PRELIMINARY

Drainage & Flooding Analysis

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Borrego Springs Unmanned Photovoltaic Solar Farm
San Diego County, CA

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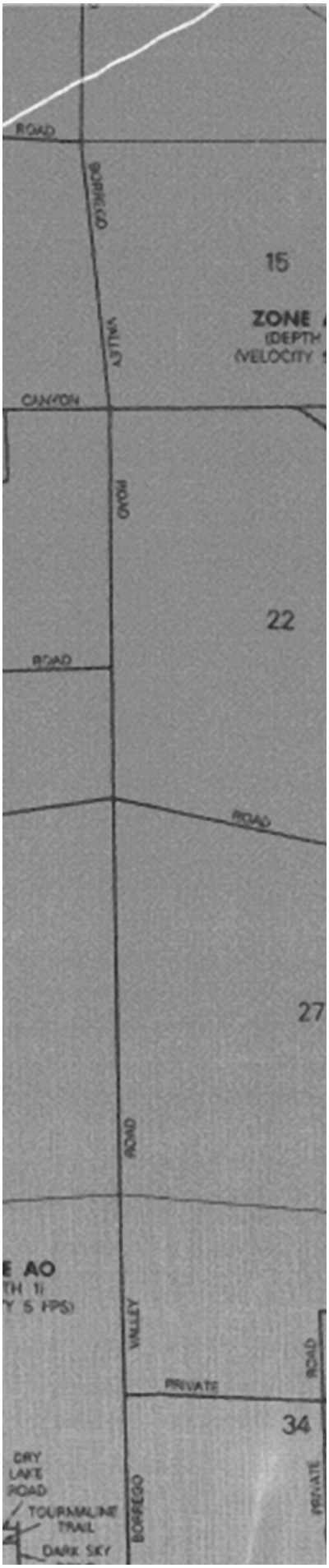

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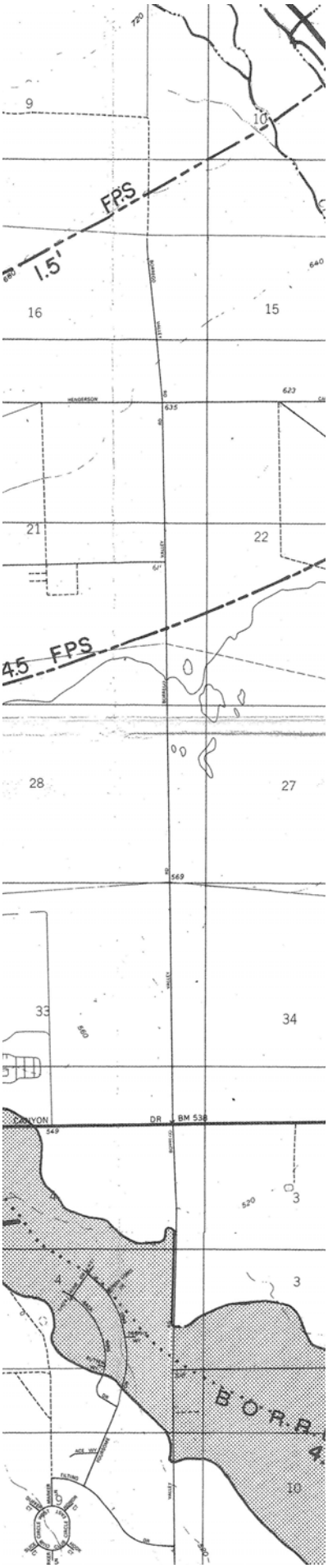

Exhibits

Title	Exhibit
Project Site & Watershed Location	"A"
Precipitation Maps	"B"
Soils & Land Use Maps	"C"
FEMA FIRM Panel (Partial)	"D"
Project Site Plans (Revised May 2011)	"E"
Existing Conditions Hydrology Study Map	"F"
Proposed Conditions Hydrology Study Maps	"G.1" & "G.2"

Attachments

Attachment	No.
Preliminary Erosion Calculations Documentation	1
Flood Hazard Protection Details from Boyle Report	2
Existing Conditions Hydrology Calculations (Area “EA”)	3
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Preliminary Drainage & Flooding Analysis

A. Introduction

1.1 Purpose, Background, & Scope

The following Preliminary Drainage & Flooding Analysis has been prepared for the new construction of the approximately 308-acre U.S. Solar One LLC (U.S. Solar) Borrego Springs Unmanned Photovoltaic Solar Farm in the Borrego Springs area of San Diego County (County), CA. This analysis has been prepared in response to the June 3, 2010 County Department of Planning & Land Use Pre-Application Scoping Letter and associated May 21, 2010 County Department of Public Works Flood Control Memorandum, which collectively requested the preparation a Preliminary Drainage & Flooding Analysis, as part of the overall Major Use Permit (MUP) Application for the project.

The purpose of this analysis is to demonstrate that the proposed project will a.) Provide requisite design measures to mitigate identified floodplain/alluvial fan hazards, b.) That these measures, and the overall project, will not alter the quantity, direction, or conveyance of tributary or on-site drainage, and c.) The project will not result in any detrimental impact to downstream properties, conveyances, or existing drainage facilities.

The scope of this analysis is as follows:

- Identification of the Flood Insurance Management Agency (FEMA) floodplain impacting the project site.
- Identification of alluvial fan(s) impacting the project site pursuant to existing study information, and identification of approximate flow depths, velocities, and peak flow rates for the 100-year storm event impacting the site based on published data.
- Identification of potential erosion, sedimentation, and debris issues impacting the project site.
- Identification of preliminary measures for mitigation of identified flood hazards, pursuant to County Flood Control and FEMA requirements and best practices.
- Preliminary Existing Conditions rational method calculations for off-site (tributary) and on-site peak flows for lesser storm events not associated with alluvial fan conditions.
- Preliminary Proposed Conditions rational method calculations for off-site (tributary) and on-site peak flows for lesser storm events not associated with alluvial fan conditions, and identification of preliminary site drainage plan.
- Reference to the stormwater quality reports prepared for the project.
- Summary of findings and project recommendations.

1.2 Project Overview

The proposed project, filed as County Department of Planning & Land Use Case No. 3992-10-009, entails the construction of either fixed or tracking photovoltaic solar fields on an approximately 308-acre property (APN 140-290-12) in the Borrego Springs area of San Diego County, southwest of the Henderson Canyon Road and Borrego Valley Road intersection, northwest of the Big Horn Road and Borrego Valley Road intersection, and two miles north of Palm Canyon Drive. The site lies within the "Clark Lake" USGS Quadrangle, in portions of Sections 16, 21, and 28 of Township 10 South, Range 6 East, San Bernardino Base Meridian, and within the Borrego Valley Watershed. Refer to Exhibit "A" for the general project site and watershed location with an aerial photo overlay.

Based on the Conceptual Site Plans for the project prepared by Joseph E. Bonadiman & Associates, Inc. (revised May 2011), the proposed project is to consist of either fixed or tracking photovoltaic solar fields (elevated on pilings), inverter pads, 24' graveled fire access roads, acceleration/deceleration lane along Borrego Valley Road, and 6' chain link breakaway fencing along the perimeter of the site. A proposed 69kv stepup substation at the southeastern corner of the site will connect with the existing SDG&E substation located at the western end of APN 141-210-01, approximately 1.37 miles south of the site on the western side of Borrego Valley Road, via a proposed generation tie-line running Borrego Valley Road.

The project is designed to have negligible impact and will not have a material change in the method, direction, or intensity of existing overall drainage, floodplain, or alluvial fan patterns.

1.3 References

The following documents have been made part of this analysis by reference:

1.) Pre-Application Scoping Letter for Case No. 3992-10-009, June 3, 2010 – County of San Diego Department of Planning & Land Use.

2.) Flood Control Requirements for Development Within the Borrego Valley FEMA Zone AO Delineated Floodplain (Memorandum), May 21, 2010 – County of San Diego Department of Public Works.

3.) San Diego County Code of Regulatory Ordinances Section 811.50(c)(2).

4.) Title 44 of Federal Code of Regulations Section 65.3 (44 CFR 65.3).

5.) San Diego County Hydrology Manual, June 2003 – County of San Diego Department of Public Works Flood Control Section.

6.) FEMA Flood Insurance Rate Map (FIRM) Panel No. 06073C0675 F, Effective Date June 19, 1997.

7.) Borrego Valley Flood Management Report, October 1989 – Boyle Engineering Corporation.

8.) Soil Survey No. CA638 (San Diego County Area, CA), Version 6, December 17, 2007 – National Resources Conservation Service (N RCS).

9.) 2001 National Land Cover Database (NLCD) - Multi-Resolution Land Characteristics Consortium (MRLC).

10.) Stormwater Management Plan, Revised August 2010 – Joseph E. Bonadiman & Associates, Inc.

B. Methodology

1.1 General Methodology

The requirements and recommendations found in the San Diego County Hydrology Manual (June 2003) provided by the San Diego County Department of Public Works was used as the overall basis for the methodology and calculations found in this analysis. The required report format (Figure 1-8) of the Hydrology Manual was used as the general outline for this analysis; note that due to the unique floodplain and alluvial fan issues impacting the site, some additions and/or modifications were made to this format.

The requirements and recommendations found in the Borrego Valley Flood Management Report (October 1989) prepared by Boyle Engineering Corporation and hereafter referred to as the "Boyle Report" were used only for calculation of scour and associate footing depth for the proposed array pilings, per the request of the County.

Rational Method calculations for the 100-year storm event have been analyzed to determine drainage impacts (if any) resulting from the proposed project.

1.2 Rational Hydrology Method Calculations

Because the total project watershed is less than 640 acres, the rational hydrology method was selected for preliminary analysis of the 100-year storm event. The San Diego County Rational Method, 2003 Manual Update (RSD3) software application from CivilDesign® Corporation was used for these preliminary calculations.

1.3 Sources of Topography

USGS quadrangle raster data obtained from the USGS Seamless Data Distribution Resource was used for tributary (off-site) and on-site topography (40' index contours and 20' interval contours) to delineate drainage areas and watercourses. This topographic information is consistent with topographic maps obtained from the County Surveyor.

1.4 Watershed Precipitation

The Rainfall Isopluvials maps for the 100-year storm (6-hour and 24-hour durations) obtained from Appendix B of the Hydrology Manual have been collectively included as Exhibits "B.1" and "B.2". The project site location and tributary drainage limits have also been included on these maps for reference. An interpolated rainfall value was derived for per this information, as tabulated on the following page.

Table 1 – Interpolated Rainfall Values by Event

FREQUENCY	DURATION	ISOPLUVIAL VALUE (IN)
100-YEAR	6-HOUR	2.65
	24-HOUR	4.25

1.5 Watershed Losses

1.) **Hydrologic Soil Group** - The Hydrologic Soil Group was identified using Appendix A from the Hydrology Manual. Per Appendix A, Soil Group "A" is shown as applicable to the entire project site and entire tributary watershed. This Soil Group was substantiated by the data obtained from Soil Survey No. CA638 (Version 6, December 17, 2007) prepared by the NRCS, which identifies the entire project site and the vast majority of the tributary watershed as Map Unit RoA ("Rositas find sand, 0 to 2 percent slopes"). Portions of the tributary watershed are also comprised of Map Units AcG ("Acid igneous rock land"), CeC ("Carrizo very gravelly sand, 0 to 9 percent slopes"), RrC ("Rositas fine sand, hummocky, 5 to 9 percent slopes"), RsA ("Rositas loamy coarse sand, 0 to 2 percent slopes"), and SrD ("Sloping gullied land"). Refer to Exhibit "C.1" for a copy of Hydrology Manual Appendix A with the project/tributary watershed overlay, as well as a copy of supporting materials from Soil Survey No. CA638.

2.) **Land Cover/Use** – Detailed digital cover/use data was obtained from the 2001 National Land Cover Database (NLCD) prepared by the Multi-Resolution Land Characteristics Consortium (MRLC), a group of eleven federal agencies which includes the NRCS; this data was verified with digital satellite photography (Google Earth) as well as a field investigation of the project site. Refer to Exhibit "C.2" for a map illustrating the NLCD cover/use data applicable to the project site and tributary watershed.

Based on the NLCD data, the vast majority of the project site is shown as "Barren", with some sporadic seasonal grasses. The tributary drainage area is shown as a mixture of "Barren", "Hay/Pasture", and "Cultivated Crops". "Barren" was equated to "Barren" on Figure 4-2 of the Hydrology Manual. "Hay/Pasture" was equated to "Irrigated Pasture" on Figure 4-2. "Cultivated Crops" was equated to "Cultivated Land – With Conservation Treatment" on Figure 4-2. "Fair" cover was assumed for "Irrigated Pasture", per satellite photography and field investigation.

Land use and zoning for the project site and surrounding area have been identified as "Multiple Rural Use" and "General Rural", respectively, per the County General Plan. Based on this information, and with regards to ultimate development of the project watershed, it is not anticipated pervious and impervious cover within the watershed will change greatly during the lifespan of the project. As such, the land use designation of "Undisturbed National Terrain" was found to be appropriate for both existing and developed rational method calculations.

Note that the proposed project will not result in an increase in imperious area; as such, the same impervious ratio has been used for both existing and proposed conditions.

C. Declaration of Responsible Charge

Per the outline set forth on Figure 1-8 and per the format indicated on Figure 1-9 of the Hydrology Manual, the Declaration of Responsible Charge for this analysis is included below:

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE CIVIL ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSBILITIES FOR PROJECT DESIGN.

REGISTERED PROFESSIONAL ENGINEER
JAMES T. STANTON
No. C-70944
Exp. 6-30-11
CIVIL
STATE OF CALIFORNIA

JAMES T. STANTON
R.C.E. 70944
EXP. 6-30-11

5-19-11
DATE

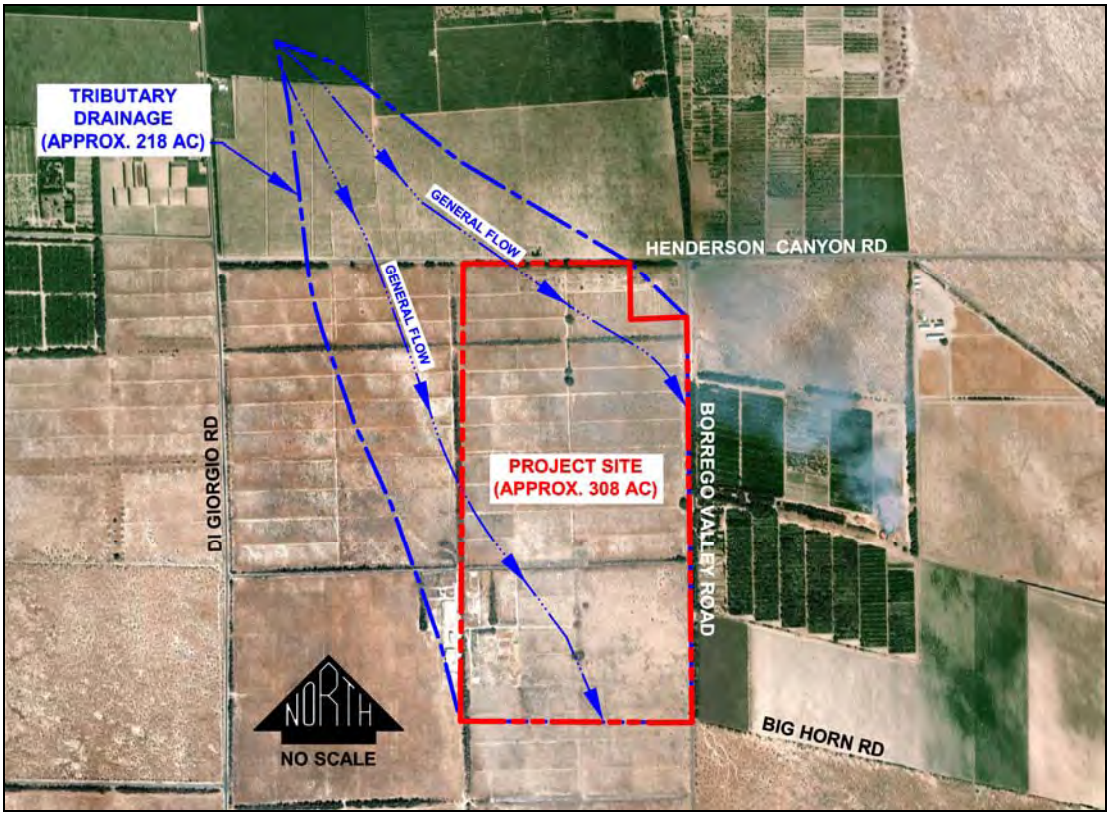
D. Watershed Description

1.1 On-Site Drainage Areas Discussion

The existing project site is approximately 308 acres in size and is characterized by sheet flow drainage running in a southeasterly direction, with average slopes of approximately 1%. As discussed in Section B1.5 of this analysis, the site is effectively barren, with some sporadic seasonal grasses. Per USGS Quadrangle data, no blue line streams traverse the site.

Pursuant to satellite imagery of the site (see next page), there is evidence of major historical sheet flow drainage impacts within the watershed and across the site. This is consistent with the floodplain and large alluvial fan hazards identified as impacting the site and discussed in Sections E and F of this analysis.

Figure 1 – Existing Site & Surrounding Area (Source: Google Earth)



A field study of the site and the surrounding area was performed on May 13, 2010. This study identified small existing earthen berms running along the perimeter of the site and along Henderson Canyon Road and Borrego Valley Road. However, it is assumed that these berms cannot provide protection from significant storm events and the existing floodplain, as evidenced by erosion and destabilization occurring along these berms from previous storm events.

1.2 Off-Site (Tributary) Drainage Areas Discussion

Based on topographic data (USGS Quadrangle) alone, the site is impacted by approximately 218 acres (0.34 square miles) of tributary drainage from the northwest. This drainage is characterized by sheet flows with no significant drainage channels or blue line streams. Existing drainage improvements are limited to small dirt or paved roads, small earthen berms, and small dikes.

E. FEMA Floodplain Identification & Impacts

1.1 FEMA Floodplain Identification

Per FEMA Flood Insurance Rate Map (FIRM) Panel No. 06073C0675 F (Effective Date: June 19, 1997), the project site is completely inundated by a Zone "AO" floodplain, further identified by FEMA as a Special Flood Hazard Area inundated by the 100-year (1% chance) base flood, with "Flow depths of 1 to 3 feet (usually sheet flow on sloping terrain; average depths determined. For areas of alluvial fan flooding, velocities also determined." Refer to Exhibit "D" for a portion ("Firmette") of FIRM Panel No. 06073C0675 F, which illustrates the floodplain in question.

1.2 FEMA Floodplain Impacts

The Zone "AO" floodplain impacting the site shows maximum flooding depths of **1.0 ft**., and maximum flooding velocities of **5 f.p.s**., for the 100-year base flood event (see Exhibit "D").

