-0.14	0.02	-1.02	0.28	-0.62	0.56
	30° / 0.12	-0.65	0.67	-0.08	0.03	-1.03	0.69	-1.05	0.74
	30° / 0.46	-0.75	0.88	-0.13	0.02	-0.47	0.20	-0.85	0.73
	15° / 0.12	-0.67	0.47	-0.12	0.03	-1.48	1.36	-1.55	0.72
	15° / 0.46	-0.88	0.76	-0.17	0.03	-0.89	0.60	-1.02	0.48
	30° / 0.12	-1.31	0.92	-0.20	0.02	-1.35	1.20	-2.28	1.08
	30° / 0.46	-1.42	1.10	-0.25	0.03	-0.57	0.32	-1.66	0.93

* Height is expressed as the ratio of the gap from the ground to the low edge of the PV divided by the c

Interpolation between configurations is allowed

Figure 5: Peak wind load coefficients – Pour-in-Place System

DRAFT

GC_N Factors (Pour-In-Place)								
		North Row Ends	North Row Mid	Mid Aisles	Mid Row Mid	Mid Row Ends	South Row Mid	South Row Ends
Tilt	H* Ratio	Min	Min	Min	Min	Min	Min	Min
15	0.12	-0.72	-0.66	-0.34	-0.43	-0.54	-0.49	-0.67
15	0.46	-0.84	-0.71	-0.58	-0.46	-0.77	-0.48	-0.88
30	0.12	-1.14	-0.85	-0.56	-0.53	-1.03	-0.65	-1.31
30	0.46	-1.2	-0.86	-0.63	-0.57	-1.19	-0.75	-1.42
25	0.39	-1.063	-0.805	-0.587	-0.526	-1.011	-0.647	-1.210
Pressure (ps	0	-13	-10	-7	-6	-12	-8	-15
Uplift per Pa	0	-272	-206	-150	-134	-258	-165	-309
Uplift (vertic	0	-246	-186	-136	-122	-234	-150	-280
Horizontal fo	0	-115	-87	-63	-57	-109	-70	-131
Number of p	0	2.50	3.50	2.50	3.50	2.50	3.50	2.50
Total uplift (	0	-616	-653	-340	-426	-586	-524	-701
Total horizo	0	-287	-304	-158	-199	-273	-244	-327

GC_My-S Factors (Pour-In-Place)								
		North Row Ends	North Row Mid	Mid Aisles	Mid Row Mid	Mid Row Ends	South Row Mid	South Row Ends
Tilt	H* Ratio	Min	Min	Min	Min	Min	Min	Min
15	0.12	-1.76	-1.4	-0.81	-1.09	-1.24	-1.22	-1.55
15	0.46	-1	-0.84	-0.66	-0.57	-0.88	-0.62	-1.02
30	0.12	-1.94	-1.31	-0.93	-0.86	-1.78	-1.05	-2.28
30	0.46	-1.4	-0.94	-0.69	-0.64	-1.35	-0.85	-1.66
25	0.39	-1.396	-0.998	-0.724	-0.684	-1.279	-0.844	-1.571
g moment		-1377	-985	-715	-675	-1262	-832	-1550
Number of panels supported		2.50	3.50	2.50	3.50	2.50	3.50	2.50
Overturnin g moment		-3443	-3447	-1787	-2363	-3155	-2913	-3875

Uplift, overturning, and sliding control:

Friction coefficient	0.45
Safety factor	1.67
Dead load on post (lb)	188

	Combination	North Row Ends	North Row Mid	Mid Aisles	Mid Row Mid	Mid Row Ends	South Row Mid	South Row Ends
Total uplift vertical (lb)	W	-616	-653	-340	-426	-586	-524	-701
Effective weight on tubs (lb)	0.6D(post)+W	-503	-540	-227	-313	-473	-411	-588
Total Horiz. force *lb)	W	287	304	158	199	273	244	327

Min tub weight based on assumed safety factor (lb)		North Row Ends	North Row Mid	Mid Aisles	Mid Row Mid	Mid Row Ends	South Row Mid	South Row Ends
	Criterial							
	Friction control	1786	1900	935	1201	1693	1504	2048
	Uplift control	840	902	379	523	790	687	982
	Overturning control	1728	1730	806	1127	1568	1433	1969
	Maximum needed	**1786**	**1900**	**935**	**1201**	**1693**	**1504**	**2048**