F. Erosion, Sedimentation, & Debris

1.1 Preliminary Site Erosion Calculations

The Universal Soil Loss Equation (USLE) discussed in Section 5 of the Hydrology Manual was used to determine preliminary long-term on-site soil losses for the project. Per Section 5.2.6 of the Hydrology Manual, the USLE is based on the following equation:

$$\mathbf{A_s = RKLsCP}$$

where:

A_s	= the computed soil loss in tons (dry weight)
R	= the rainfall erosion index for the given storm period
K	= the soil erodibility factor
L	= the slope length factor
s	= the slope gradient factor
C	= cropping management (vegetation) factor
P	= erosion control practice factor

1. **R** – The rainfall erosion index was calculated using the interpolated 2-year, 6-hour isopluvial value for the project (see Exhibit "B.1") of 0.75, plotted on Figure 5-2 of the Hydrology Manual. This results in an R factor of **8**.
2. **K** – The soil erodibility factor was obtained using Table 5-2 of the Hydrology Manual. As discussed in Section B1.5, the entire site is comprised of Mapping Unit "RoA" (fine sand 0-2%). Based on Table 5-2, the K factor for the site is **0.17**.
3. **Ls** – The slope length/gradient factor (combined into one single topographic factor) was determined using Figure 5-5 of the Hydrology Manual, using a slope length (across the entire site) of approximately 5,650 ft. and an average slope of 1% (Figure 5-5 was extrapolated for the slope length). This resulted in an approximate Ls factor of **0.34**.

4. **C** – The cropping management (vegetation) factor was determined assuming the project site post-clearing and grubbing (bare ground). As such, per Section 5.2.6.4 of the Hydrology Manual, a C factor of **1.0** has been used for non-graveled areas. Per Table 5-6, a C factor of **0.05** has been used for the proposed graveled fire roads.
5. **P** – Per Table 5-6 of the Hydrology Manual, a P factor of **1.0** has been applied to bare ground areas (assumed packed and smooth), and a P factor of **1.0** has been applied to the proposed graveled fire roads.

Based on these factors, and using the USLE, the estimated soil loss for bare ground areas is 0.462 tons-per-acre, per year**,** and the estimated soil loss for the proposed graveled fire lanes is 0.023 tons-per-acre, per year. Assuming a preliminary soil weight 100 lbs. per c.f., this equates to 9.24 c.f. per acre, per year and 0.46 c.f. per acre, per year for bare ground and graveled areas, respectively.

Based on the Conceptual Site Plan for the project, approximately 278 acres of the site will be bare ground, and approximately 30 acres are proposed as graveled fire lanes. This equates to 2,569 c.f. per year and 14 c.f. per year total erosion for bare ground and graveled areas, respectively, for a total loss of **2,583 c.f., or 96 c.y., per year.** Refer to Attachment No. 1 for applicable figures, tables, and other applicable excerpts from Section 5 of the Hydrology Manual used in the preliminary USLE calculations for this project. Note that a final estimated volume of yearly soil loss will be determined in the Final Drainage & Flooding Analysis, based upon the Soils Report for the project.

Short-term (construction stage) erosion will be also determined in the Final Drainage & Flooding Analysis for this project, based on selected mitigation measures for construction stage erosion per the Storm Water Pollution Prevention Plan (SWPPP) prepared for the project. Typical construction stage erosion control Best Management Practices (BMPs) include silt fencing, sandbag and/or gravel bags, and a stabilized construction entrance/exit.

1.2 Sedimentation & Debris Impacts

Specific guidelines for determining sedimentation and debris impacts are not included in the Hydrology Manual. However, there is potential for significant off-site suspended sediment and debris impacts to the project site from the 100-year event, as the project is a.) Within an established alluvial fan with a large tributary watershed that includes moderately-vegetated foothill areas to the northeast, and b.) "Within and/or adjacent to wildlands with the potential to support wildland fires" (per the Page 12-20 of the June 3, 2010 County Pre-Application Scoping Letter). The flood protection measures described in Section H, below, will account for these potential impacts.

G. Proposed Flood/Drainage Hazards Mitigation

Proposed flood/drainage hazards mitigation measures for the project site have been designed pursuant to County requirements and per correspondence with the County, described on the following page:

Inverter Pads:

For both the fixed and tracking scenarios, the inverter pads shall be constructed in one of two ways:

1.) Equipment in water-tight encasing on concrete pads constructed at grade. Pads shall be rotated to be parallel to the average direction of site flow (calculated to be approximately 30 degrees), with a taper at the upstream end of the pad. Associated shade structures for each inverter pad shall be elevated on pilings a minimum of 2' above grade (1' FEMA depth plus 1' additional).

OR

2.) Equipment (lowest horizontal member) raised a minimum of 2' (FEMA flood depth of 1' plus an additional 1' per County requirements) above grade on pilings with foundation footings. Orientation shall be north-south.

Both of these options (including all dimensions) are illustrated on Sheet 4 of the project Site Plan (see Exhibit "E").

69kv Stepup Substation (On-Site):

For both the fixed and tracking scenarios, equipment within the proposed 69kv stepup substation will be as follows:

1.) One (1) 4' x 8' control building (8' tall) elevated on blocks a minimum 2' (FEMA depth of 1' plus an additional 1' per County requirements) above grade.

2.) Two (2) 34.5kv circuit breakers (5' tall) in watertight encasings on 4' x 4' concrete pads at grade and associate assembly racks on pilings.

3.) Two (2) air switch assemblies on pilings.

4.) One (1) 69kv circuit breaker (5' tall) in watertight encasings on 4' x 5' concrete pad at grade.

5.) One (1) 69/34.5kv transformer (8' tall) in watertight encasing on 4' x 10' concrete pad at grade.

Plan and section views of the proposed 69kv stepup substation equipment, including all dimensions, are included on Sheet 4 of the project Site Plan (see Exhibit "E").

Breakaway Fencing:

For both the fixed and tracking scenarios, the proposed 6 ft. chain link perimeter fence shall be "breakaway" fencing per County requirements (see Exhibit "E").

Solar Arrays:

For both the fixed and tracking scenarios, the solar arrays shall be elevated (lowest horizontal member) a minimum of 2' above grade on pilings; additional depth for the proposed pilings has been calculated as shown on Sheet 4 of the Site Plans (Exhibit "E") per Attachment 2 of this report.

Inverter Pad Number/Distribution:

For the fixed layout scenario, (see Sheet 2 of Exhibit "E") 32 total inverter pads are proposed (constructed in one of the two ways described above). There is a horizontal distance of approx. 296' and vertical distance of approx. 966' between these pads for the fixed layout scenario.

For the tracking layout scenario, (see Sheet 3 of Exhibit "E"), 31 total inverter pads are proposed (constructed in one of the two ways described above). There is a horizontal distance of approx. 818' and vertical distance of approx. 391' between these pads for the fixed layout scenario.

H. Existing Conditions Rational Method Calculations (100 Year Storm Event)

Preliminary rational method calculations were performed for the 100-year storm event for existing watershed conditions. For these preliminary calculations, two drainage areas, "EA" and "EB", were considered to determine peak flow rates discharging from the project site via sheet flow to Location No. 1 (the neighboring property to the south) and Location No. 2 (Borrego Valley Road). Refer to Exhibit "F" for the Existing Conditions Hydrology Study Map illustrating these drainage areas and discharge locations.

These calculations were performed using the methodology and precipitation/loss values described in Section B of this analysis, and using the drainage area input characteristics tabulated on the following page:

Table 2 – Existing Conditions Rational Method Input Values

DRAINAGE SUBAREA	NODE LOCATION	SUBAREA SIZE (AC)	LAND USE TYPE	TOTAL AREA TRIBUTARY TO NODE (AC)	SOIL TYPE	SUBAREA WATERCOURSE LENGTH (FT)	ELEVATION AT NODE (FT)
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	683
EA-1	2	26.30		26.30		2,253	660
EA-2	3	108.68		134.98		2,855	632
EA-3	4	194.98		329.95		3,291	606
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	685
EB-1	2	48.12		48.12		3,035	654.5
EB-2	3	147.57		195.69		3,368	629.5

The resulting existing conditions output calculations for drainage areas "EA" and "EB" are tabulated on the following page.

Table 3 – Existing Conditions Rational Method Output Calculations

DRAINAGE SUBAREA	NODE	PEAK Q_{100} AT NODE (CFS)
EA	2	11.69
	3	36.46
	4	68.53
EB	2	19.46
	3	48.37

As tabulated above, runoff peak flow rates for all storm events are very low, due to the relatively low rainfall values, land use type, soil type, and the very gradual (1% average) slope characteristic of the watershed. Refer to Attachment No. 3 and Attachment No. 4 for printouts of all existing conditions rational method calculations for drainage areas "EA" and "EB", respectively.

I. Proposed Conditions Rational Method Calculations (100 Year Storm Event)

Preliminary rational method calculations were also performed for the 100-year storm event for proposed conditions drainage areas "PA" and "PB". Refer to Exhibits "G.1" and "G.2" for the Proposed Conditions Hydrology Study Maps (which include overlays of the fixed and tracking layout scenarios).

For proposed conditions drainage areas, the closest land use type match remains "Undisturbed National Terrain". As the proposed project does not propose any alteration of the existing drainage characteristics, the rational method input data for proposed conditions also remains unchanged from existing conditions. As such, the same C value of 0.20 has been used for both existing and proposed conditions, as the proposed on-site improvements will not increase the impervious fraction enough to warrant an increase in C value.

Proposed conditions calculations were performed using the methodology and precipitation/loss values described in Section B of this analysis, and using the drainage area input characteristics tabulated on the following page.

Table 4 – Proposed Conditions Rational Method Input Values

DRAINAGE SUBAREA	NODE LOCATION	SUBAREA SIZE (AC)	LAND USE TYPE	TOTAL AREA TRIBUTARY TO NODE (AC)	SOIL TYPE	SUBAREA WATERCOURSE LENGTH (FT)	ELEVATION AT NODE (FT)
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	683
PA-1	2	26.30		26.30		2,253	660
PA-2	3	108.68		134.98		2,855	632
PA-3	4	194.98		329.95		3,291	606
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	685
PB-1	2	48.12		48.12		3,035	654.5
PB-2	3	147.57		195.69		3,368	629.5

The resulting proposed conditions output calculations for drainage areas "PA" and "PB" are tabulated below:

Table 5 – Proposed Conditions Rational Method Output Calculations

DRAINAGE SUBAREA	NODE	PEAK Q_{100} AT NODE (CFS)
PA	2	11.69
	3	36.46
	4	68.53
PB	2	19.46
	3	48.37

Table 6 – Pre- and Post-Development Summary Table

CONDITION	DRAINAGE SUBAREA	NODE	PEAK Q_{100} AT NODE (CFS)	VELOCITY AT NODE (FPS)	H (ELEVATION AT NODE)	L (FT)	C	Tc (MIN) AT NODE	I (IN/HR)	SUBAREA A (AC)
PRE	EA	2	11.69	-	660	70 (INITIAL)/2253 (TOTAL)	0.20	12.5 (INITIAL)/29.49 (TOTAL)	2.223	26.30
		3	36.46	1.61	632	2855.00	0.20	63.85	1.35	108.68
		4	68.53	1.88	606	3291.00	0.20	95.95	1.039	194.98
	EB	2	19.46	-	654.5	70 (INITIAL)/3035 (TOTAL)	0.20	12.5 (INITIAL)/34.14 (TOTAL)	2.02	48.12
		3	48.37	1.63	629.5	3368	0.20	73.26	1.236	147.57
POST	PA	2	11.69	-	660	70 (INITIAL)/2253 (TOTAL)	0.20	12.5 (INITIAL)/29.49 (TOTAL)	2.223	26.30
		3	36.46	1.61	632	2855.00	0.20	63.85	1.35	108.68
		4	68.53	1.88	606	3291.00	0.20	95.95	1.039	194.98
	PB	2	19.46	-	654.5	70 (INITIAL)/3035 (TOTAL)	0.20	12.5 (INITIAL)/34.14 (TOTAL)	2.02	48.12
		3	48.37	1.63	629.5	3368	0.20	73.26	1.236	147.57

As shown on Table 6 on the previous page, the proposed project does not result in an increase in peak runoff or velocities for the 100-year storm event, as hydrologic input data for proposed conditions remains unchanged from existing conditions. None of the calculated velocities are anticipated to be erosive. Refer to Attachment No. 5 and Attachment No. 6 for printouts of all proposed conditions rational method calculations for drainage areas "PA" and "PB", respectively.

J. Water Quality

Per the requirements of the June 3, 2010 County Pre-Application Scoping Letter, a Minor Stormwater Management Plan dated August 2010, has been prepared by Joseph E. Bonadiman & Associates, Inc. to address project stormwater quality and adherence to Low Impact Development (LID) guidelines; this document has been tentatively approved by the County. Refer to this study for detailed information.

K. Conclusion & Recommendations

1.1 Conclusion

As discussed in Section J, above, the proposed project will not result in any increases in peak runoff. As such, no detention/retention of flow is proposed, and drainage for all storm events is to be passed through the site, emulating existing conditions. This is consistent with the primary goal of protecting the proposed solar fields and associated facilities from the 100-year flood event/alluvial fan without impacting the flow depths, velocities, or directions of the floodplain/alluvial fan.

As discussed previously in Section H of this analysis, appropriate non-structural methods of floodplain and alluvial fan protection are proposed for the project.

1.2 Recommendations

Based on the findings of this Preliminary Drainage & Flooding Analysis, the following recommendations are made:

1.) Conduct an aerial topographic survey of the project site for inclusion of more accurate contour data in the Final Drainage & Flooding Analysis for the project.

2.) Final estimates of long-term site erosion shall incorporate the findings of the site-specific Soils/ Geotechnical Report for the project.

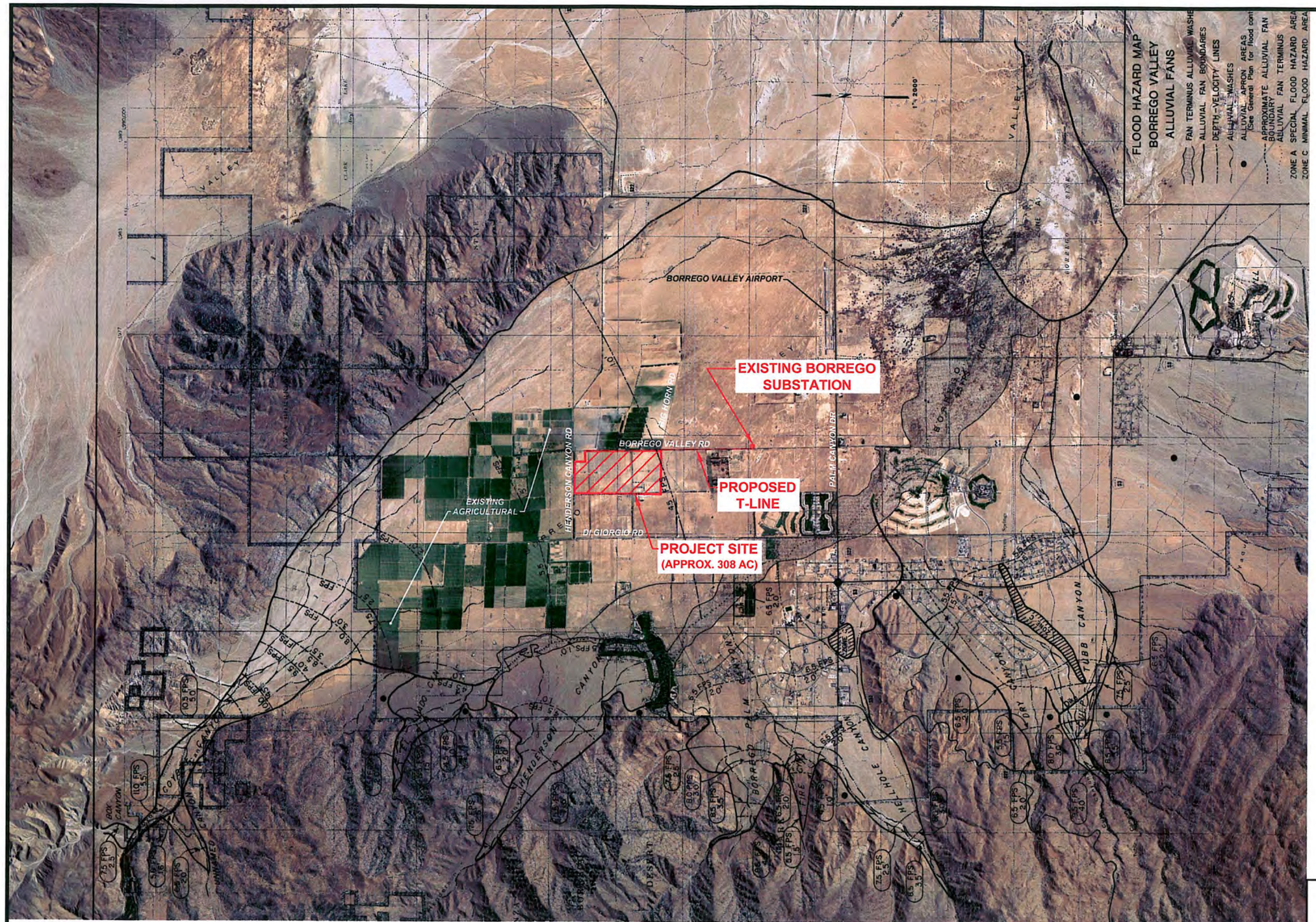
3.) If any on-site drainage facilities are ultimately proposed, appropriate hydraulic calculations, based on the 100-year storm event, shall be included in the Final Drainage & Flooding Analysis.

4.) Per County requirements, final design calculations will need to be submitted to demonstrate that all proposed sections of breakaway fencing will fail under a force less than that of the site-specific peak 100-year flow (i.e., based upon the velocity and depth from the FIRM).

(END)

EXHIBIT “A”

Project Site & Watershed Location



6,000' 0' 6,000' 12,000' 18,000'

GRAPHIC SCALE: 1" = 6,000'

MAP NOTES:

1. UNDATED SATELLITE ORTHOPHOTO OBTAINED FROM GOOGLE EARTH PRO.
2. FLOOD HAZARD MAP OVERLAY SCANNED FROM BORREGO VALLEY FLOOD MANAGEMENT REPORT DATED OCTOBER 1989 & PREPARED BY BOYLE ENGINEERING CORPORATION.
3. HORIZONTAL COORDINATE SYSTEM FOR THIS MAP IS CALIFORNIA STATE PLANE, N.A.D. 1983, ZONE VI.

NORTH

REVISIONS

NO	DESCRIPTION	BY	APPROVED	DATE
1				
2				
3				
4				
5				

PROJECT SITE & WATERSHED LOCATION

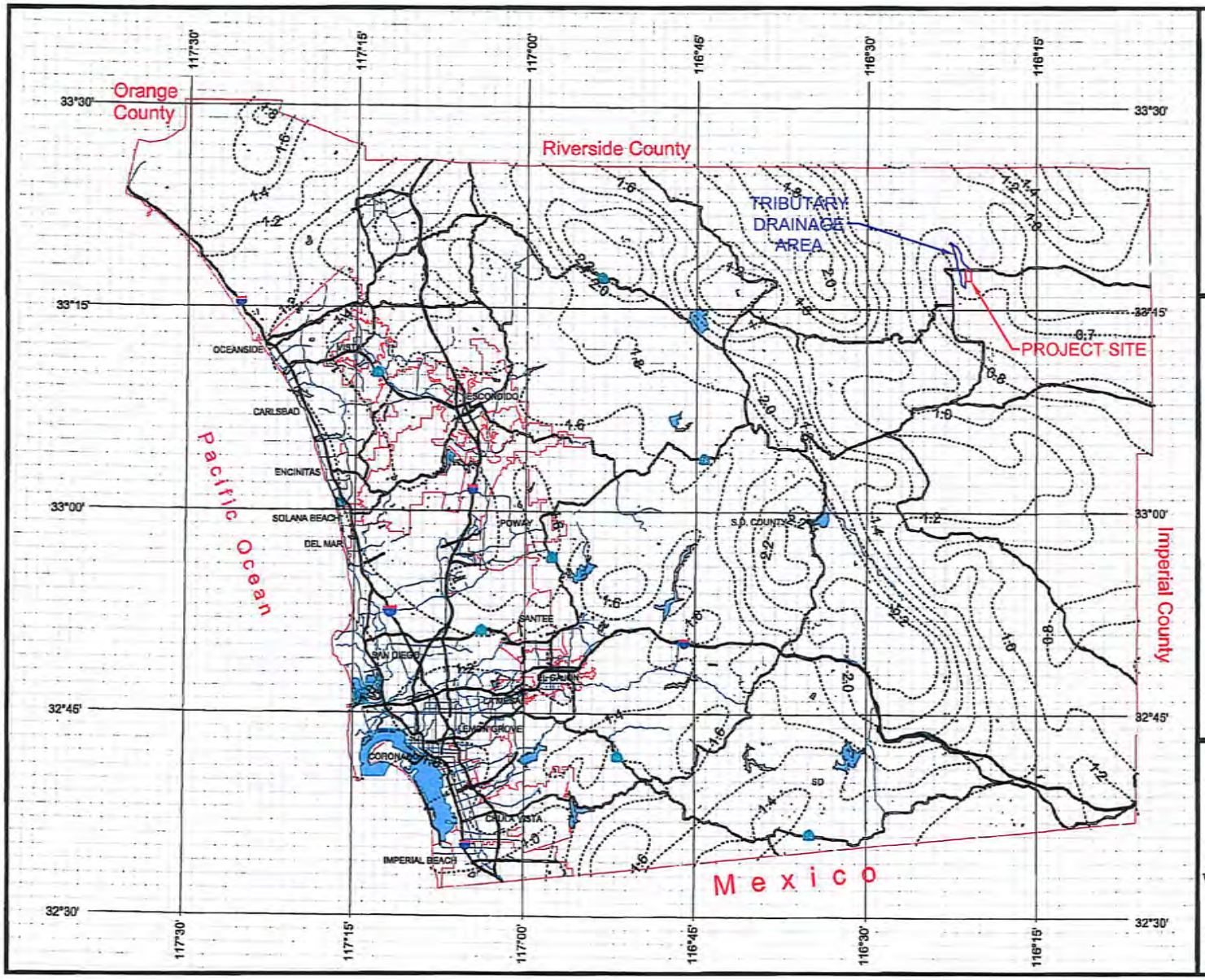
BORREGO SPRINGS UNMANNED P.V. SOLAR FARM
IN THE COUNTY OF SAN DIEGO, CA

PREPARED FOR: U.S. SOLAR ONE, LLC

DRAWN BY: JDN	SCALE: 1" = 6,000'	SHEET: 1 OF 1	A
CHECKED BY: JTS	JOB NO: 103617		
DISREGARD PRINTS BEARING EARLIER REVISION DATES →	08-06-10		

EXHIBIT “B”

Precipitation Maps



County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 0.75 IN

DPW GIS
Department of Public Works
Geographic Information Services

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N W E S

3 0 3 Miles

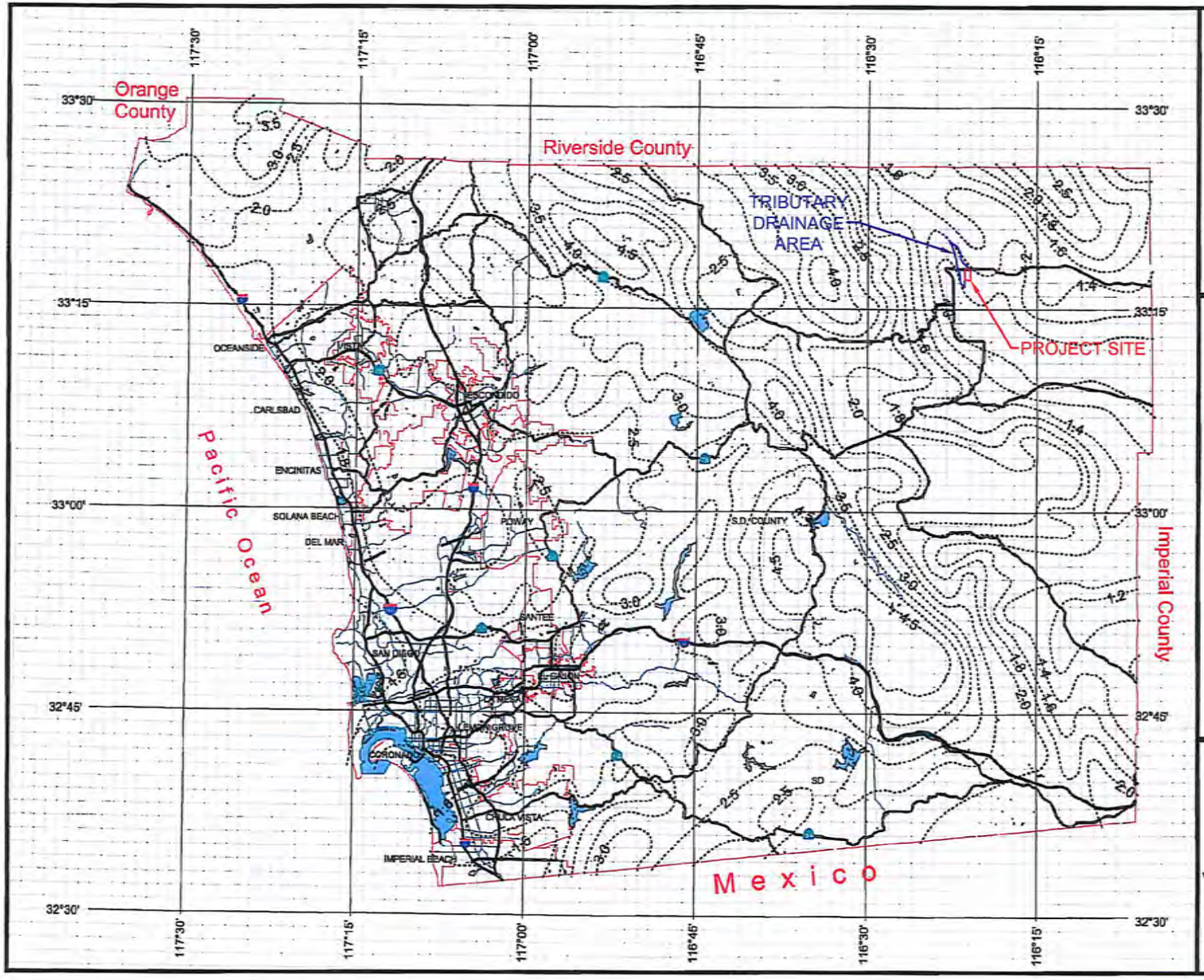
REDUCED FROM 11"x17"

RAINFALL MAP (2-YEAR, 6-HOUR)
U.S. SOLAR ONE, LLC BORREGO SPRINGS
UNMANNED PHOTOVOLTAIC SOLAR FARM
LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-1



County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 1.10 IN

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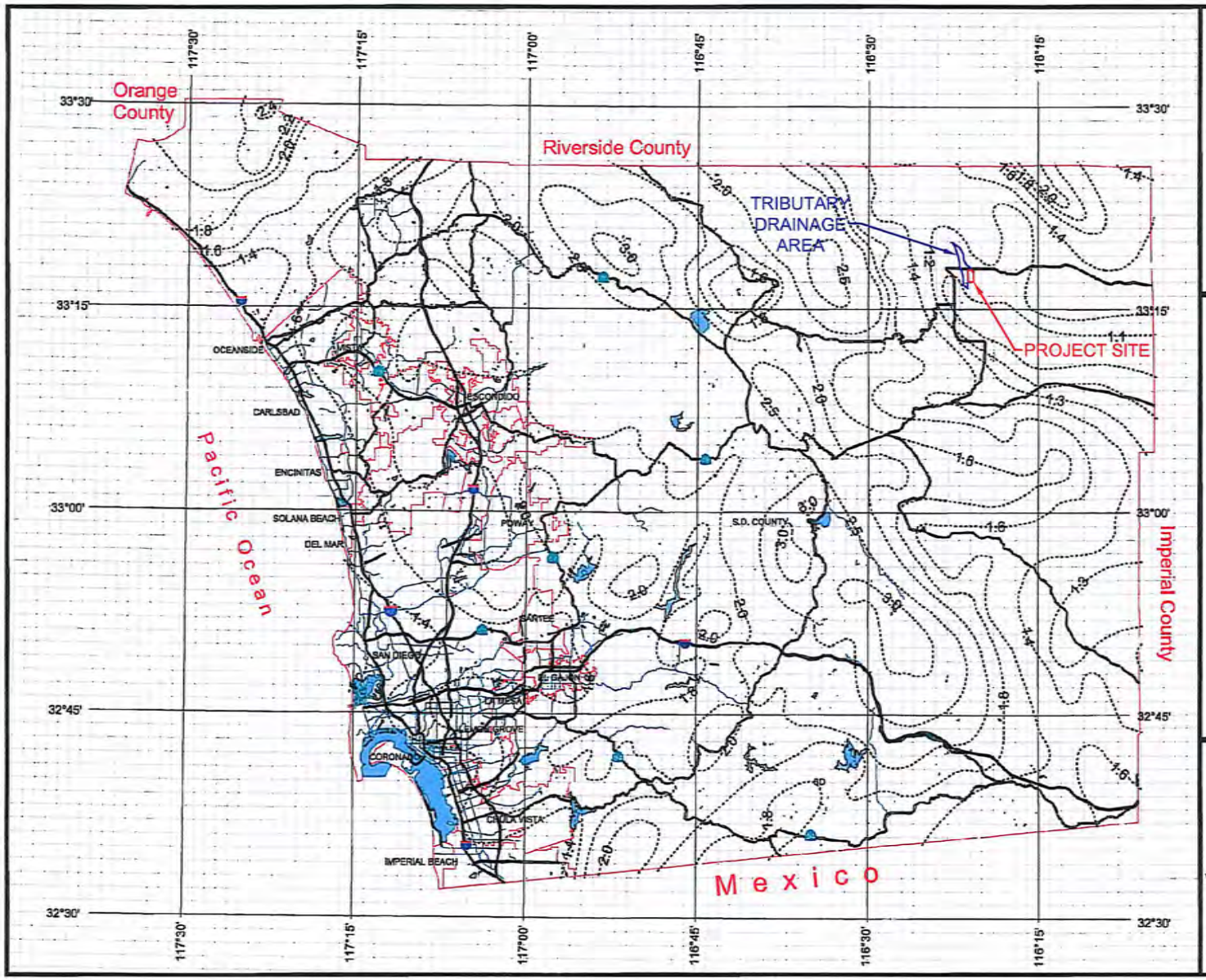
RAINFALL MAP (2-YEAR, 24-HOUR)
U.S. SOLAR ONE, LLC BORREGO SPRINGS
UNMANNED PHOTOVOLTAIC SOLAR FARM
LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-2



County of San Diego Hydrology Manual

Rainfall Isopluvials

5 Year Rainfall Event - 6 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 1.15 IN

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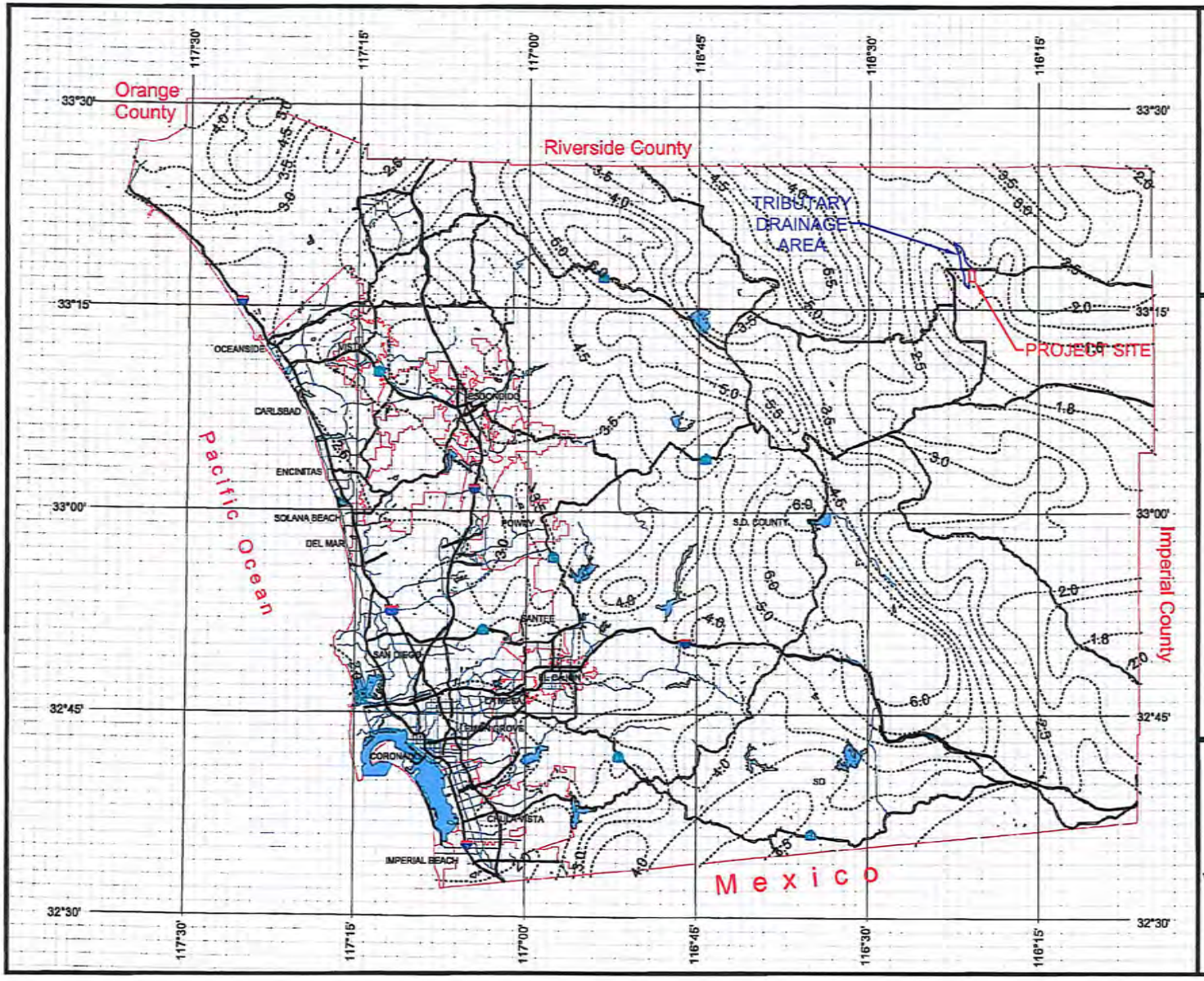
RAINFALL MAP (5-YEAR, 6-HOUR)
U.S. SOLAR ONE, LLC BORREGO SPRINGS
UNMANNED PHOTOVOLTAIC SOLAR FARM
LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-3



County of San Diego Hydrology Manual

Rainfall Isopluvials

5 Year Rainfall Event - 24 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 1.90 IN

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RAINFALL MAP (5-YEAR, 24-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

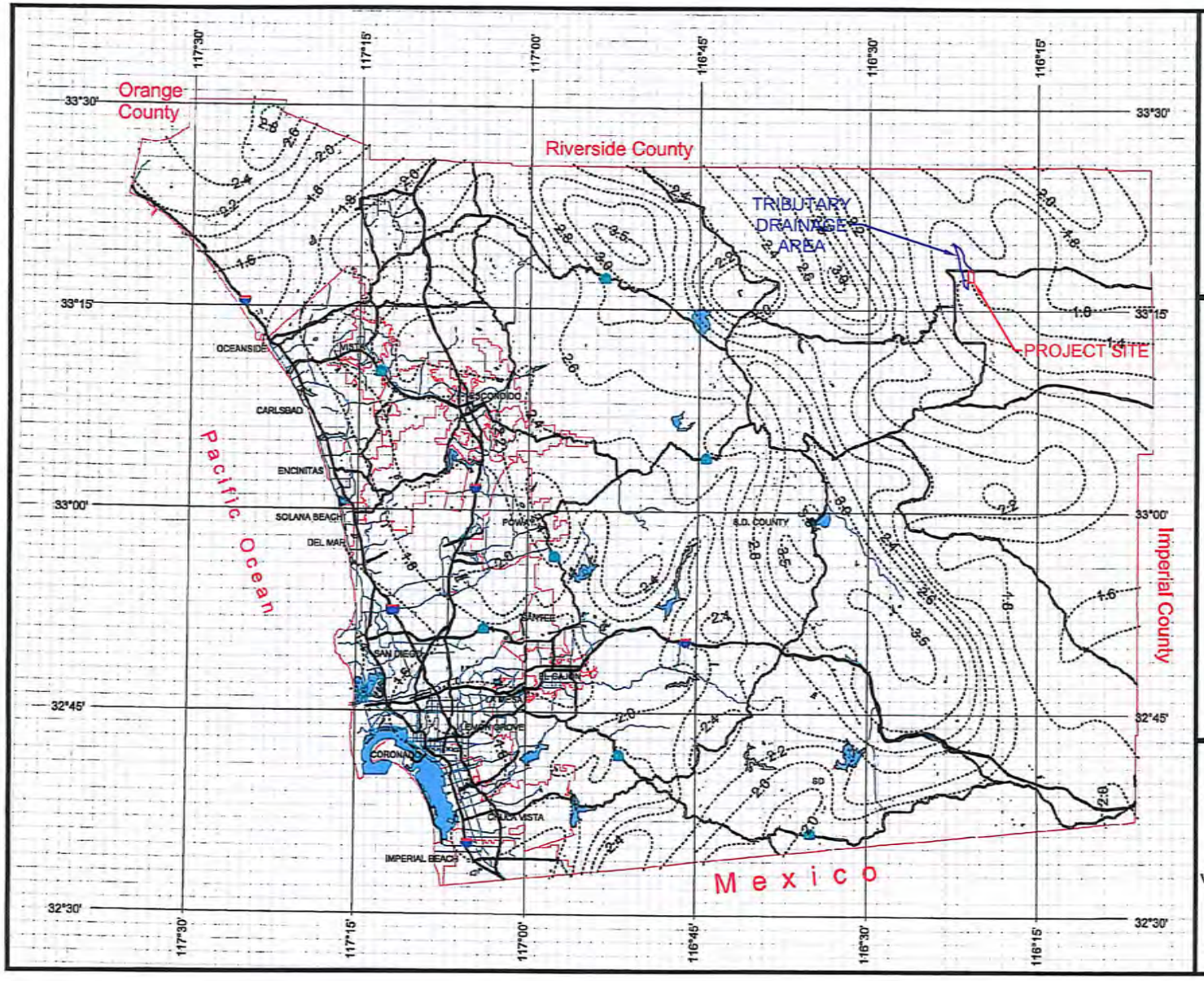
UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-4