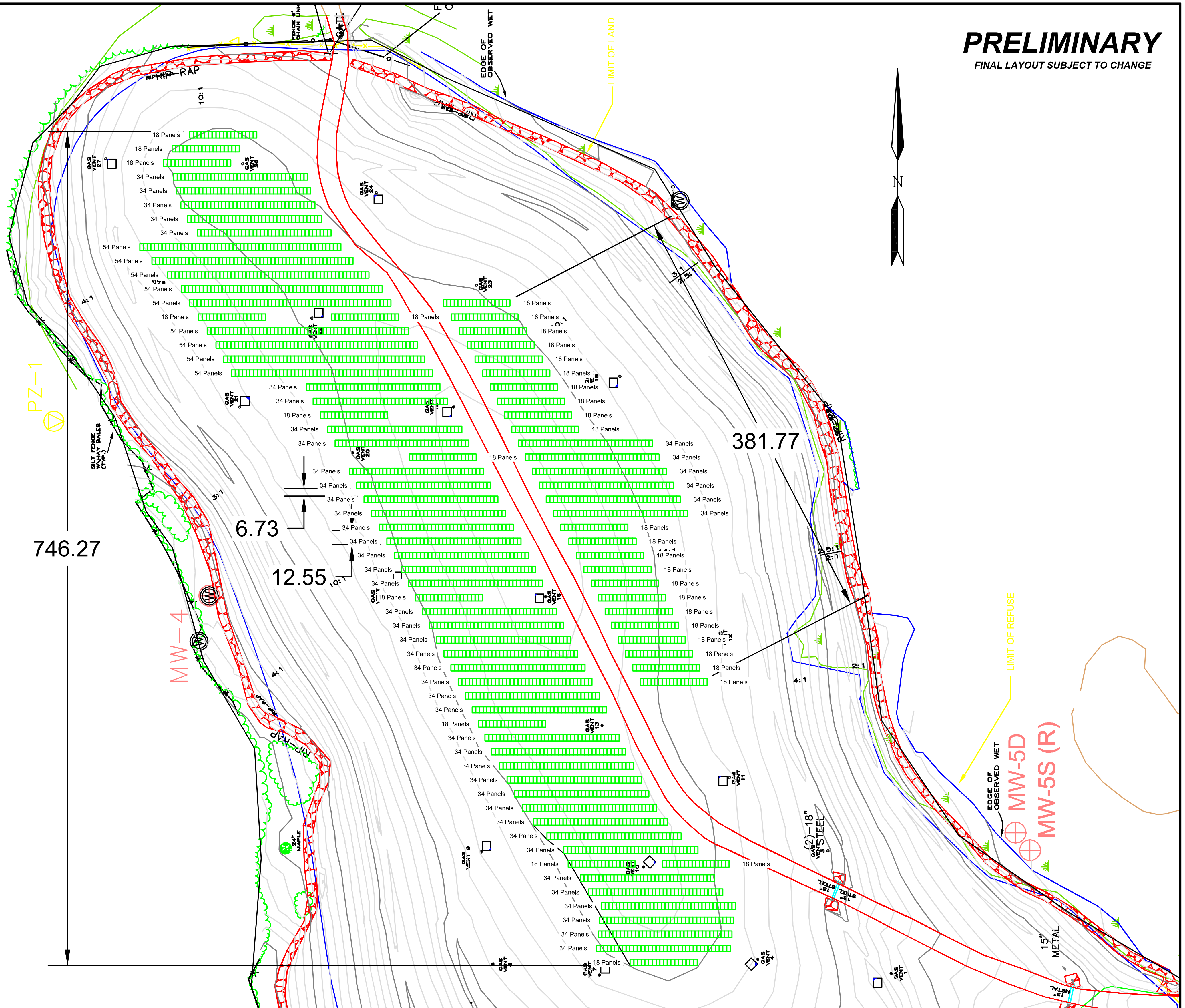
Soil pressure control on the tub edge

		North Row Ends		North Row Mi		Mid Aisles		Mid Row Mid		Mid Row Ends		South Row Mid		South Row Ends	
Vertical force	D+0.75W+0.75S (or0.45W)	2917	3820	3566	4293	2273	2918	3037	3577	2847	3672	3266	4160	3116	4050
Moment (lb-ft)		-1146	647	-1151	464	-637	542	-806	333	-1048	516	-991	671	-1264	561
e/L		0.39	0.17	0.32	0.11	0.28	0.19	0.27	0.09	0.37	0.14	0.30	0.16	0.41	0.14
Soil Stress (ksf)		0.19	0.49	0.26	0.52	0.18	0.38	0.24	0.43	0.20	0.46	0.25	0.53	0.20	0.50
Soil Stress (psi)		1.34	3.38	1.83	3.60	1.24	2.62	1.69	2.96	1.36	3.17	1.72	3.65	1.40	3.49
Vertical force (lb)	0.6D+0.6W (or0.45W)	1283	2486	1360	2330	708	1568	888	1608	1220	2320	1093	2284	1460	2705
Moment (lb-ft)		-1528	863	-1535	619	-850	722	-1075	444	-1397	688	-1322	895	-1686	748
e/L		1.19	0.35	1.13	0.27	1.20	0.46	1.21	0.28	1.14	0.30	1.21	0.39	1.15	0.28
Soil Stress (ksf)		0.31	0.36	0.32	0.32	0.17	0.25	0.22	0.22	0.29	0.33	0.27	0.35	0.34	0.38
Soil Stress (psi)		2.15	2.53	2.20	2.23	1.19	1.73	1.50	1.55	1.99	2.28	1.85	2.40	2.39	2.61
Max soil pressure (KSF)		0.53			< 1Ksf Ok										
Max Soil Stress (psi)		3.65			< 7 Psi Ok										

Tub bottom dimensions (ft) 1.53 * 6

PRELIMINARY

FINAL LAYOUT SUBJECT TO CHANGE



LEGEND

Trina 310W PV Module

0 50' 125' 250'

STATE OF NEW HAMPSHIRE
MINGQIAO ZHU
No. 10792
LICENSED
PROFESSIONAL ENGINEER

2/25/2015

PRELIMINARY

FINAL LAYOUT SUBJECT TO CHANGE

AERIAL VIEW

Array Information

	PV Modules	Racking
Manufacturer	Trina	Gamechange Racking
Model	TSM-PD14 310W	25-Degree Pour-in-Place
Dimensions	77.01" x 39.06" x 1.57"	
Weight	60.8 lbs	
Quantity	2790	

2790 modules at 310W

864.9 MW

Design Information

Building Occupancy Category	I
Wind Exposure Category	C
Design Wind Speed	105 mph ASCE7-10
Design Snow Load	80 psf
Area of Array	2.82 acres
No. of rows	90

GENERAL NOTES

- The layout shown herein is based on site layout geometry provided to GameChange Racking by the customer.
- Any changes to the site that may affect the solar PV arrays depicted herein shall be notified to GameChange Racking.
- GameChange Racking is a custom design layout for provided PV modules only. Refer to Array Information table.
- GameChange racking cannot be responsible for errors during installation caused by changes that impact the layout as shown

Issue:	By:	Date:	Description:
1	EM	12-16-2014	Original Layout

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730 Fifth Avenue, 16th Floor
New York, NY 10019
Tel:212-359-0205

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GAMECHANGE RACKING®
STRONG. SIMPLE.