County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 1.50 IN

DPW GIS

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REDUCED FROM 11"x17"

RAINFALL MAP (10-YEAR, 6-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

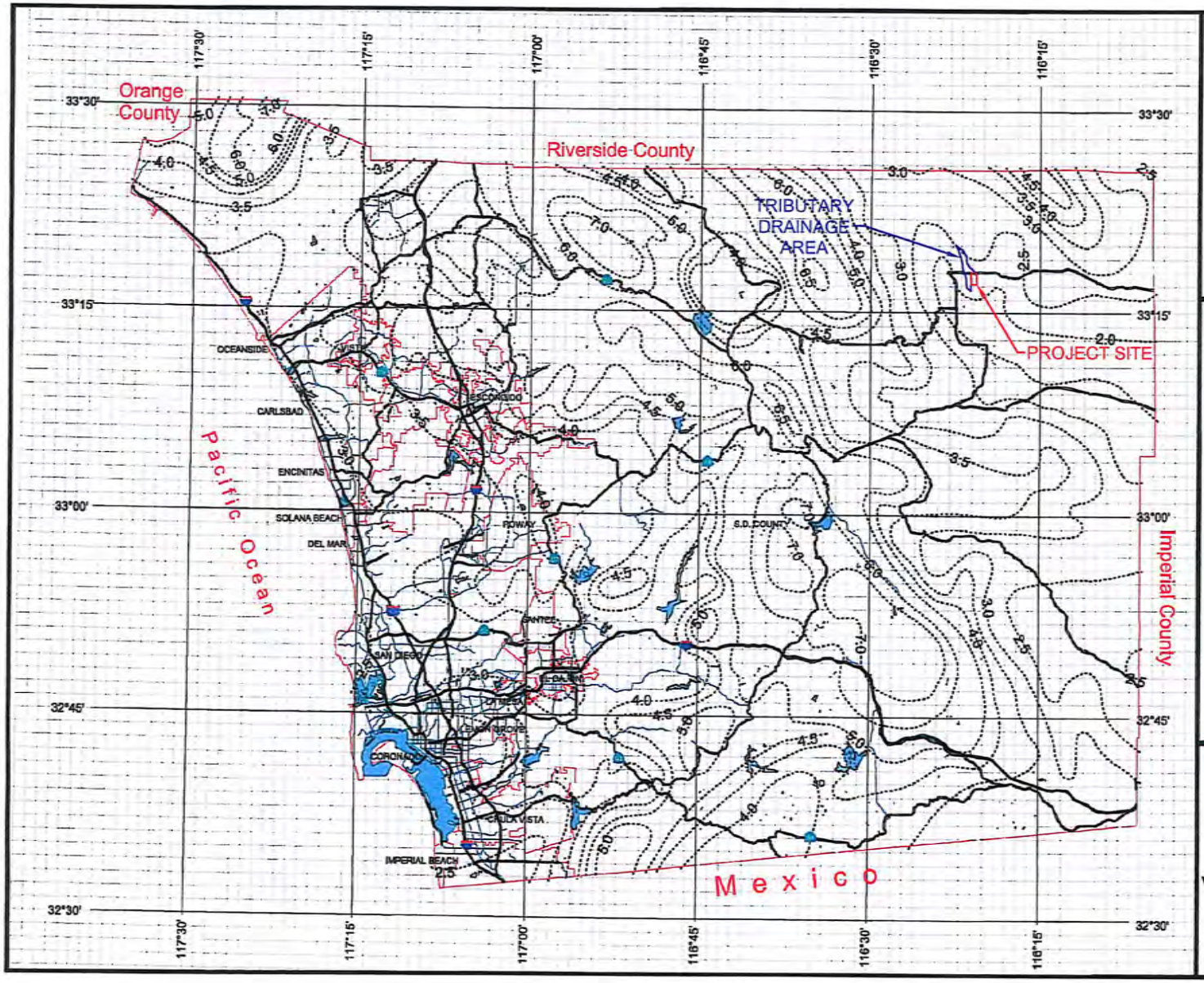
UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-5



County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 2.25 IN

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RAINFALL MAP (10-YEAR, 24-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

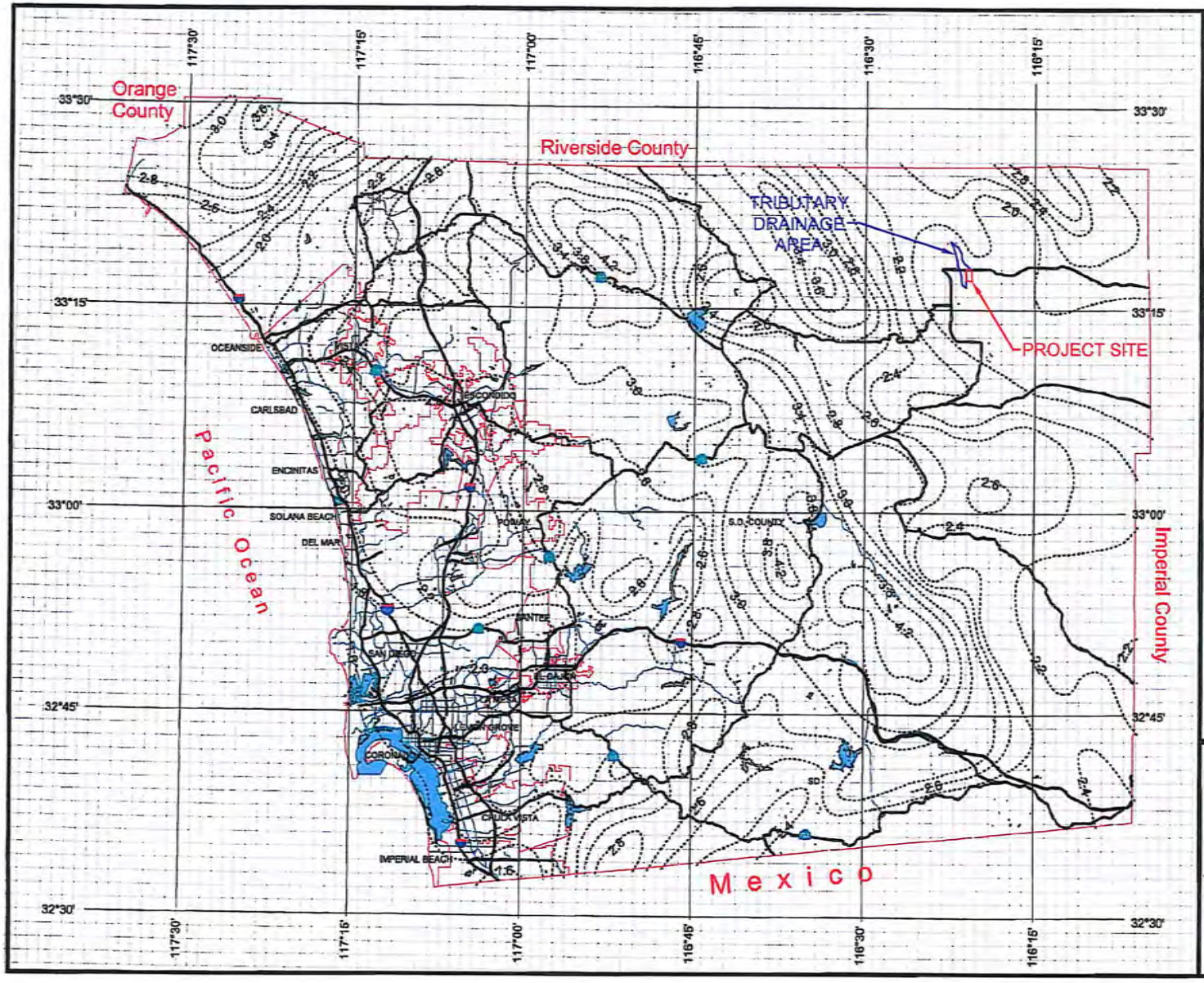
UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-6



County of San Diego Hydrology Manual

Rainfall Isopluvials

25 Year Rainfall Event - 6 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 2.00 IN

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RAINFALL MAP (25-YEAR, 6-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

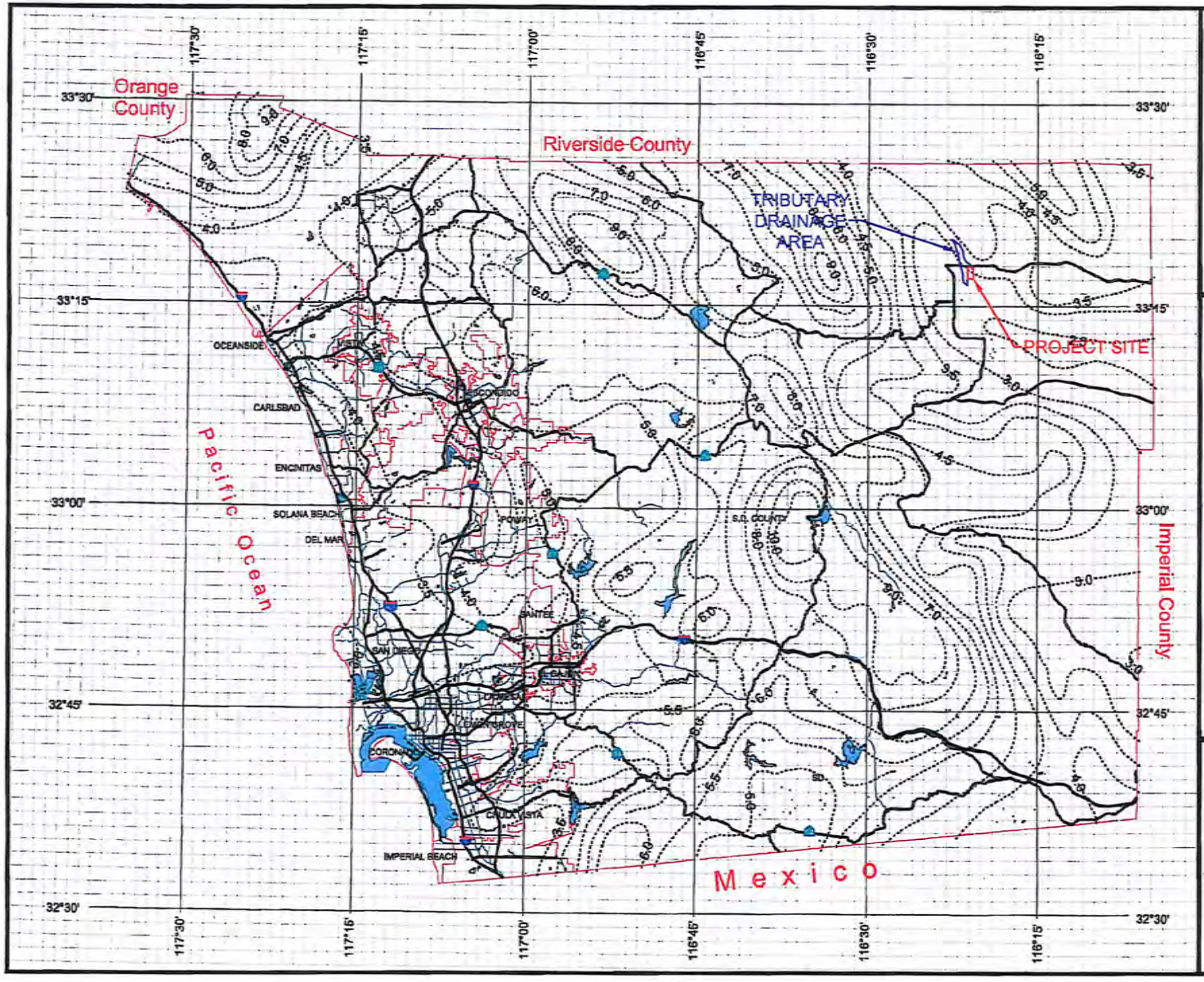
UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-7



County of San Diego Hydrology Manual

Rainfall Isopluvials

25 Year Rainfall Event - 24 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 3.00 IN

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3 0 3 Miles

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RAINFALL MAP (25-YEAR, 24-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

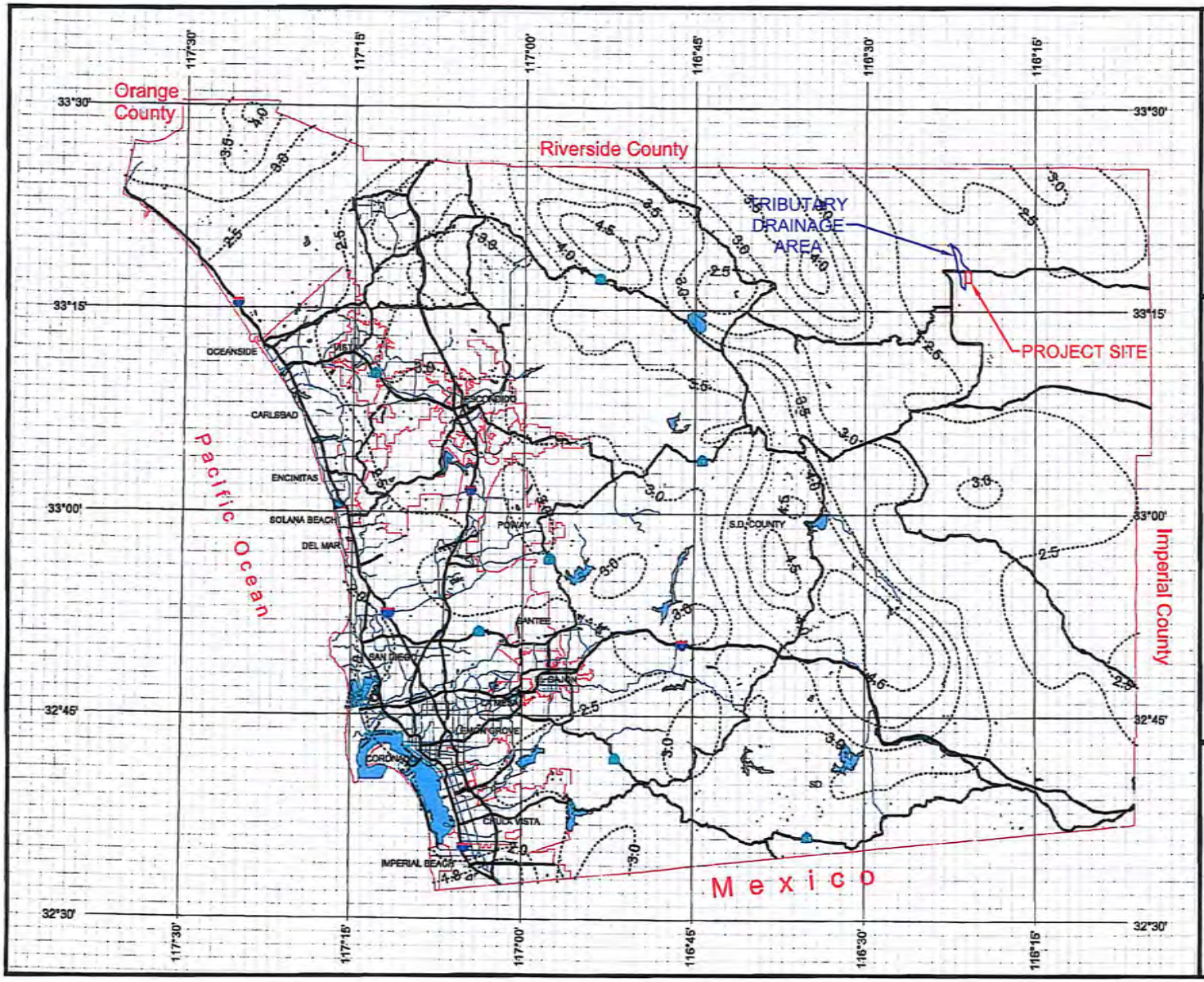
UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-8



County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 2.50 IN

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RAINFALL MAP (50-YEAR, 6-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

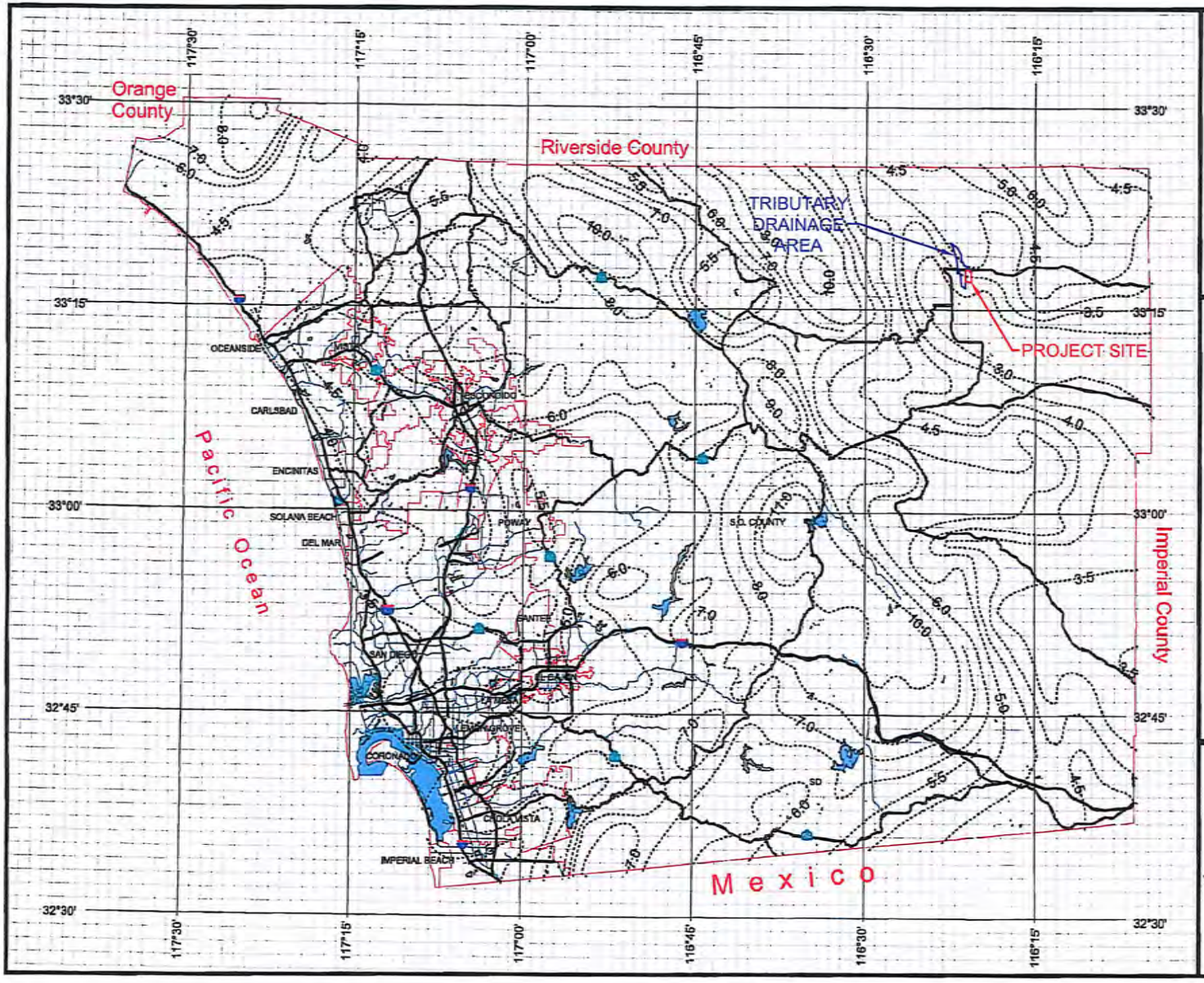
UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-9



County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 4.00 IN

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RAINFALL MAP (50-YEAR, 24-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

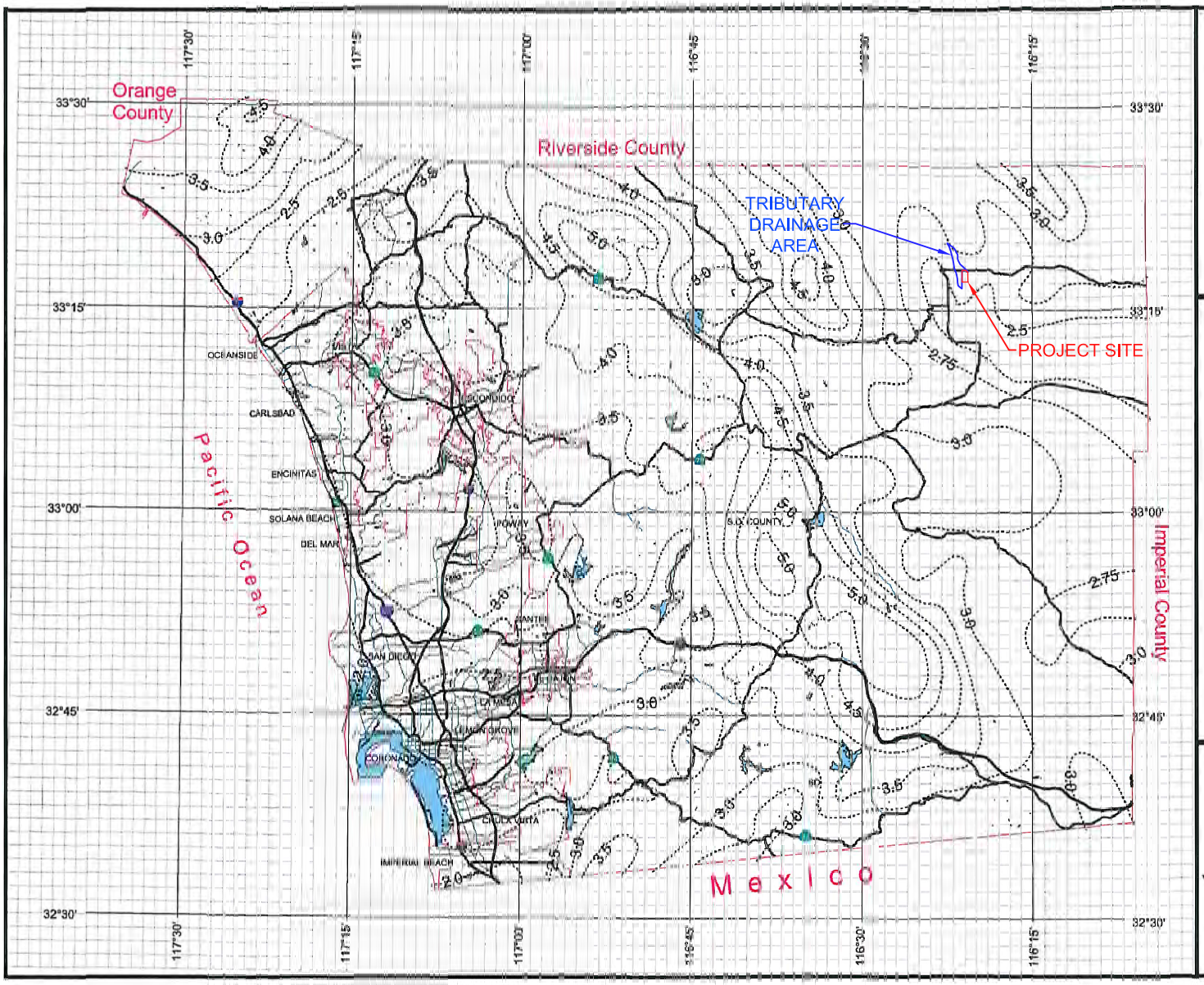
UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-10



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 2.65 IN

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N W E S

3 0 3 Miles

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RAINFALL MAP (100-YEAR, 6-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

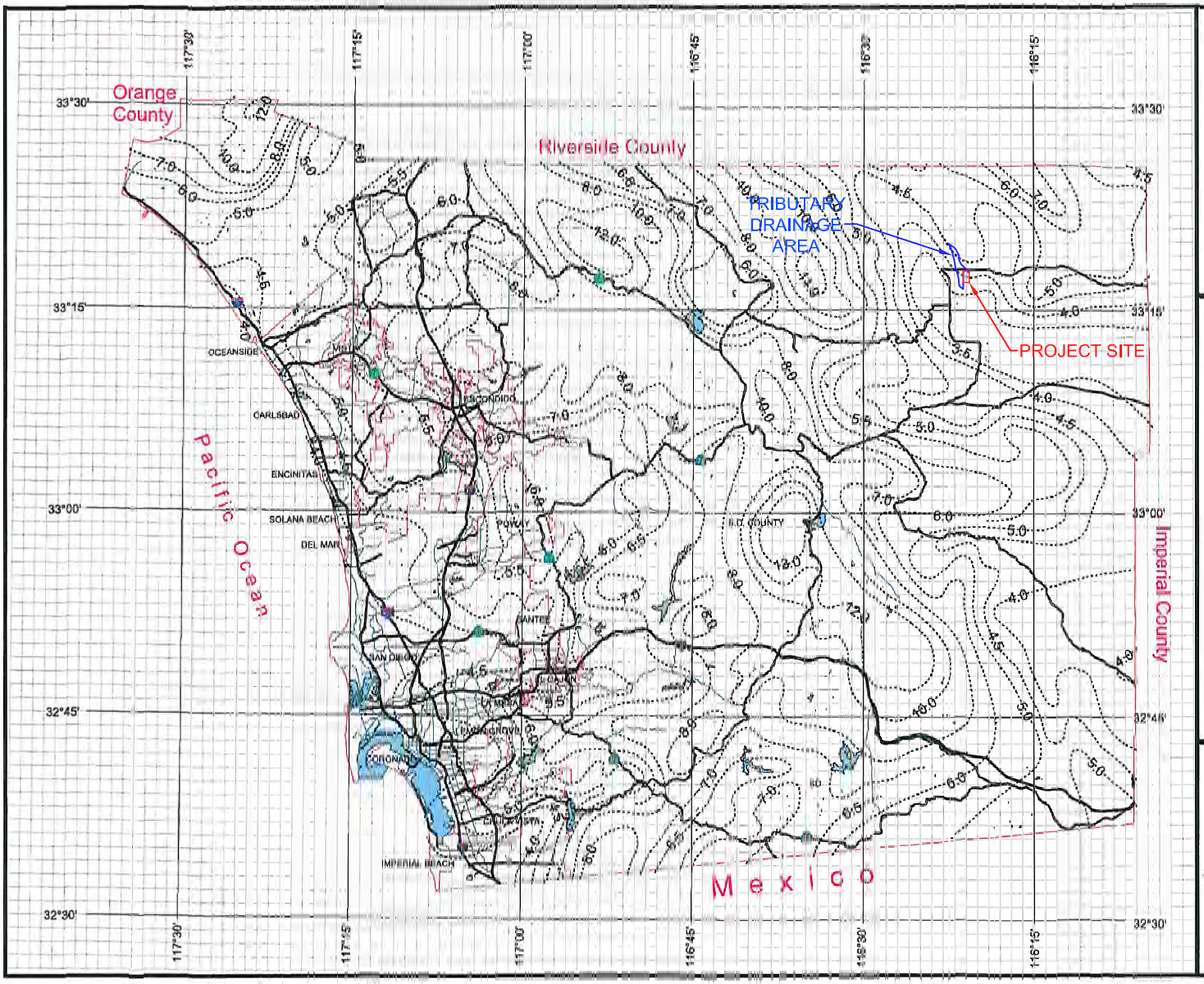
UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

B-11



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

INTERPOLATED RAINFALL: 4.25 IN

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REDUCED FROM 11"x17"

RAINFALL MAP (100-YEAR, 24-HOUR)

U.S. SOLAR ONE, LLC BORREGO SPRINGS

UNMANNED PHOTOVOLTAIC SOLAR FARM

LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1

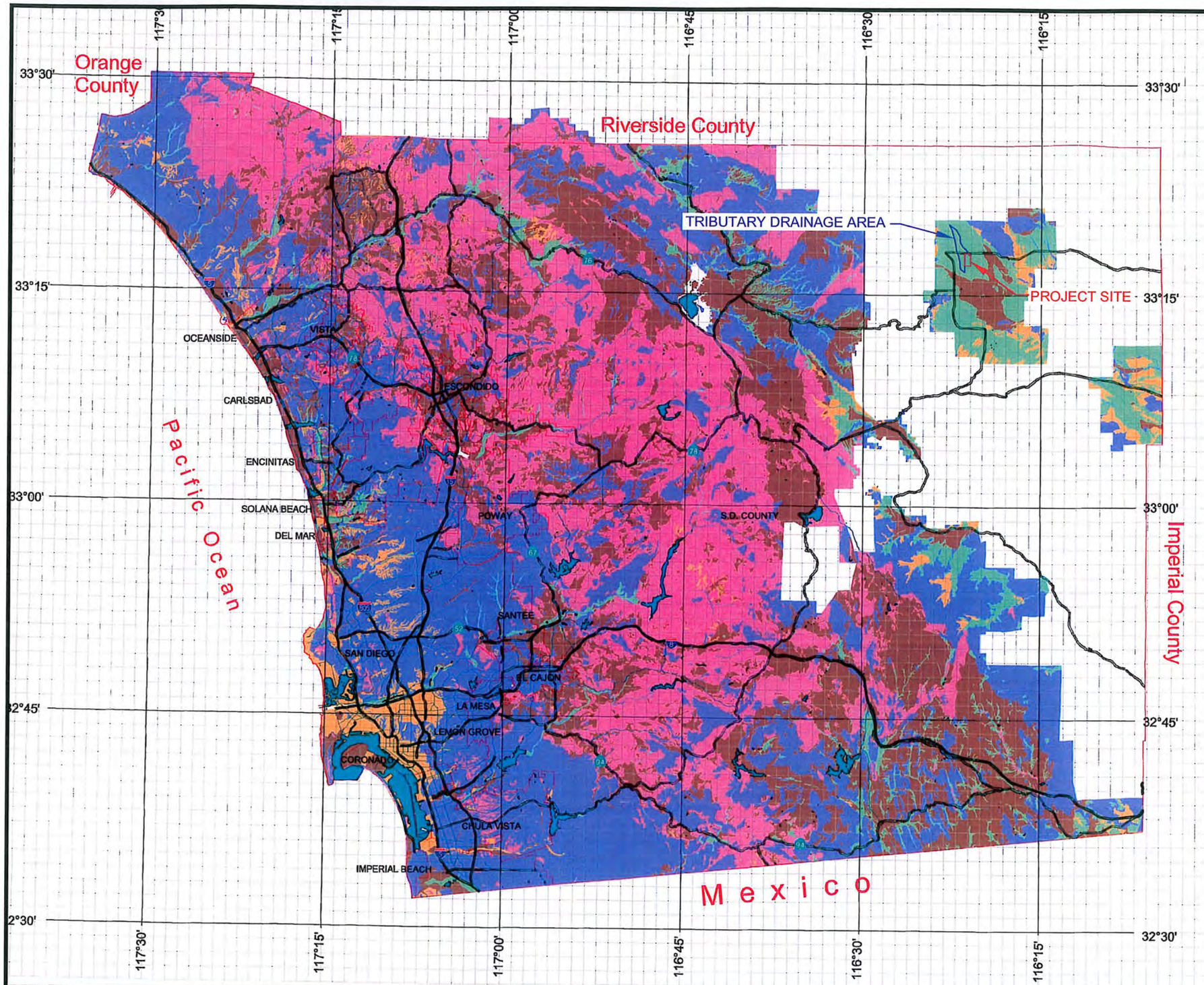
B-12

EXHIBIT “C”

Soils & Land Use Maps

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

PROJECT SITE & TRIBUTARY DRAINAGE ARE COMPLETELY WITHIN SOIL GROUP "A".

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Department of Public Works Geographic Information Services

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3 0 3 Miles

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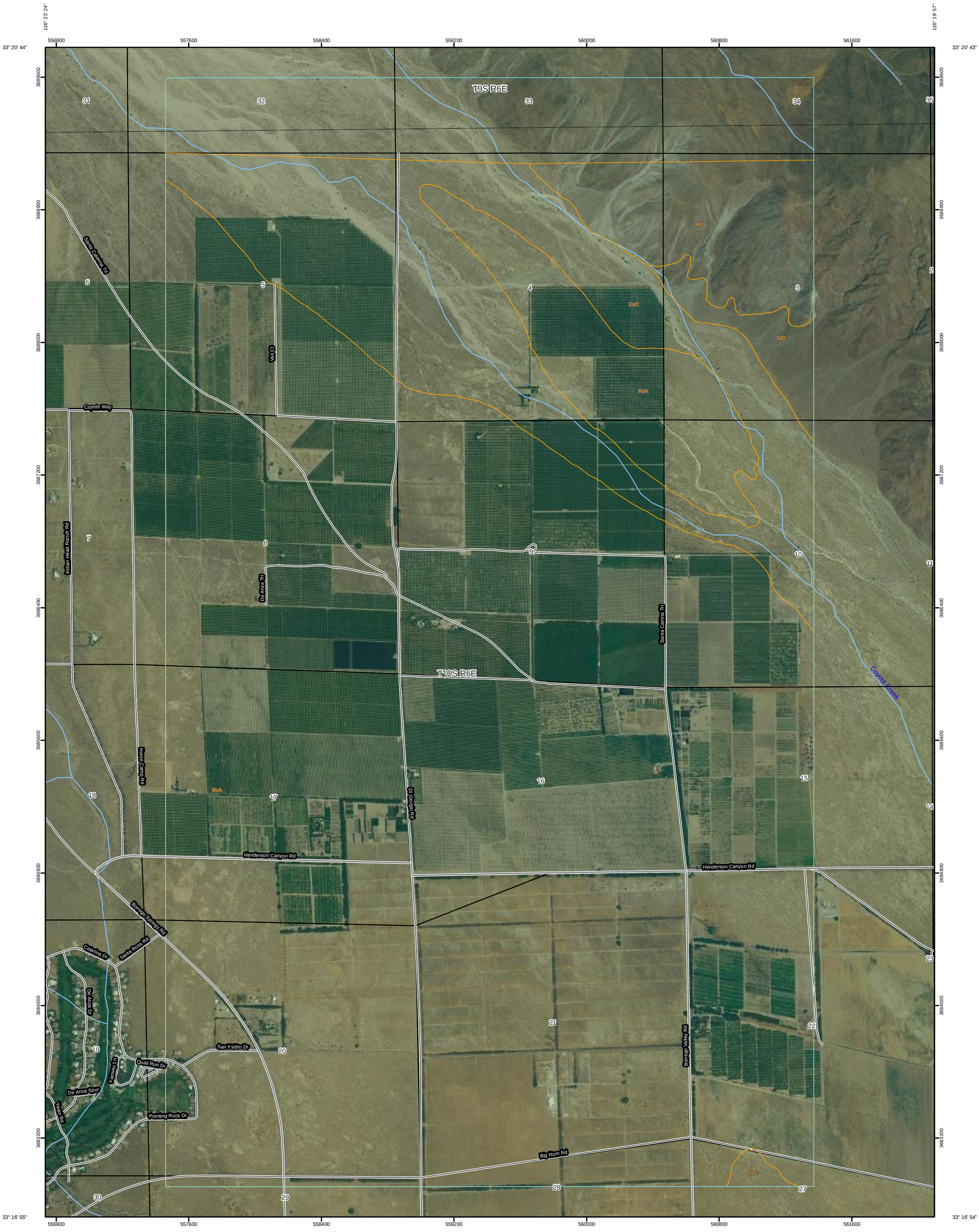
SOILS GROUP MAP

U.S. SOLAR ONE, LLC BORREGO SPRINGS
UNMANNED PHOTOVOLTAIC SOLAR FARM
LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS

SHEET: 1 OF 1 C-1



Map Scale: 1:14,400 if printed on C size (17" x 22") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1,800 2,700

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities
- PLSS Township and Range
- PLSS Section

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:14,400 if printed on C size (17" × 22") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: ANZA-BORREGO AREA, CALIFORNIA
Survey Area Data: Not available

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 5/31/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

ANZA-BORREGO AREA, CALIFORNIA (CA804)			
No soil data available for this soil survey area.			
Totals for Area of Interest		**6,470.3**	**100.0%**

San Diego County Area, California (CA638)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AcG	Acid igneous rock land	264.6	4.1%
CeC	Carrizo very gravelly sand, 0 to 9 percent slopes	840.1	13.0%
RoA	Rositas fine sand, 0 to 2 percent slopes	4,505.2	69.6%
RrC	Rositas fine sand, hummocky, 5 to 9 percent slopes	13.7	0.2%
RsA	Rositas loamy coarse sand, 0 to 2 percent slopes	297.4	4.6%
SrD	Sloping gullied land	70.2	1.1%
Subtotals for Soil Survey Area		**5,991.2**	**92.6%**
Totals for Area of Interest		**6,470.3**	**100.0%**