Customer: **New Hampshire Solar Garden**

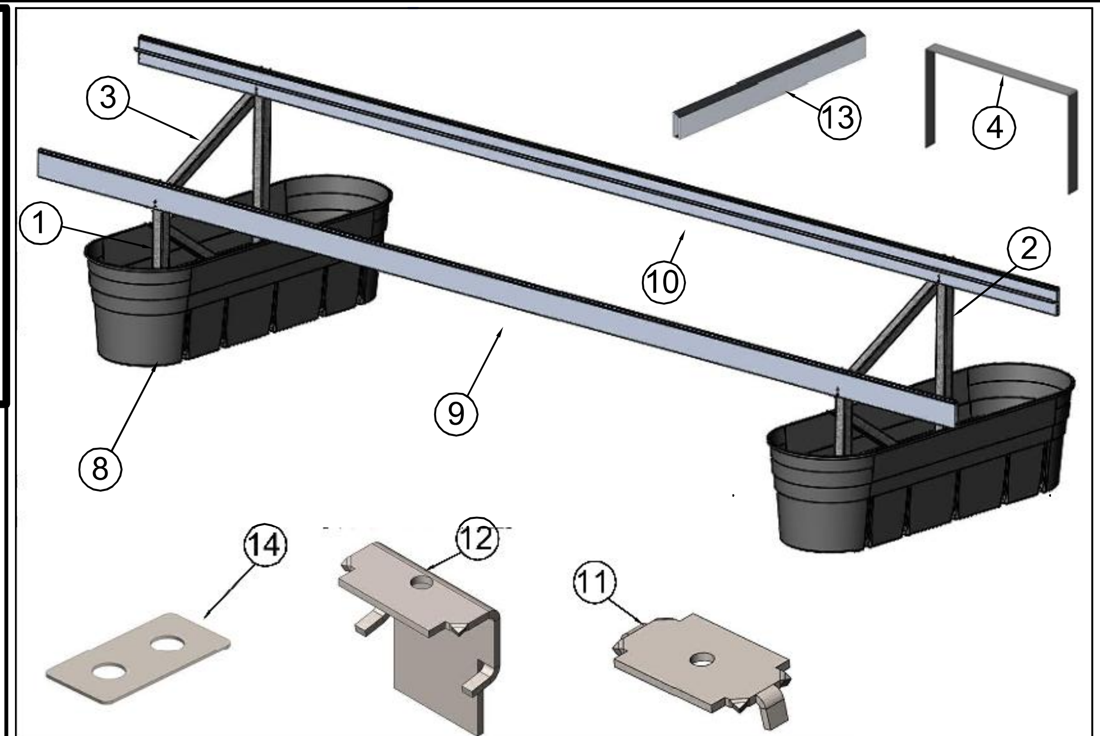
Project: **Hillsboro Landfill**

Location: **Municipal Dr, Hillsboro, NH 03244**

SITE PLAN

TOP TIPS:

1. **Use vertical adjustability provided to make Mounting Rails level, and the site install look great.**
2. **Use multiple hoops around plywood when pouring concrete into tubs, so the tubs look great after poured.**
3. **If pouring concrete in areas with freezing winters make sure to use freeze thaw additives, and use frost blankets if possible.**
4. **If pouring concrete in below freezing temperatures make sure to use accelerators that are NOT calcium chloride based**



PARTS LIST

Item No.	Description	Part No.	Material
1	South Post	GC271	Galvanized,12 gauge G90 Stl.
2	North Post	GC272	Galvanized,12 gauge G90 Stl.
3	Angled Beam	GC276	Galvanized,12 gauge G90 Stl.
4	Tub Straps	GC298	Galvanized,12 gauge G90 Stl.
5	Angled Stand	GC277	Galvanized,16 gauge G90 Stl.
6	Horizontal Beam	GC275	Galvanized,16 gauge G90 Stl.
7	Brace Beam	GC278	Galvanized,12 gauge G90 Stl.
8	GC Tub	GC Tub	Styrofoam / HMWPE
9	Panel Mounting Rail Lower	GC263	Al Alloy
10	Panel Mounting Rail Upper	GC263T	Al Alloy
11	Panel Mid Clip	GC315T	Al Alloy 6005A-T61
12	Panel End Clip	GC314T	Al Alloy 6005A-T61
13	Splice	GC251	Al Alloy at 0.10" thick
14	Stiffening Plate	GC255	Stainless Steel 304 at 0.063" thick
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16	Carriage/ T-Bolts		Stainless Steel 1/4-20
17	Flange Nuts		Magnacoated: serrated
18	Serrated hex head TEK Screws		Stainless Steel / Magacoated, 1/4" dia. x 1-1/4" / 1-1/2" long
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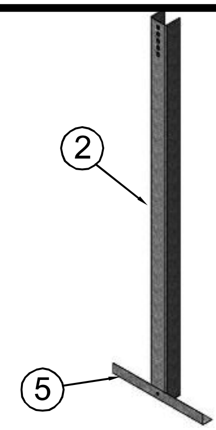
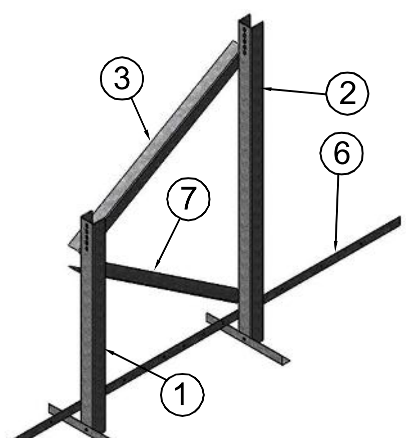


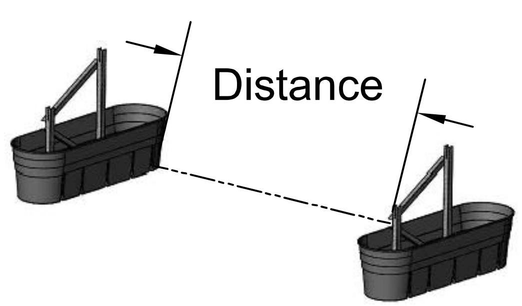
1) Take North Post and install Angle Stand to the bottom of the North Post using 3/8-16 x 3/4" hex bolts and flange nuts. With "U" shape of North Post facing north and "L" shape of Angle Stand facing north. Torque to specifications.