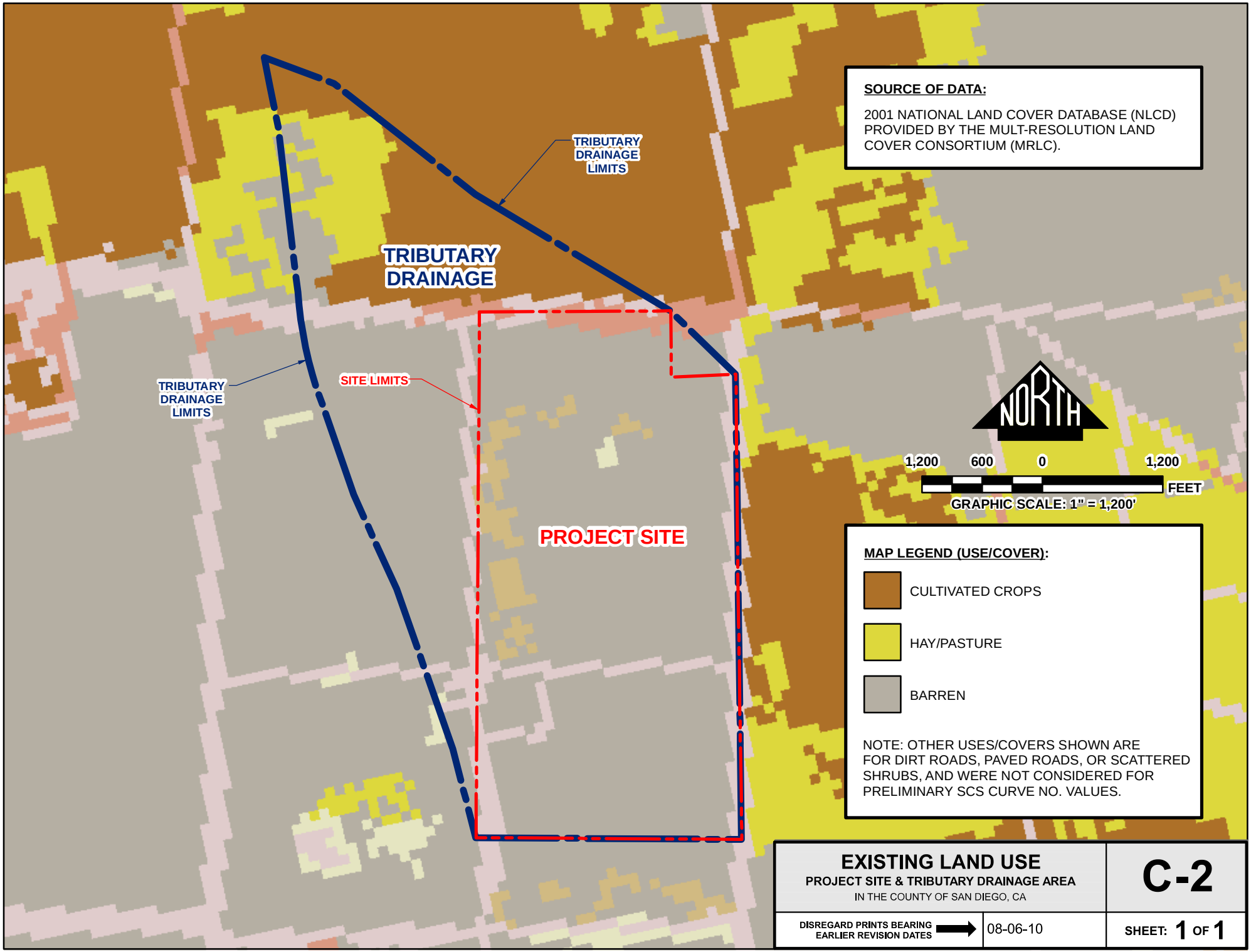
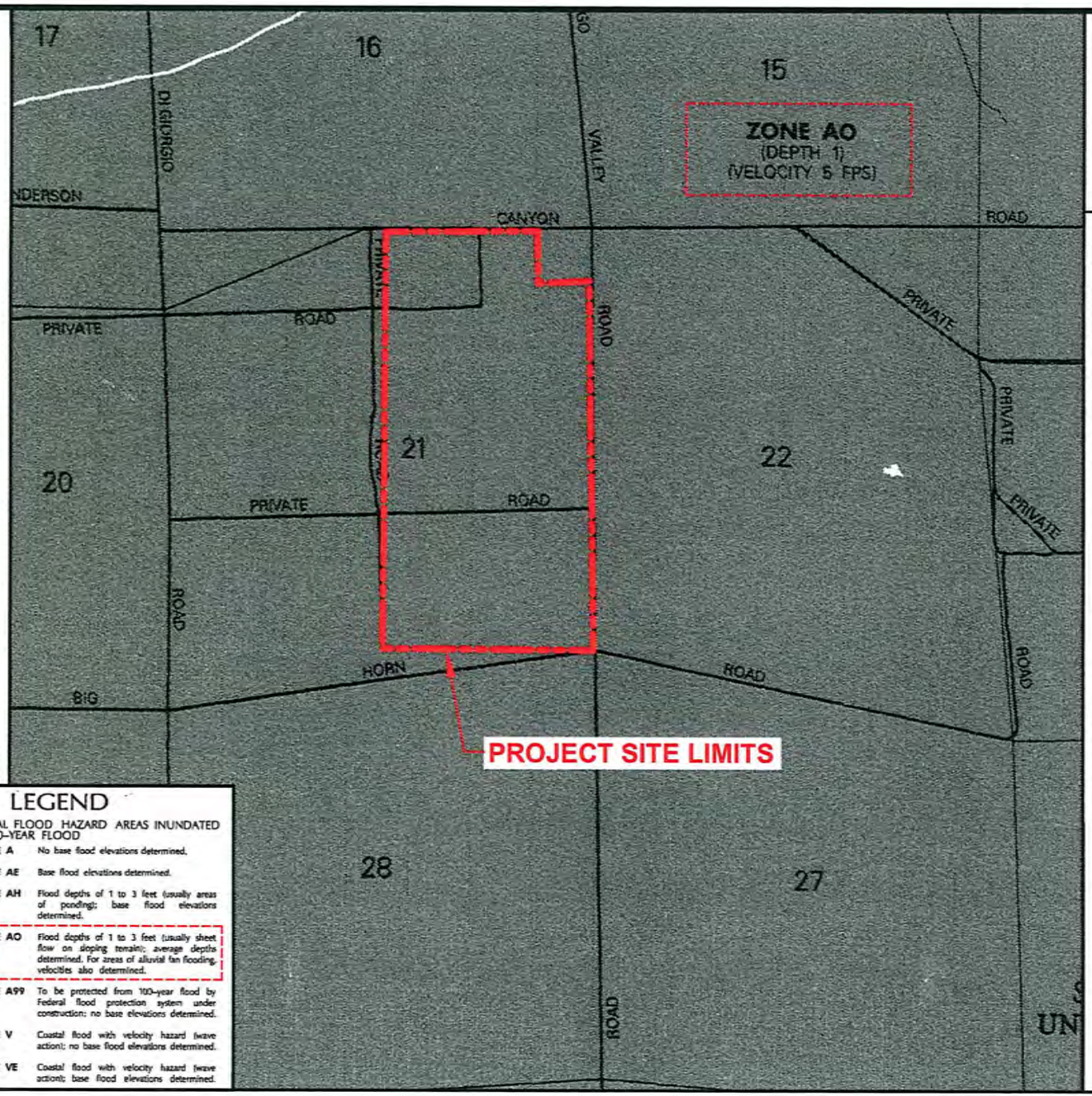

TRIBUTARY DRAINAGE LIMITS
TRIBUTARY DRAINAGE
TRIBUTARY DRAINAGE LIMITS
SITE LIMITS
PROJECT SITE
NORTH
1,200 600 0 1,200
FEET
GRAPHIC SCALE: 1" = 1,200'
SOURCE OF DATA:
2001 NATIONAL LAND COVER DATABASE (NLCD) PROVIDED BY THE MULT-RESOLUTION LAND COVER CONSORTIUM (MRLC).
MAP LEGEND (USE/COVER):
CULTIVATED CROPS
HAY/PASTURE
BARREN
NOTE: OTHER USES/COVERS SHOWN ARE FOR DIRT ROADS, PAVED ROADS, OR SCATTERED SHRUBS, AND WERE NOT CONSIDERED FOR PRELIMINARY SCS CURVE NO. VALUES.
EXISTING LAND USE
PROJECT SITE & TRIBUTARY DRAINAGE AREA
IN THE COUNTY OF SAN DIEGO, CA
C-2
DISREGARD PRINTS BEARING EARLIER REVISION DATES
08-06-10
SHEET: 1 OF 1

EXHIBIT “D”

FEMA FIRM Panel (Partial)



GRAPHIC SCALE: 1" = 2,000'

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 675 OF 2375
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO COUNTY, UNINCORPORATED AREAS	060284	0675	F

MAP NUMBER 06073C0675 F

EFFECTIVE DATE: JUNE 19, 1997

Federal Emergency Management Agency

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE A99	To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
ZONE V	Coastal flood with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood with velocity hazard (wave action); base flood elevations determined.

EXHIBIT NOTES:

1. PARTIAL FEMA FIRM MAP OBTAINED FROM THE FEMA ONLINE MAP SERVICE CENTER.
2. PROJECT BOUNDARY PER SITE PLAN DATED 08-02-2010, PREPARED BY JOSEPH E. BONADIMAN & ASSOCIATES, INC.
3. HORIZONTAL COORDINATE SYSTEM FOR THIS MAP IS CALIFORNIA STATE PLANE, N.A.D. 1983, ZONE VI.

FEMA FIRM MAP (PARTIAL)

U.S. SOLAR ONE, LLC BORREGO SPRINGS
UNMANNED PHOTOVOLTAIC SOLAR FARM
LOCATED WITHIN SAN DIEGO COUNTY, CA

PREPARED FOR: U.S. SOLAR HOLDINGS				
DRAWN BY: JDN	SCALE: 1" = 2,000'	SHEET: 1 OF 1		D
CHECKED BY: JTS	JOB NO: 103617			
DISREGARD PRINTS BEARING EARLIER REVISION DATES →	08-02-10			

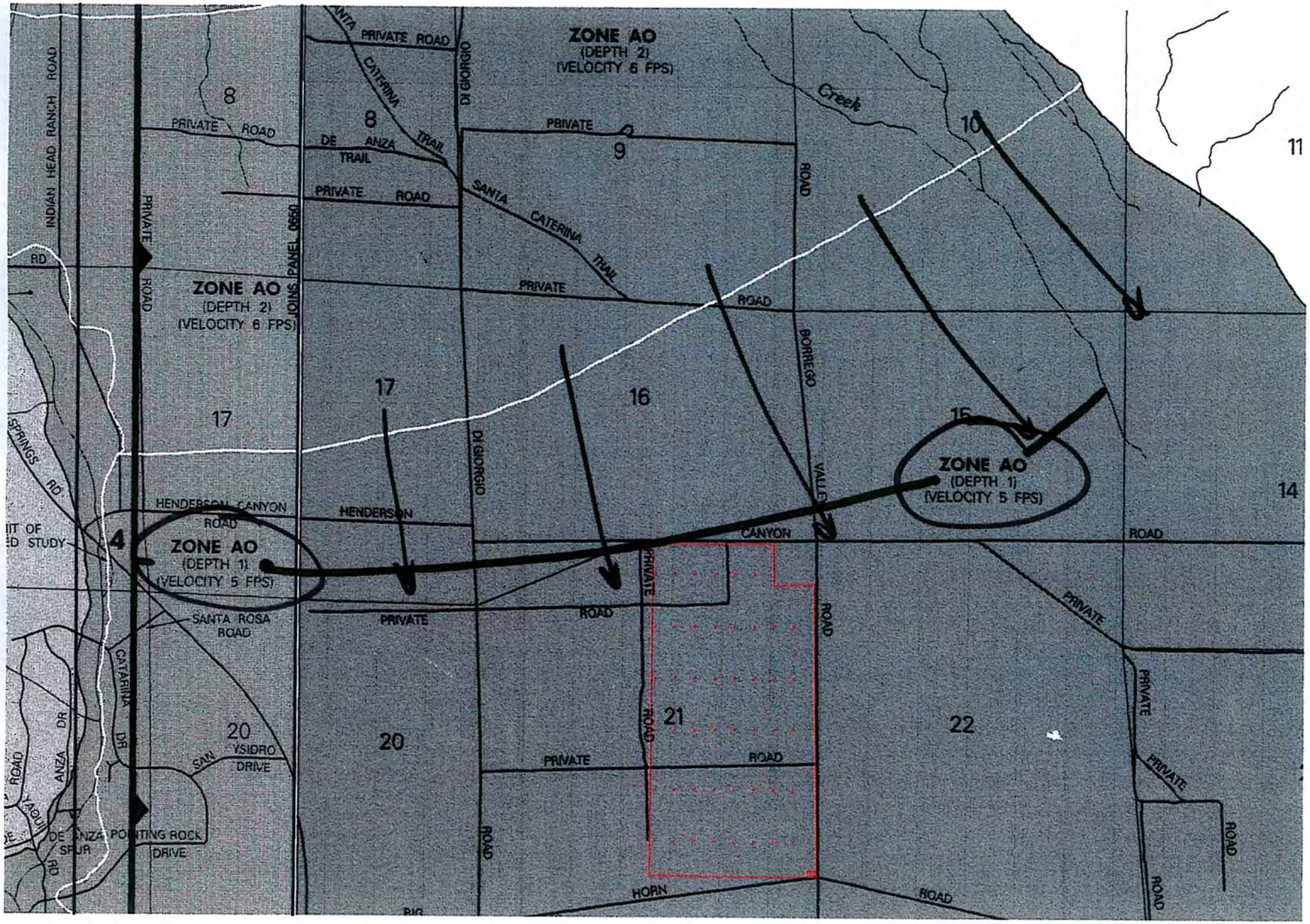

ZONE AO
(DEPTH 2)
(VELOCITY 6 FPS)
ZONE AO
(DEPTH 1)
(VELOCITY 5 FPS)
ZONE AO
(DEPTH 2)
(VELOCITY 6 FPS)
ZONE AO
(DEPTH 1)
(VELOCITY 5 FPS)
INDIAN HEAD RANCH ROAD
PRIVATE ROAD
DE ANZA TRAIL
SANTA CATERINA TRAIL
DI GIORGIO
BORREGO VALLEY
HENDERSON CANYON ROAD
SANTA ROSA ROAD
CATARINA DR
SAN YSIDRO DRIVE
POINTING ROCK DRIVE
HORN ROAD
Creek
JOINS PANEL 0650
8
9
10
11
14
15
16
17
20
21
22
4

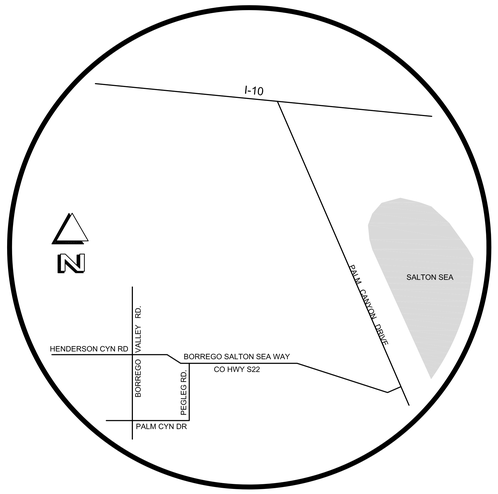
EXHIBIT “E”

Project Site Plans
(Revised May 2011)

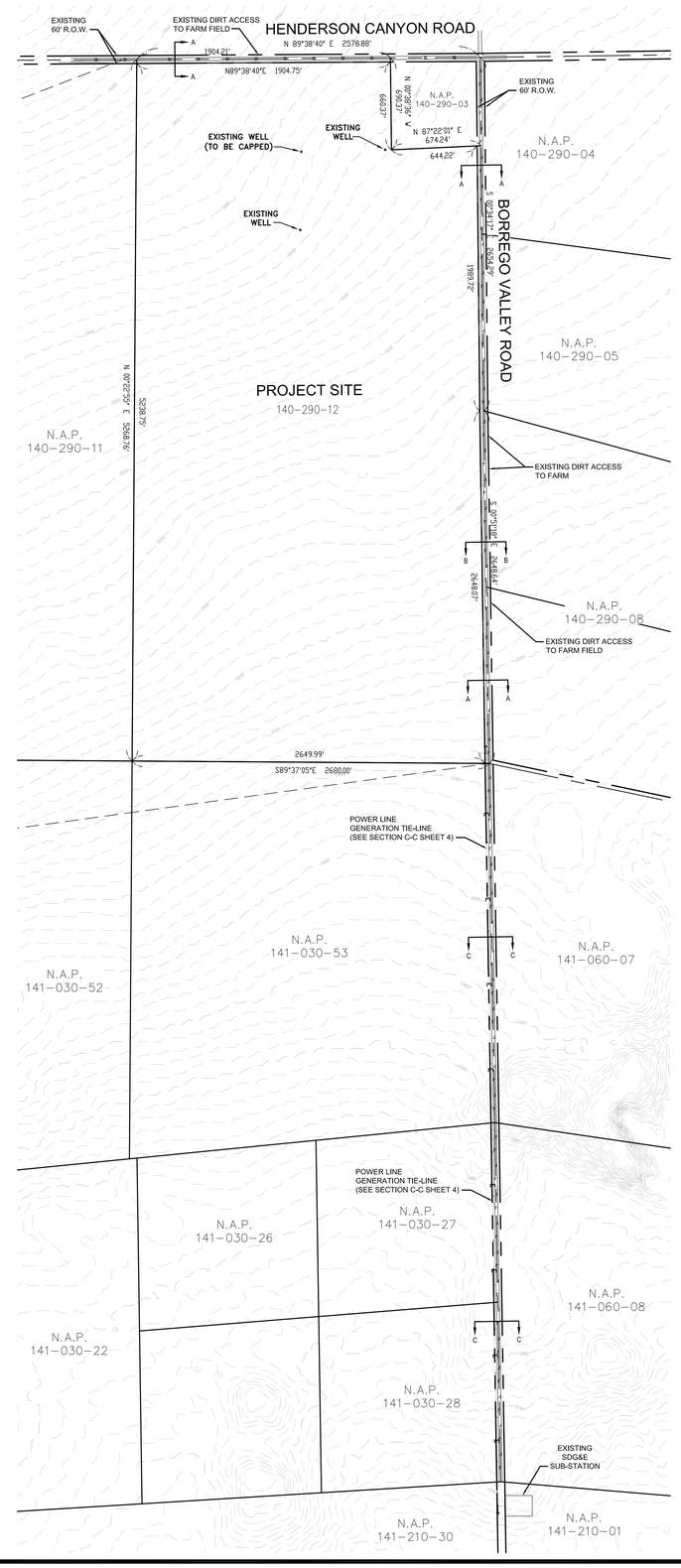
BORREGO 1 SOLAR PROJECT

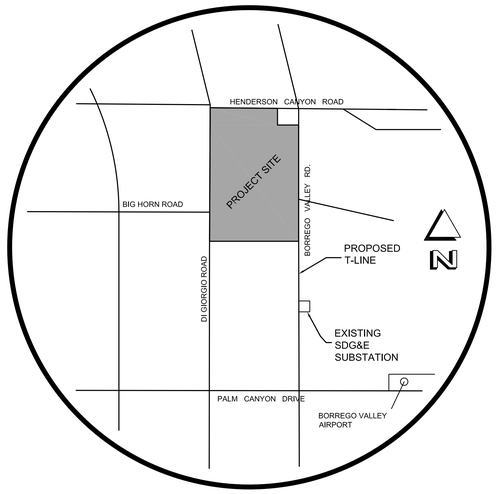
PROPOSED PHOTOVOLTAIC SOLAR POWER PROJECT
SAN DIEGO COUNTY, CALIFORNIA

PORTIONS OF SECTION 21 OF TOWNSHIP 10 SOUTH, RANGE 6 EAST, SAN BERNARDINO BASE MERIDIAN, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT OF SAID LAND



AREA MAP
N.T.S.





VICINITY MAP
N.T.S.