2) Place South Post south of the North Post with "U" shape facing north. Then install the Horizontal Beam to the lower section of the North Post and South Post. Use 3/8-16 x 3/4" hex bolts and flange nuts to attach. Make sure bolt head is on the outside and flange nut on the inside.Torque to specifications.

3) Install Angled Beam to the top ends of the North and South Post. Install Brace Beam below Angled Beam. Use 3/8-16 x 3/4" hex bolts and flange nuts to attach, with bolt head on the outside. Torque to specifications. Rail Support Assembly is complete.

4) Place first GC Tubs in locations specified per site layout and ensure ground is level.

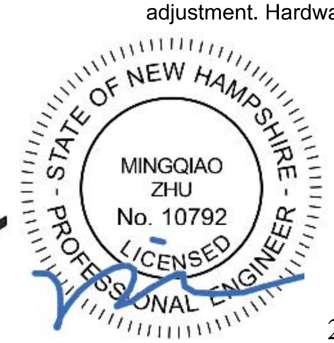


5) Place Rail Support Assembly inside of Tub. The Angled Stand and Horizontal Beam will aid in proper positioning inside the Tub, 1" tolerance. Align southern edge of the Tub with the string line. Make sure horizontal beam is level.

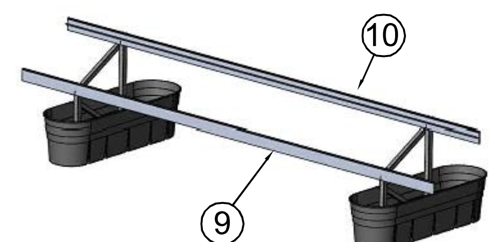
6) If Horizontal Beam is not level, then raise one Post and support with pile of 1" gravel underneath until till is correct.

7) Repeat Rail Support Assembly and installation for adjacent Tubs. Position Rail Support Assembly and Tubs to the appropriate distance apart as required by layout.

8) Install Panel Mounting Rails to the tops of the Posts, on the south side. The Panel Mounting Rail Upper (with tray) is installed on the North Posts. The Panel Mounting Rail Lower is to be installed on the South Posts. Rails will be installed through middle slots on Posts, to enable future vertical adjustment. Hardware for attaching the Rails will be 3/8-16 x 1-1/2" hex bolts and flange nuts.

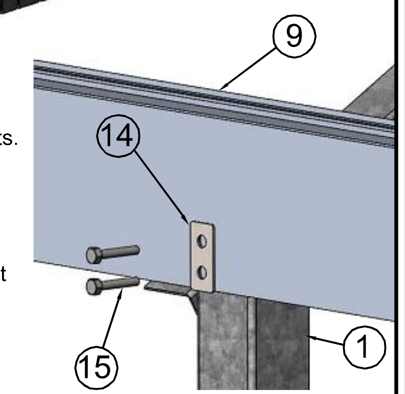


2/25/2015



9) Place Stiffening Plate on south side of Panel Mounting Rails. Insert the 3/8-16 x 1-1/2" bolts though Stiffening Plate, Rails and then through Posts. Then attach with serrated flange nuts. Make sure bolts heads are on the south side. Torque to specifications.

In corrosive Environments, insert another Stiffening Plate between Posts and Panel Mounting Rails. Place them so that bolts pass though Stiffening Plate.



10) If using a continuous Panel Mounting Rail layout. Mark 1/4" to each side of the center line of the Splice, creating the thermal expansion zone . Attach using serrated head TEK screws 3/4" long. On south side insert one screw centered vertically on the splice, and approximately 4" from the end of the Rail.

When attaching the next Rail, slide over Splice. Do not attach. At each thermal break, leave 1/2" of space between Panel Mounting Rails.

GC Pour-in-Place System

- Use only GameChange parts. Use of other parts to complete the installation as substitutes may void the warranty.
- Make sure the ground structure (notably in the case of a capped landfill) is inspected and can support the loading resulting from the GC Pour-n-Place Ground System and provided PV modules.
- Follow all safety instructions that are required by relevant local, regional and national organizations and procedures as outlined in this Install manual, both for mechanical and electrical aspects of the solar PV array installation.
- When encountering undocumented or unexpected obstacles requiring a work around, they should be noted on working drawings and notified to supervisor for evaluation. Work should then be completed in a manner that ensures that the remainder of the array is not affected.
- Customers are responsible for grade variations.and making sure slope tolerances support GameChange System. GC Pour-in-Place Ground System ideally should be installed on flat, level and pre-compacted ground. This is to avoid system settlement over time. Topsoil with loam content and organics should be removed, and soil scraped down to subsoil level. If the system is installed on new fill, the soil should be compacted with a compacting roller prior to installation. However, due to vertical adjustability of the Rails on the Posts, the GC Pour-in-Place System may be erected on less than ideally prepared grounds when site conditions preclude removal of topsoil. In that scenario, the rails should be adjusted to appropriate heights on Posts during periods of operation and maintenance visits.
- Customers are responsible for grade variations.
- Reference Install Manual for installation. Not following Install Manual may result in voiding warranty.
- Ballast molds are provided for each site by GameChange. Recommended to use concrete mixtures with freeze thaw additive which are weather and UV resistant if in areas with required additive.
- Pour concrete immediately if heavy wind is expected, as it may blow assembled module Mounting Rails and Assembly over and cause damage.

Tool Required

- 7/16” Deep and Short Sockets(1/4 ” bolts)
- 9/16” Deep and Short Sockets (3/8 ” bolts)
- 7/16” and 9/16” Wrenches
- Torque Wrench
- Suggested finish torques : 1/4" hardware use 6 ft lbs
3/8" x 1.5" hardware (Aluminum Rail joint hardware) use 12 ft lbs
3/8" x .75" Hardware (Post Assembly joint hardware) use 15 ft lbs
- String Line
- Impact drill with interchangeable drivers
- ¼” Drill Bit
- Must use anti-seize such as LocTite for bolts used to mount modules (most bolts come pre-dip with anti-seize)
- Tape Measure
- Concrete mixture (weather and UV Resistant if required) per GameChange ballast plan
- 48 inch long level
- Rack assembly jig made of plywood and 2 ”x4” wood.

Preventative Maintenance

- After Installation, installer must annually monitor for any surface rust that may occur over time. Identify any rust areas, wire brush area to remove rust, and spray area with 70%+ zinc rich paint.
- Clips must be checked annually and after storms with severe winds to make sure their installation and torque settings remain correct.
- Annual inspection must be done for mechanical movement due to any reason including thermal expansion and contraction. Any mechanical movement must be rectified.
- Torque settings must be checked for all hardware.
- All Clips must be checked to make sure there is no gap between side of Clip and module.
- Proper preventative maintenance must be conducted or warranty may be voided.

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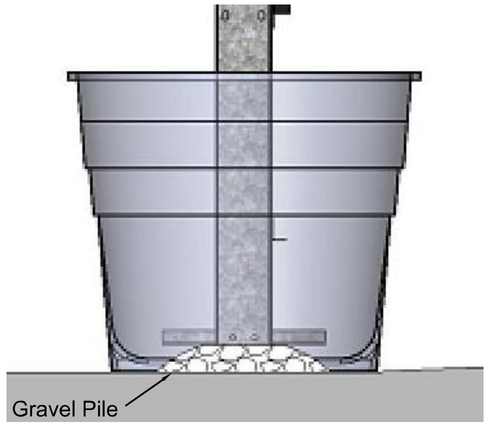
Pour In Place System

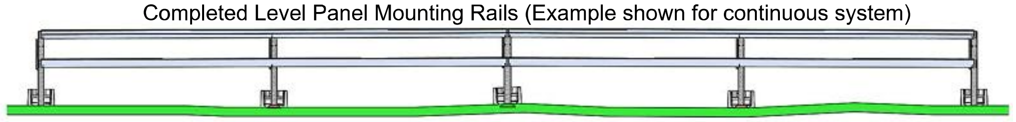
11) Vertical adjustability is set prior to pouring concrete, and this is in addition to moving Rails higher or lower on Posts. After Rail installation is complete run a string along Upper and Lower Rails, in the east west direction. Evaluate Rails.

12) Place small piles of 1" gravel under the Rail Support Assembly until Rails touch the string.

Keep Horizontal Beam level at all times. Horizontal Beam must not get closer than 5" from the top of the Tub and must stay 2" above the ground.



Completed Level Panel Mounting Rails (Example shown for continuous system)

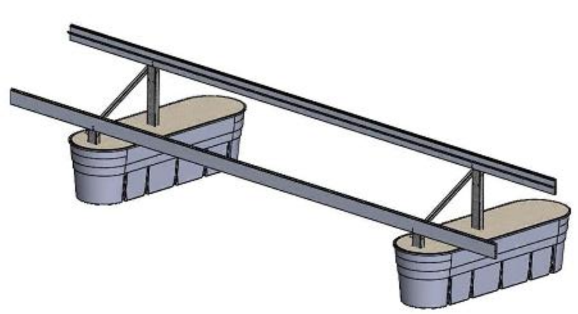


13) Place plywood pieces along long side of Tubs. Then place Tub Straps on the top (wrapping around sides) of the Tubs before pouring concrete. Use three Straps minimum for HMWPE Tubs. Follow GameChange ballast plan.

14) Concrete should first be poured in the center of the Tub, then use shovels to push to the ends. Once filled, true up Posts and Rails, and check Angled Beams to make sure system is at correct tilt. Pound on one Post to correct tilt. This should all be done before concrete settling. Use vibrator rob to follow industry standards, and magnesium trowel to towel wash around Posts so precipitation does not collect.

- Mixture should be for:
  - -High strength (4000 psi minimum)
  - -Normal weight of 4000 lbs/yd³
- Bobcat with gravity feed bucket, or concrete pump should be used when there are weight constraints on the land or rows are narrow.
- 5" slump for concrete
- Allow concrete to set for 1-2 day before removing Straps and plywood.

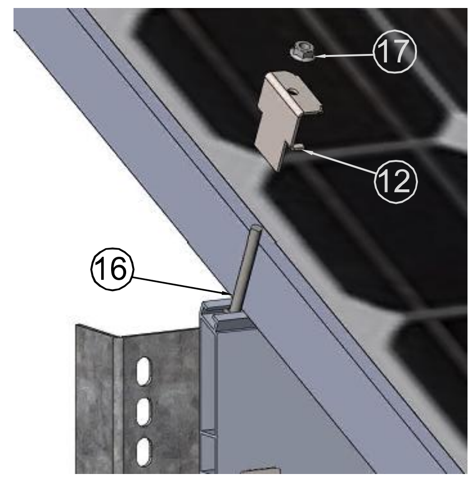
15) At least three days after concrete is poured, drill four inch (4 ") diameter weep holes on each long side of the Tub walls, centered 2" above the ground level, centered on wall of Tub the long way. This enables water to drain out.