SITE INFORMATION:

APN:	140-290-12-00	
USE REGULATIONS:	S92, GENERAL RURAL	
ANIMAL REGULATIONS:	W	
DEVELOPMENT REGULATIONS:		
DENSITY:	0.25	
LOT SIZE:		
GROSS:	13,437,006 SF/308.47 AC	
NET:	13,227,665 SF/303.67 AC	
BUILDING TYPE:	C	
HEIGHT:	G, 35' MAX.	
SET BACKS:	D	
MINIMUM SETBACKS:	PER "D"	PROVIDED
FRONT:	60' FROM CL. (20' MIN. FROM PL.)	60'
SIDE INT:	15'	30'
SIDE EXT:	35' FROM CL.	30'
REAR:	25'	30'
EXISTING LAND USE:	AGRICULTURAL	
PROPOSED LAND USE:	PHOTOVOLTAIC SOLAR POWER PROJECT	

APPLICANT:

NRG SOLAR BORREGO I LLC
1015 WEST HAYS
BOISE, ID 83702
PHONE: (208) 344-5428
FAX: (208) 343-1218

ATTN: MIKE ELLIOTT

LAND OWNER:

COCOPAH NURSERIES INC. CO.
81880 ARUS AVE.
INDIO, CA 92201

LEGAL DESCRIPTION:

THAT PORTION OF SECTION 21, TOWNSHIP 10 SOUTH, RANGE 6 EAST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA DESCRIBED AS FOLLOWS.

BEGINNING AT THE SOUTHEAST CORNER OF SECTION 21, MONUMENTED WITH A 2" STEEL PIPE AND DISC STAMPED LS 4068, SAID CORNER IS LOCATED SOUTH 0°42'47" EAST 5302.93 FEET FROM A BRASS PLATE MARKED LS 1880 AT THE NORTHEAST CORNER OF SECTION 21;

THENCE NORTH 89°37'05" WEST 2680.00 FEET;

THENCE NORTH 0°22'55" EAST 5268.76 FEET TO THE NORTHERLY LINE OF SECTION 21;

THENCE ALONG SAID NORTHERLY LINE NORTH 89°38'40" EAST 1904.21 FEET TO THE WESTERLY LINE OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF THE NORTHEAST 1/4 SECTION 16;

THENCE ALONG SAID WESTERLY LINE SOUTH 0°38'36" EAST 690.37 FEET TO THE SOUTHERLY LINE OF THE NORTHEAST 1/4 OF THE NORTHEAST 1/4 OF THE NORTHEAST 1/4 SECTION 16;

THENCE ALONG SAID SOUTHERLY LINE NORTH 87°22'01" EAST 674.22 FEET TO THE EASTERLY LINE OF SECTION 21;

THENCE ALONG SAID EASTERLY LINE SOUTH 0°34' 17" EAST 1990.73 FEET TO THE WEST 1/4 CORNER OF SECTION 21;

THENCE CONTINUING ALONG THE EASTERLY LINE OF SECTION 21 SOUTH 0°51' 18" EAST 2648.64 TO THE POINT OF BEGINNING.

THE ABOVE DESCRIBED PARCEL OF LAND CONTAINS 308.17 ACRES, MORE OR LESS.

FLOOD ZONE NOTE:

NATIONAL FLOOD INSURANCE PROGRAM
THE SUBJECT PROPERTY IS LOCATED WITHIN ZONE AO, AREAS DETERMINED TO BE WITHIN THE 100-YEAR FLOODPLAIN PER F.I.R.M. MAP COMMUNITY PANEL 675 OF 2375; MAP No. 06073C0675 F.

EFFECTIVE DATE: JUNE 19, 1997.

"ZONE AO – FLOOD DEPTHS OF 1 TO 3 FEET (USUALLY SHEET FLOW ON SLOPING TERRAIN); AVERAGE DEPTHS DETERMINED. FOR AREAS OF ALLUVIAL FAN FLOODING, VELOCITIES ALSO DETERMINED."

PRELIMINARY GRADING PLAN NOTE:

THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PEFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSION BEFORE COMMENCING SUCH ACTIVITY.

NOTES:

1. PROPOSED ENTRY GATE SHALL COMPLY WITH THE COUNTY CONSOLIDATED FIRE CODE SECTION 96.1.503.6 AND COUNTY STANDARD DESIGN.
2. THERE ARE NO EASEMENTS WITHIN THE PROJECT SITE.
3. THERE ARE NO PROPOSED DRAINAGE DEVICES OR POST CONSTRUCTION BMP'S PROPOSED.

SITE PREPARATION / EARTHWORK:

SITE PREPARATION WILL CONSIST OF CLEARING, GRUBBING, SCARIFYING AND RECOMPACTING, WITH MINOR GRADING TO REMOVE ANY MOUNDS, HOLES OR DITCHES THAT HAVE BEEN LEFT AS PART OF THE PREVIOUS AGRICULTURAL USE. THE INTENT IS TO CLEAR AND SMOOTH THE SITE TO A NEAR NATURAL CONDITION. NO CUT OR FILL SLOPES ARE PROPOSED

EARTHWORK QUANTITIES

GRADING/RECOMPACTING:	±489,913 CY
TRENCHING:	±6,000 CY
EQUIPMENT OVEREXCAVATION:	±35,000 CY
TOTAL:	CUT 41,000 CUBIC YARDS
	FILL 41,000 CUBIC YARDS

NOTE: THE ABOVE LISTED QUANTITIES REFLECT THE ENGINEER'S ESTIMATE OF THE ACTUAL VOLUMES OF MATERIAL CUT AND FILLED. THESE QUANTITIES ARE FOR ESTIMATING PURPOSE ONLY.

400 0 400 800 1200
SCALE: 1"=400'

LEGEND

- CENTERLINE
- RIGHT-OF-WAY
- PROPERTY LINE
- FIRE SETBACK
- EQUIPMENT SETBACK
- PROPOSED FENCE LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR

REGISTERED PROFESSIONAL ENGINEER JAMES T. SHAW No. 42944 Exp. 6-30-11 CIVIL STATE OF CALIFORNIA
09-06-11

JOSEPH E. BONADIMAN & ASSOCIATES INC.
consulting engineers land surveyors
234 N. ARROWHEAD AVE., SAN BERNARDINO, CA 92408-1013
PHONE: (909) 885-3806 - FAX: (909) 381-1721

VERTICAL DATUM

BENCH MARK: TOPOGRAPHIC CONTOURS GENERATED FROM THE NATIONAL ELEVATION DATASET (NED) DIGITAL ELEVATION MODEL (DEM) OBTAINED FROM THE UNITED STATES GEOLOGICAL SURVEY (USGS), NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), 1/3 ARC-SECOND (APPROXIMATELY 10 METER) PRECISION.

HORIZONTAL DATUM

BASIS OF BEARINGS: CENTERLINE OF HENDERSON CANYON ROAD BEING, N 89°38'40" E.

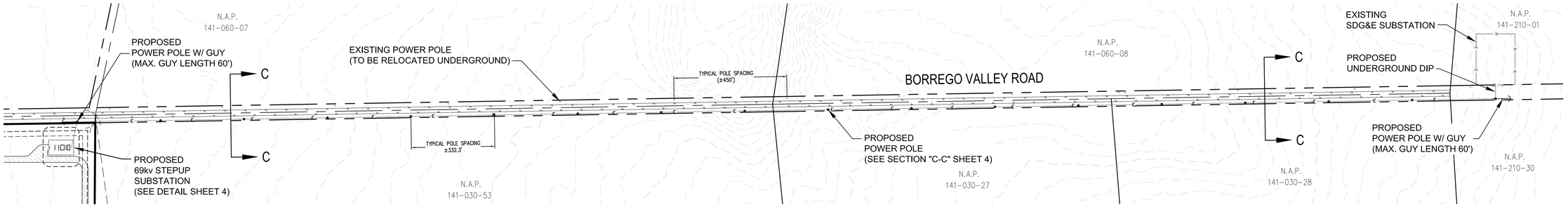
BORREGO 1 SOLAR PROJECT
CONCEPTUAL SITE PLAN
TOWNSHIP 10 SOUTH, RANGE 6 EAST
SAN DIEGO COUNTY, CALIFORNIA

REVISIONS

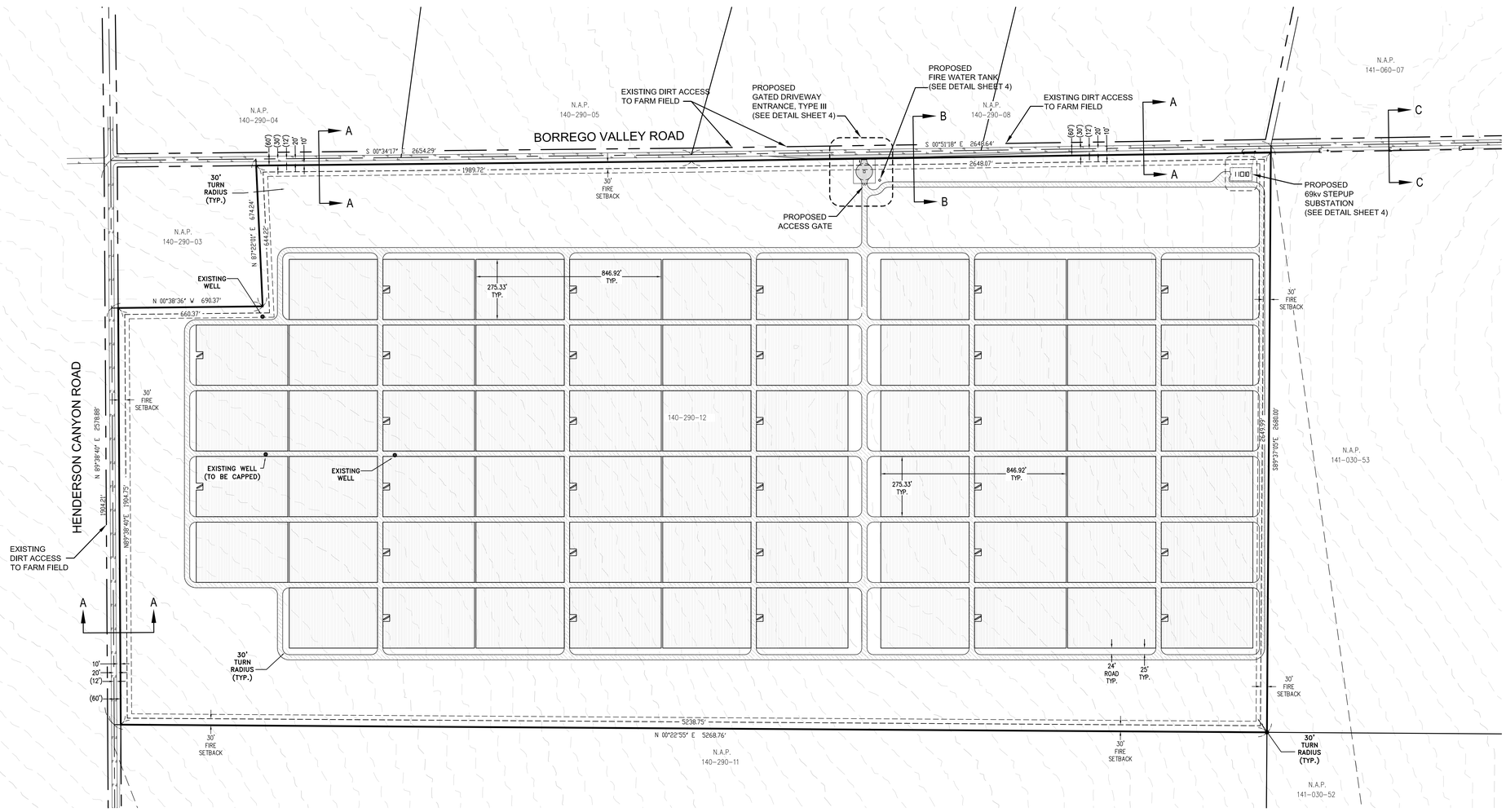
NO	DESCRIPTION	BY	APPROVED	DATE

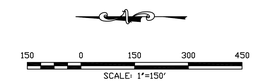
PREPARED FOR:	NRG SOLAR BORREGO I LLC		
DRAWN BY: J.T.S.	SCALE: 1" = 400'	SHEET: 1 OF 4	C1
CHECKED BY: J.T.S.	JOB NO: 103617		
DISREGARD PRINTS BEARING EARLIER REVISION DATES	05-16-11		

TYPICAL GEN-TIE



FIXED TILT, 26 MW AC OR 32 MW DC





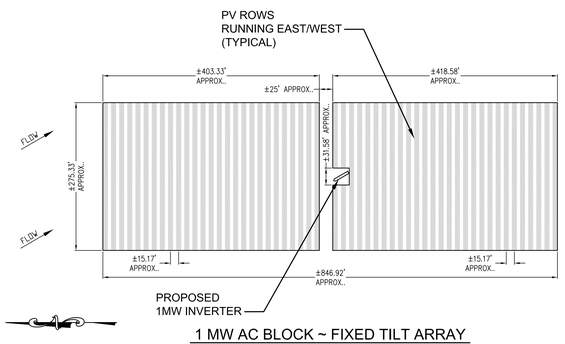
FLOOD NOTES:

1.) ALL PROPOSED EQUIPMENT NOT ELEVATED ABOVE THE FLOODPLAIN TO BE IN WATER-TIGHT ENCASING.

2.) ALL PROPOSED SITE FENCING TO BE BREAKAWAY (SEE DETAIL SHEET 4).

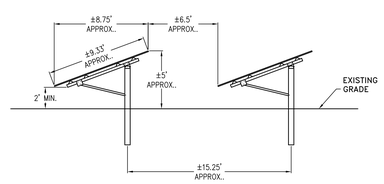
LEGEND

- CENTERLINE
- RIGHT-OF-WAY
- PROPERTY LINE
- FIRE SETBACK
- EQUIPMENT SETBACK
- PROPOSED FENCE LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR



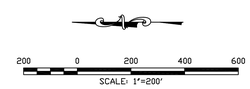
1 MW AC BLOCK ~ FIXED TILT ARRAY
TYPICAL

NOTE: INFORMATION & DIMENSIONS SHOWN ABOVE MAY VARY DEPENDING ON MANUFACTURER AND EQUIPMENT INSTALLED.



FIXED TILT ARRAY, RACK SECTION
TYPICAL

NOTE: INFORMATION & DIMENSIONS SHOWN ABOVE MAY VARY DEPENDING ON MANUFACTURER AND EQUIPMENT INSTALLED.



SITE EQUIPMENT INFORMATION

*FIXED ARRAY LENGTH:	846.92 FT. (APPROX..)
*FIXED RACK SPACING:	15.17 FT. (APPROX..)
*FIXED ARRAY WIDTH:	275.33 FT. (APPROX..)
*AREA NEEDED PER BLOCK:	233,182.48 SF./5.35 AC. (APPROX..)
*162 PANELS/ROW x 26 ROWS/ARRAY + 135 PANELS/ROW x 2 ROWS/ARRAY:	4,482 PANELS/SOUTH BLOCK (APPROX..)
*162 PANELS/ROW x 27 ROWS/ARRAY:	4,374 PANELS/NORTH BLOCK (APPROX..)
	*8,856 PANELS/ARRAY (APPROX..)
*PANEL COVERAGE PER ARRAY:	127938.32 SF./2.94 AC. (APPROX..)
32 ARRAYS x 8,856 PANELS/ARRAY:	283,392 PANELS TOTAL (APPROX..)
LOT COVERAGE	
*SOLAR PANELS:	4,094,026 SF./ 93.99 AC. (APPROX..)
*EQUIPMENT:	7,500 SF./ 0.17 AC. (APPROX..)
SITE AREA (NET):	13,227,665 SF/303.67 AC
*SITE COVER RATIO:	31.0% (APPROX..)

* INFORMATION SHOWN ABOVE MAY VARY DEPENDING ON MANUFACTURER AND EQUIPMENT INSTALLED.

JOSEPH E. BONADIMAN & ASSOCIATES INC.
consulting engineers land surveyors
234 N. ARROWHEAD AVE., SAN BERNARDINO, CA 92408-1013
PHONE: (909) 885-3806 - FAX: (909) 381-1721

VERTICAL DATUM

BENCH MARK: TOPOGRAPHIC CONTOURS GENERATED FROM THE NATIONAL ELEVATION DATASET (NED) DIGITAL ELEVATION MODEL (DEM) OBTAINED FROM THE UNITED STATES GEOLOGICAL SURVEY (USGS), NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), 1/3 ARC-SECOND (APPROXIMATELY 10 METER) PRECISION.

HORIZONTAL DATUM

BASIS OF BEARINGS: CENTERLINE OF HENDERSON CANYON ROAD BEING, N 89°38'40" E.

BORREGO 1 SOLAR PROJECT

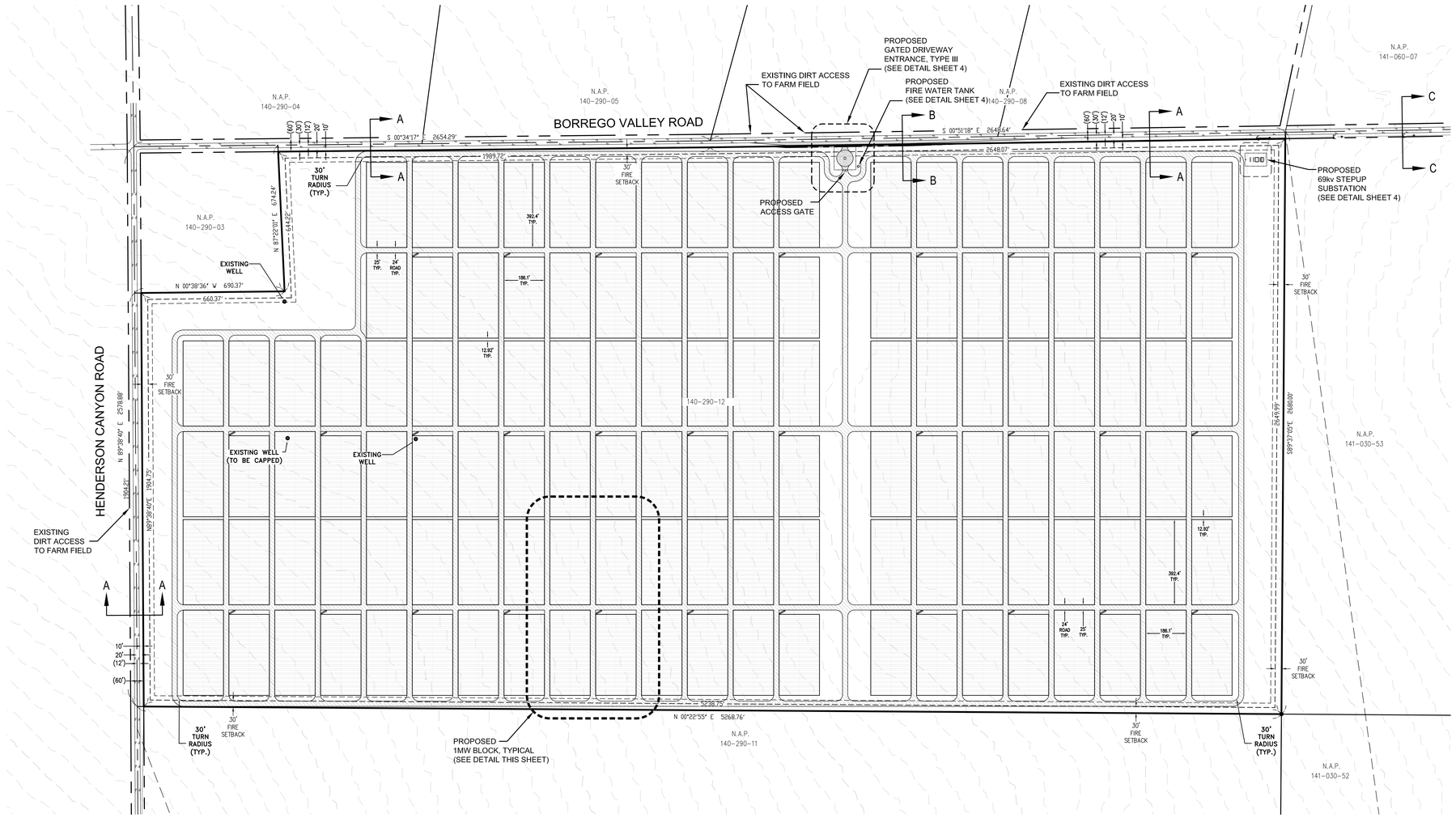
CONCEPTUAL SITE PLAN ~ FIXED ARRAY
TOWNSHIP 10 SOUTH, RANGE 6 EAST
SAN DIEGO COUNTY, CALIFORNIA