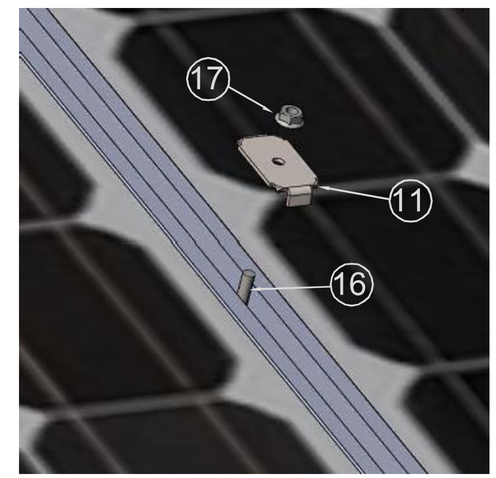
16) Insert t-bolt (or carriage bolt) into slot on Panel Mounting Rail, approximately 1/2"+ from the end of the Panel Mounting Rail. Place panel on Rail next to bolt. Then place End Clip over bolt and slide panel under the End Clip. Leave a 1/2" spacing from the edge of the End Clip to the end of the Rail. Make sure panel is snug against End Clip. Fasten using flange nut and torque as required.

17) Repeat steps when using Mid Clips in between panels. Insert t-bolts (carriage bolts) into Rails between panels and place Mid Clips over T-bolts. Make sure panel is snug against Mid Clip. Fasten using flange nut and torque as required.

18) When end of Panel Mounting Rail is reached or thermal break is required, then finish with End Clip. Remember to continue to leave 1/2" spacing from the edge of the End Clip to the end of the Rail.



End Clip

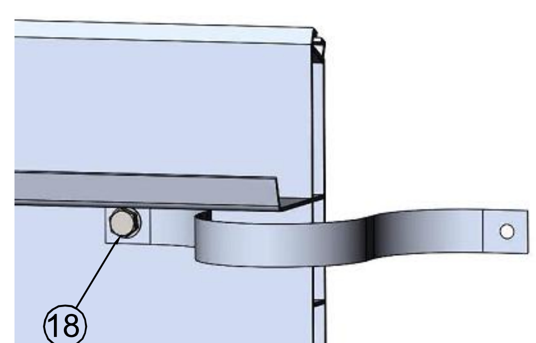


Mid Clip

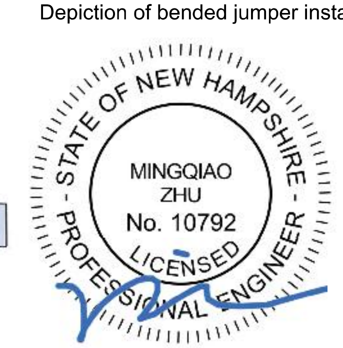
19) After panels have been installed on a row of Rails, go across Rails and adjust to the proper height where required. Panel Mounting Rails are to be at the same level height. Height differences may have occurred due to ground deviations. Proper ground preparation should eliminate need for this step.

20) Panels and Panel Mounting Rails are all bonded together East/ West, so that each row forms one single structure. A jumper (GC provided strip or WEEB-6.7) is required at thermal breaks to continue the bonding/grounding. Install jumpers by using a serrated head TEK screw 1-1/4-1-1/2" length within the third rail chamber up and approximately 1" in from the rail edge so as not to interfere with the rail to Post joint or the Splice installation. Game Change recommends 16 strings may be grounded together using 8 gauge copper wire.

The entire system needs to be grounded from a single point to an appropriate grounding source.



Depiction of bended jumper installation



2/25/2015

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- Pour concrete immediately if heavy wind is expected, as it may blow assembled module Mounting Rails and Assembly over and cause damage.

Tool Required

- 7/16" Deep and Short Sockets(1/4 " bolts)
- 9/16" Deep and Short Sockets (3/8 " bolts)
- 7/16" and 9/16" Wrenches
- Torque Wrench
- Suggested finish torques : 1/4" hardware use 6 ft lbs
3/8" x 1.5" hardware (Aluminum Rail joint hardware) use 12 ft lbs
3/8" x .75" Hardware (Post Assembly joint hardware) use 15 ft lbs
- String Line
- Impact drill with interchangeable drivers
- ¼" Drill Bit
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- Tape Measure
- Concrete mixture (weather and UV Resistant if required) per GameChange ballast plan
- 48 inch long level
- Rack assembly jig made of plywood and 2 "x4" wood.

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Pour In Place System

APPENDIX B

Loureiro Engineering Associates, Inc. Calculations

TUB FOOT
1.53' x 6'
see game change racking

BEARING CAPACITY (RECT FOOTING)

TERZAGHI eq. DAS PG 460 + SHAPE FACTOR

ϕ 30° sand

$q_u = 0 + 0 + \frac{1}{2}[1 - 0.4(\frac{B}{L})]\gamma B N_\gamma$

$= 0 + 0 + \frac{1}{2}[1 - 0.4(\frac{1.53}{6})](120)(1.53)(22.4)$

$= \frac{1}{2}[0.898](120)(1.53)(22.4)$

$= 1,846.6$ psf

$=$ FS 3 $\Rightarrow$ 615 psf > 530 MAX. PSF FROM GAME CHANGE ASCE 7-10 ANALYSIS

SLOPE STABILITY

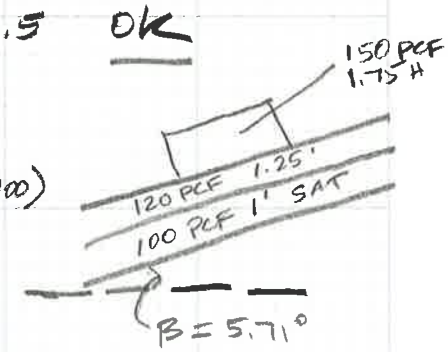
FACTOR OF SAFETY (FS) = TAN ϕ / TAN β

ϕ FRIC. ANGLE OF SAND / MSW = 25°

β = SLOPE ANGLE = 10:1 (1' / 10) $\tan^{-1}\frac{1}{10} = 5.71°$

FS = TAN 25 / TAN 5.71 = 4.66 > 1.5 OK

UNDER SATURATED DRAIN LAYER CONDITION



NORMAL FORCE = (1.75')(150) + (1.25')(120) + (1')(100)
= 512.5 PSF

BOYANT FORCE U = (1')(62.4) = 62.4 psf

$FS = \frac{(N-U)\tan\phi}{N \tan\beta} = \frac{(512.5 - 62.4)\tan 25°}{512.5 \tan 5.71}$

$= \frac{209.9}{51.2} = 4.1 > 1.5$ OK

TUB WEIGHT (EACH)

DIMENSION: 6' LONG x 1.53' WIDE x 1.75' TALL = 16.1 CF

CONCRETE: 150 PCF x 16.1 CF = 2415 lbs + 188 lbs

PSF LOAD = 2603 / (6 x 1.53) = 283.6 psf

← equip dead load see pg 7 GameChange CALCs

DAS

where q_c, q_q, and q_γ are the contributions of cohesion, surcharge, and unit weight of soil, respectively

Reissner (1924) has expressed q_q as

$$q_q = qN_q \tag{10.31}$$

where

$$N_q = e^{\pi \tan \phi} \tan^2 \left(45 + \frac{\phi}{2}\right) \tag{10.32}$$

Prandtl (1921) has shown that

$$q_c = cN_c \tag{10.33}$$

where

$$N_c = (N_q - 1) \tan \phi \tag{10.34}$$

↑ Eq. (10.32)

Caquot and Kerisel (1953) have expressed q_γ as

$$q_\gamma = \frac{1}{2} B\gamma N_\gamma \tag{10.35}$$

The numerical values given by Caquot and Kerisel can be approximated (Vesic, 1973) as

$$N_\gamma = 2(N_q + 1) \tan \phi \tag{10.36}$$

↑ Eq. (10.32)

Combining Eqs. (10.30), (10.31), (10.33), and (10.35) we obtain

$$q_u = cN_c + qN_q + \frac{1}{2} \gamma B N_\gamma \tag{10.37}$$

This is in the same general form as given by Terzaghi [Eq. (10.9)]. However, the values of the bearing capacity factors are not the same. The values of N_q, N_c, and N_γ, defined by Eqs. (10.32), (10.34), and (10.36), are given in Table 10.1, but, for all practical purposes, Terzaghi's bearing capacity factors will yield good results. Differences in bearing capacity factors are usually minor as compared to the unknown soil parameters.

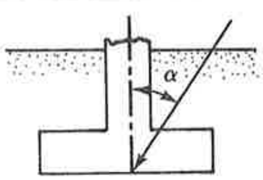
Table 10.1 | (10.34), and (

ϕ (1)	N_c (2)	
0	5.14	
1	5.38	
2	5.63	
3	5.90	
4	6.19	
5	6.49	
6	6.81	
7	7.16	
8	7.53	
9	7.92	
10	8.35	
11	8.80	
12	9.28	
13	9.81	
14	10.37	
15	10.98	
16	11.63	
17	12.34	
18	13.10	
19	13.93	
20	14.83	
21	15.82	
22	16.88	
23	18.05	
24	19.32	
25	20.72	
26	22.25	
27	23.94	
28	25.80	
29	27.86	
30	30.14	
31	32.67	
32	35.49	
33	38.64	
34	42.16	
35	46.12	
36	50.59	
37	55.63	
38	61.35	
39	67.87	
40	75.31	
41	83.86	
42	93.71	
43	105.11	
44	118.37	1
45	133.88	1
46	152.10	1
47	173.64	1
48	199.26	2
49	229.93	2
50	266.89	3

[a]After Vesic (1973)

Table 10.2 Values of the Shape, Depth, and Inclination Factors

Shape factors for rectangular footing (B = width of footing; L = length of footing)
$\lambda_{cs} = 1 + \left(\frac{B}{L}\right)\left(\frac{N_q}{N_c}\right)$ $\lambda_{qs} = 1 + \left(\frac{B}{L}\right)(\tan\phi)$ $\lambda_{\gamma s} = 1 - 0.4\left(\frac{B}{L}\right)$
Shape factors for square and circular footing
$\lambda_{cs} = 1 + \frac{N_q}{N_c}$ $\lambda_{qs} = 1 + \tan\phi$ $\lambda_{\gamma s} = 0.6$
Depth factors for $\frac{D_f}{B} \le 1$
$\lambda_{qd} = 1 + 2\tan\phi(1-\sin\phi)^2\left(\frac{D_f}{B}\right)$ $\lambda_{cd} = \lambda_{qd} - \frac{1-\lambda_{qd}}{N_q \cdot \tan\phi}$ $\lambda_{\gamma d} = 1$
Depth factor for $\phi = 0$
$\lambda_{\gamma d} = 1 + 0.4\left(\frac{D_f}{B}\right)$
Depth factors for $\frac{D_f}{B} > 1$
$\lambda_{qd} = 1 + 2\tan\phi(1-\sin\phi)^2\tan^{-1}\left(\frac{D_f}{B}\right)$ $\lambda_{cd} = \lambda_{qd} - \frac{1-\lambda_{qd}}{N_q \cdot \tan\phi}$ $\lambda_{\gamma d} = 1$
Depth factor for $\phi = 0$
$\lambda_{cd} = 1 + 0.4\tan^{-1}\left(\frac{D_f}{B}\right)$
Inclination factors
$\lambda_{ci} = \left(1 - \frac{\alpha°}{90°}\right)^2$ $\lambda_{qi} = \left(1 - \frac{\alpha°}{90°}\right)^2$ $\lambda_{\gamma i} = \left(1 - \frac{\alpha°}{\phi°}\right)^2$



10.6 General Comments

In Section 10.5, the relati
(1953) and approximated
However, in many other te
as obtained by Meyerhof (1
ed. In this chapter, Eq. (1
for general information, the
Hanson (1970) will be briefl

Meyerhof's Equation (1

$$N_\gamma = (N_q - 1)\tan(1$$
↑
Eq. (10.32)

Hansen's Equation (1970

$$N_\gamma = 1.5(N_q - 1)\tan$$
↑
Eq. (10.32)

A comparison of the variatio
(10.40) is given in Figure 10.

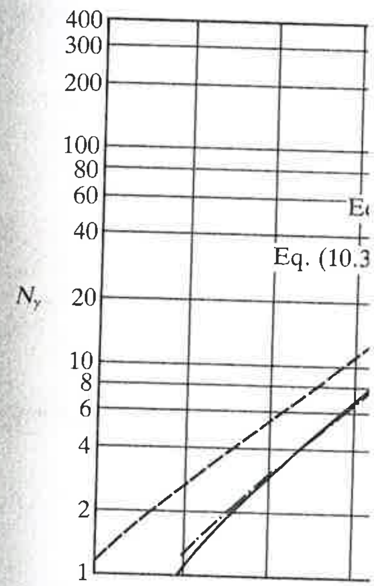


Figure 10.15 Comparison of bearin

sion, surcharge, and unit

(10.31)

(10.32)

(10.33)

(10.34)

s

(10.35)

isel can be approximated

(10.36)

5) we obtain

(10.37)

y Terzaghi [Eq. (10.9)]. rs are not the same. The), (10.34), and (10.36), are poses, Terzaghi's bearing nces in bearing capacity own soil parameters.

Table 10.1 Bearing Capacity Factors[a] [Eqs. (10.32), (10.34), and (10.36)]

ϕ (1)	N_c (2)	N_q (3)	N_γ (4)	N_q/N_c (5)	$\tan\phi$ (6)
0	5.14	1.00	0.00	0.20	0.00
1	5.38	1.09	0.07	0.20	0.02
2	5.63	1.20	0.15	0.21	0.03
3	5.90	1.31	0.24	0.22	0.05
4	6.19	1.43	0.34	0.23	0.07
5	6.49	1.57	0.45	0.24	0.09
6	6.81	1.72	0.57	0.25	0.11
7	7.16	1.88	0.71	0.26	0.12
8	7.53	2.06	0.86	0.27	0.14
9	7.92	2.25	1.03	0.28	0.16
10	8.35	2.47	1.22	0.30	0.18
11	8.80	2.71	1.44	0.31	0.19
12	9.28	2.97	1.69	0.32	0.21
13	9.81	3.26	1.97	0.33	0.23
14	10.37	3.59	2.29	0.35	0.25
15	10.98	3.94	2.65	0.36	0.27
16	11.63	4.34	3.06	0.37	0.29
17	12.34	4.77	3.53	0.39	0.31
18	13.10	5.26	4.07	0.40	0.32
19	13.93	5.80	4.68	0.42	0.34
20	14.83	6.40	5.39	0.43	0.36
21	15.82	7.07	6.20	0.45	0.38
22	16.88	7.82	7.13	0.46	0.40
23	18.05	8.66	8.20	0.48	0.42
24	19.32	9.60	9.44	0.50	0.45
25	20.72	10.66	10.88	0.51	0.47
26	22.25	11.85	12.54	0.53	0.49
27	23.94	13.20	14.47	0.55	0.51
28	25.80	14.72	16.72	0.57	0.53
29	27.86	16.44	19.34	0.59	0.55
30	30.14	18.40	22.40	0.61	0.58
31	32.67	20.63	25.99	0.63	0.60
32	35.49	23.18	30.22	0.65	0.62
33	38.64	26.09	35.19	0.68	0.65
34	42.16	29.44	41.06	0.70	0.67
35	46.12	33.30	48.03	0.72	0.70
36	50.59	37.75	56.31	0.75	0.73
37	55.63	42.92	66.19	0.77	0.75
38	61.35	48.93	78.03	0.80	0.78
39	67.87	55.96	92.25	0.82	0.81
40	75.31	64.20	109.41	0.85	0.84
41	83.86	73.90	130.22	0.88	0.87
42	93.71	85.38	155.55	0.91	0.90
43	105.11	99.02	186.54	0.94	0.93
44	118.37	115.31	224.64	0.97	0.97
45	133.88	134.88	271.76	1.01	1.00
46	152.10	158.51	330.35	1.04	1.04
47	173.64	187.21	403.67	1.08	1.07
48	199.26	222.31	496.01	1.12	1.11
49	229.93	265.51	613.16	1.15	1.15
50	266.89	319.07	762.89	1.20	1.19

[a] After Vesic (1973)

APPENDIX C

Hillsboro Town Solar, LLC Cap Inspection Form

HILLSBORO TOWN SOLAR, LLC
HILLSBOROUGH LANDFILL CAP INSPECTION FORM

Date: ____

Weather Conditions: ____

Ground Conditions: ____

Inspected By: ____

Signature: ____

Reviewed By: ____

On-Cap Features:

1) Vegetative Layer in good condition? Yes ___ No____

2) Are side slopes in good condition? Yes ___ No____

3) Evidence of Erosion Yes ___ No____

If so, Where? ____

4) Is Cap Settlement Uniform? Yes____ No____

If No, Where? ____

5) Are there Depressions in Cap Surface? Yes____ No____

If Yes, Where? ____

6) Evidence of damage due to burrowing animals? Yes____ No____

7) Evidence of damage to cap due to unauthorized access? Yes____ No____

8) Evidence of damage to solar array? Yes____ No____

If Yes, Why? ____

9) Landfill vents in good condition? Yes____ No____

10) Is access road across the landfill cap in good Condition? Yes____ No____

11) Overall condition of cap? Good ___ Fair _____ Poor ___

Other On-Cap Observations (If Any):

____

____

____

____

____

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____

____