REVISIONS

NO	DESCRIPTION	BY	APPROVED	DATE

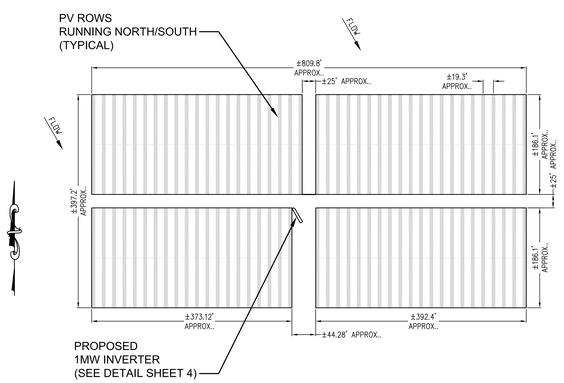
PREPARED FOR:	NRG SOLAR BORREGO I LLC		
DRAWN BY: J.T.S.	SCALE: 1" = 200'	SHEET: 2 OF 4	C1
CHECKED BY: J.T.S.	JOB NO: 103617		
DISREGARD PRINTS BEARING EARLIER REVISION DATES	05-16-11		

SINGLE AXIS TRACKER, 26 MW AC OR 31 MW DC



LEGEND

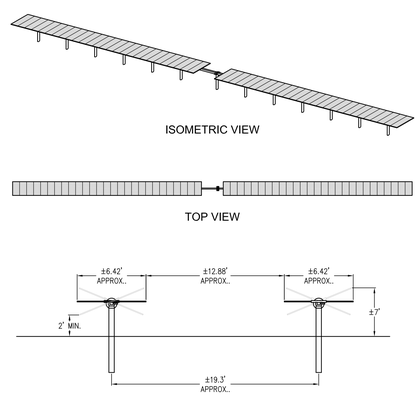
- CENTERLINE
- RIGHT-OF-WAY
- PROPERTY LINE
- FIRE SETBACK
- EQUIPMENT SETBACK
- PROPOSED FENCE LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR



1MW BLOCK ~ SINGLE AXIS TRACKER ARRAY

TYPICAL

NOTE: INFORMATION & DIMENSIONS SHOWN ABOVE MAY VARY DEPENDING ON MANUFACTURER AND EQUIPMENT INSTALLED.



SINGLE AXIS TRACKER, RACK SECTION

TYPICAL

NOTE: INFORMATION & DIMENSIONS SHOWN ABOVE MAY VARY DEPENDING ON MANUFACTURER AND EQUIPMENT INSTALLED.

FLOOD NOTES:

1.) ALL PROPOSED EQUIPMENT NOT ELEVATED ABOVE THE FLOODPLAIN TO BE IN WATER-TIGHT ENCASING.

2.) ALL PROPOSED SITE FENCING TO BE BREAKAWAY (SEE DETAIL SHEET 4).

SITE EQUIPMENT INFORMATION

*TRACKER ARRAY LENGTH:	186.10 FT. (APPROX..)
*TRACKER ROW SPACING:	19.30 FT. (APPROX..)
*TRACKER ARRAY WIDTH:	392.40 FT. (APPROX..)
*AREA NEEDED PER BLOCK:	73,025.60 SF./1.68 AC. (APPROX..)
*54 PANELS/ROW x 21 ROWS/ARRAY:	1,134 PANELS/306.1kw BLOCK (APPROX..)
*54 PANELS/ROW x 20 ROWS/ARRAY:	1,080 PANELS/291.6kw BLOCK (APPROX..)
*PANEL COVERAGE PER ARRAY:	99,113.74 SF./2.27 AC. (APPROX..)
*(306.1kw BLOCK x 93)+(291.6kw BLOCK x 31):	138,942 PANELS TOTAL (APPROX..)
LOT COVERAGE	
*SOLAR PANELS:	3,072,526 SF./ 70.54 AC. (APPROX..)
*EQUPMENT:	1,811 SF./ 0.04 AC. (APPROX..)
SITE AREA (NET):	13,227,665 SF/303.67 AC
*SITE COVER RATIO:	23.2% (APPROX..)

* INFORMATION SHOWN ABOVE MAY VARY DEPENDING ON MANUFACTURER AND EQUIPMENT INSTALLED.

JOSEPH E. BONADIMAN & ASSOCIATES INC.
consulting engineers land surveyors
234 N. ARROWHEAD AVE., SAN BERNARDINO, CA 92408-1013
PHONE: (909) 885-3806 - FAX: (909) 381-1721

VERTICAL DATUM

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HORIZONTAL DATUM

BASIS OF BEARINGS: CENTERLINE OF HENDERSON CANYON ROAD BEING, N 89°38'40" E.

BORREGO 1 SOLAR PROJECT

CONCEPTUAL SITE PLAN ~ TRACKER ARRAY
TOWNSHIP 10 SOUTH, RANGE 6 EAST
SAN DIEGO COUNTY, CALIFORNIA

REVISIONS

NO	DESCRIPTION	BY	APPROVED	DATE

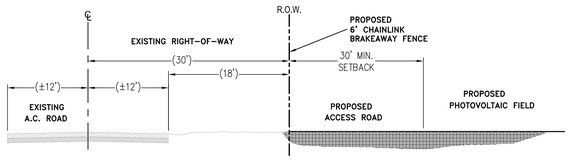
200 0 200 400 600
SCALE: 1"=200'

PREPARED FOR:	NRG SOLAR BORREGO I LLC		
DRAWN BY: J.T.S.	SCALE: 1" = 200'	SHEET: 3 OF 4	C1
CHECKED BY: J.T.S.	JOB NO: 103617		
DISREGARD PRINTS BEARING EARLIER REVISION DATES	05-16-11		

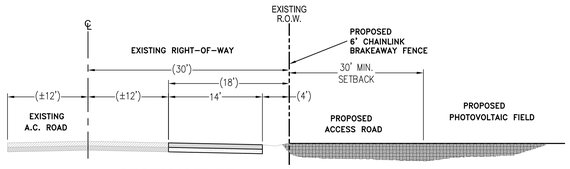
BORREGO 1 SOLAR PROJECT

PROPOSED PHOTOVOLTAIC SOLAR POWER PROJECT
SAN DIEGO COUNTY, CALIFORNIA

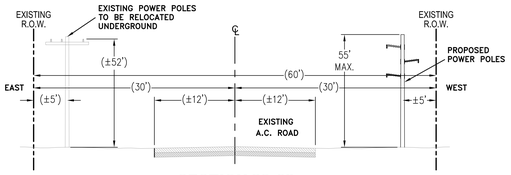
PORTIONS OF SECTION 21 OF TOWNSHIP 10 SOUTH, RANGE 6 EAST, SAN BERNARDINO BASE MERIDIAN, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT OF SAID LAND



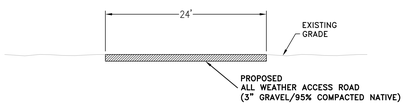
SECTION "A-A"
TYPICAL STREET SECTION
NOT TO SCALE



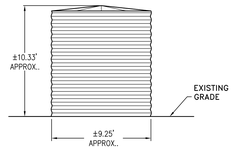
SECTION "B-B"
DECELERATION/ACCELERATION LANE SCTION
NOT TO SCALE



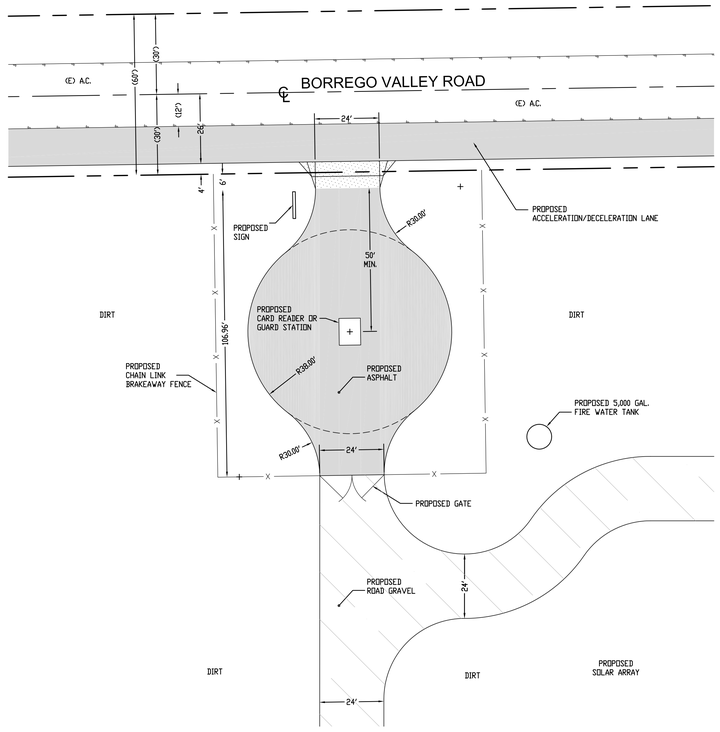
SECTION "C-C"
BORREGO VALLEY ROAD GEN-TIE SECTION
NOT TO SCALE



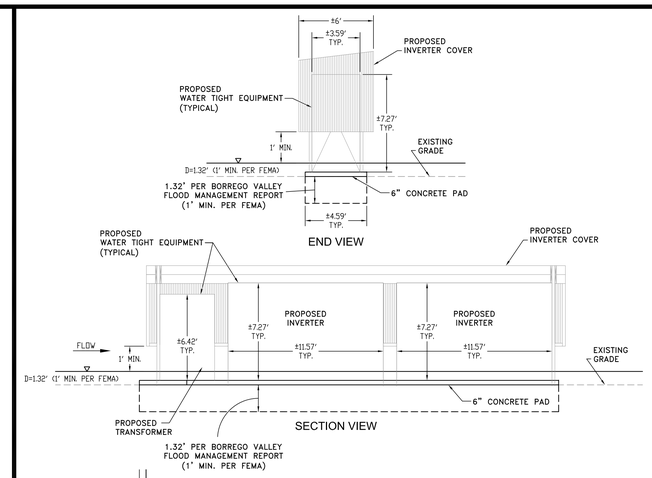
ON-SITE ACCESS ROAD
NOT TO SCALE

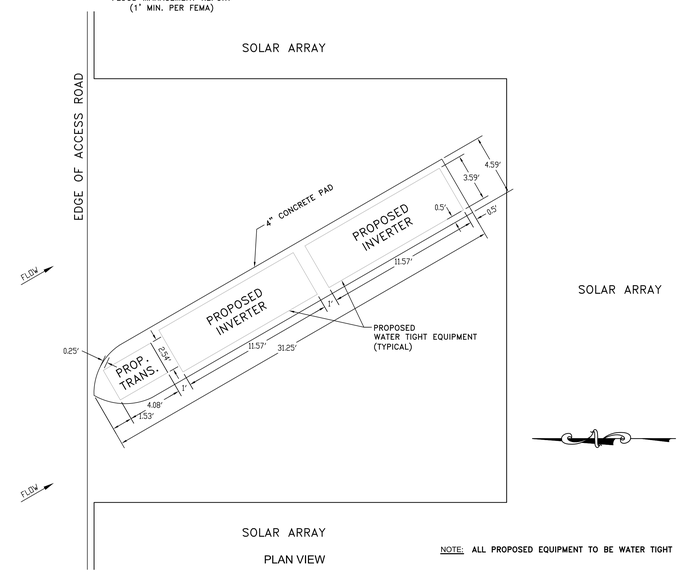


5,000 GAL CORRUGATED METAL FIRE WATER TANK
TYPICAL



GATED DRIVEWAY ENTRANCE, TYPE III
SCALE: 1" = 20'

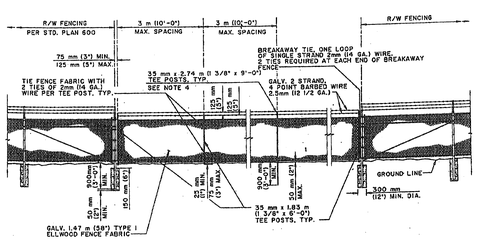




PLAN VIEW

NOTE: ALL PROPOSED EQUIPMENT TO BE WATER TIGHT

1MW INVERTER PAD ~ OPTION 1
TYPICAL



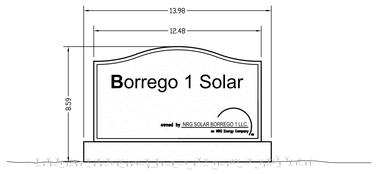
DETAILS FOR LENGTHS IN EXCESS OF 6 m (20')

NOTES

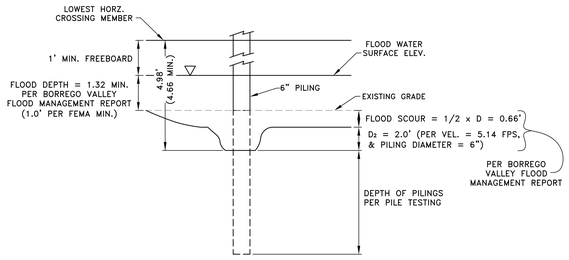
1. ALL FENCE MATERIALS AND FITTINGS SHALL CONFORI SPECIFICATIONS" UNLESS OTHERWISE SPECIFIED.
2. THE FABRIC SHALL BE PLACED ON THE DOWNSTREAM STRETCHED TAUT, AND FASTENED AS SHOWN.
3. POSTS SHALL BE 35 mm x 35 mm x 3 mm (1 3/8" x MUM, GALVANIZED TEE FENCE POSTS.
4. TEE POSTS NOT TO BE EMBEDDED IN CONCRETE. TEE DRIVEN 900 mm (3'-0") INTO GROUND AT 6 m (20'-0 TERMEDIATE TEE POSTS SHALL BE SET AS SHOWN.

TYPICAL BREAKAWAY FENCE DETAIL

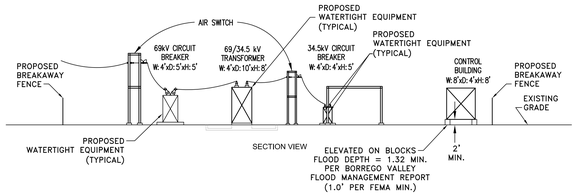
NOTE: DESIGN CALCULATIONS WILL BE PROVIDED DURING FINAL ENGINEERING TO DEMONSTRATE THAT ALL PROPOSED FENCING WILL FAIL UNDER A FORCE LESS THAN THAT OF THE SITE SPECIFIC PEAK 100 YEAR FLOW (I.E. BASED UPON THE VELOCITY AND DEPTH FROM THE F.I.R.M.)

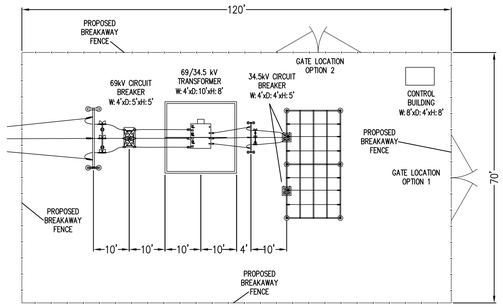


PROPOSED SIGN
NOT TO SCALE

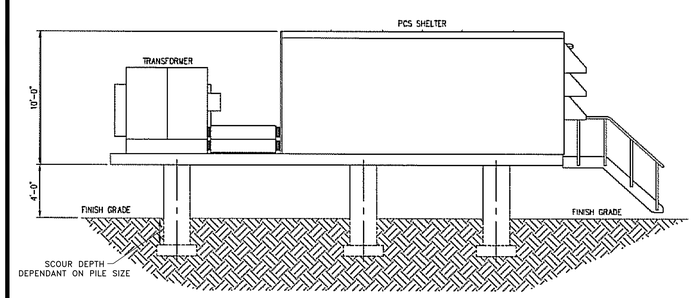


TYPICAL SOLAR FIELD PILING
N.T.S.

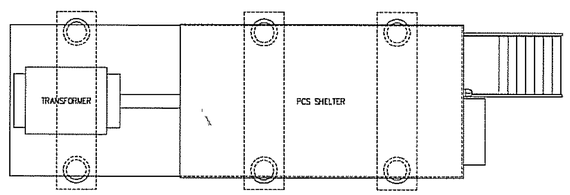




69kv STEPUP SUBSTATION
N.T.S.

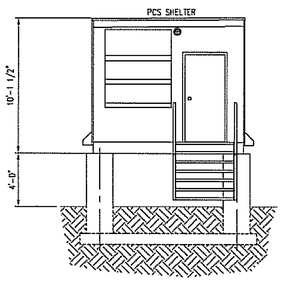


SOUTH ELEVATION
SCALE: 1/4"=1'-0"



ELEVATED PCS INVERTER PLAN
SCALE: 1/4"=1'-0"

1MW INVERTER PAD ~ OPTION 2
TYPICAL



LEGEND

- CENTERLINE
- RIGHT-OF-WAY
- PROPERTY LINE
- FIRE SETBACK
- EQUIPMENT SETBACK
- PROPOSED FENCE LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR

REGISTERED PROFESSIONAL ENGINEER JOSEPH E. BONADIMAN No. C-70844 Exp. 6-30-11 CIVIL STATE OF CALIFORNIA 05-06-11

JOSEPH E. BONADIMAN & ASSOCIATES INC.
consulting engineers land surveyors
234 N. ARROWHEAD AVE., SAN BERNARDINO, CA 92408-1013
PHONE: (909) 885-3806 - FAX: (909) 381-1721

VERTICAL DATUM

BENCH MARK: TOPOGRAPHIC CONTOURS GENERATED FROM THE NATIONAL ELEVATION DATASET (NED) DIGITAL ELEVATION MODEL (DEM) OBTAINED FROM THE UNITED STATES GEOLOGICAL SURVEY (USGS), NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), 1/3 ARC-SECOND (APPROXIMATELY 10 METER) PRECISION.

HORIZONTAL DATUM

BASIS OF BEARINGS: CENTERLINE OF HENDERSON CANYON ROAD BEING, N 89°38'40" E.

BORREGO 1 SOLAR PROJECT
CONCEPTUAL SITE PLAN
TOWNSHIP 10 SOUTH, RANGE 6 EAST
SAN DIEGO COUNTY, CALIFORNIA

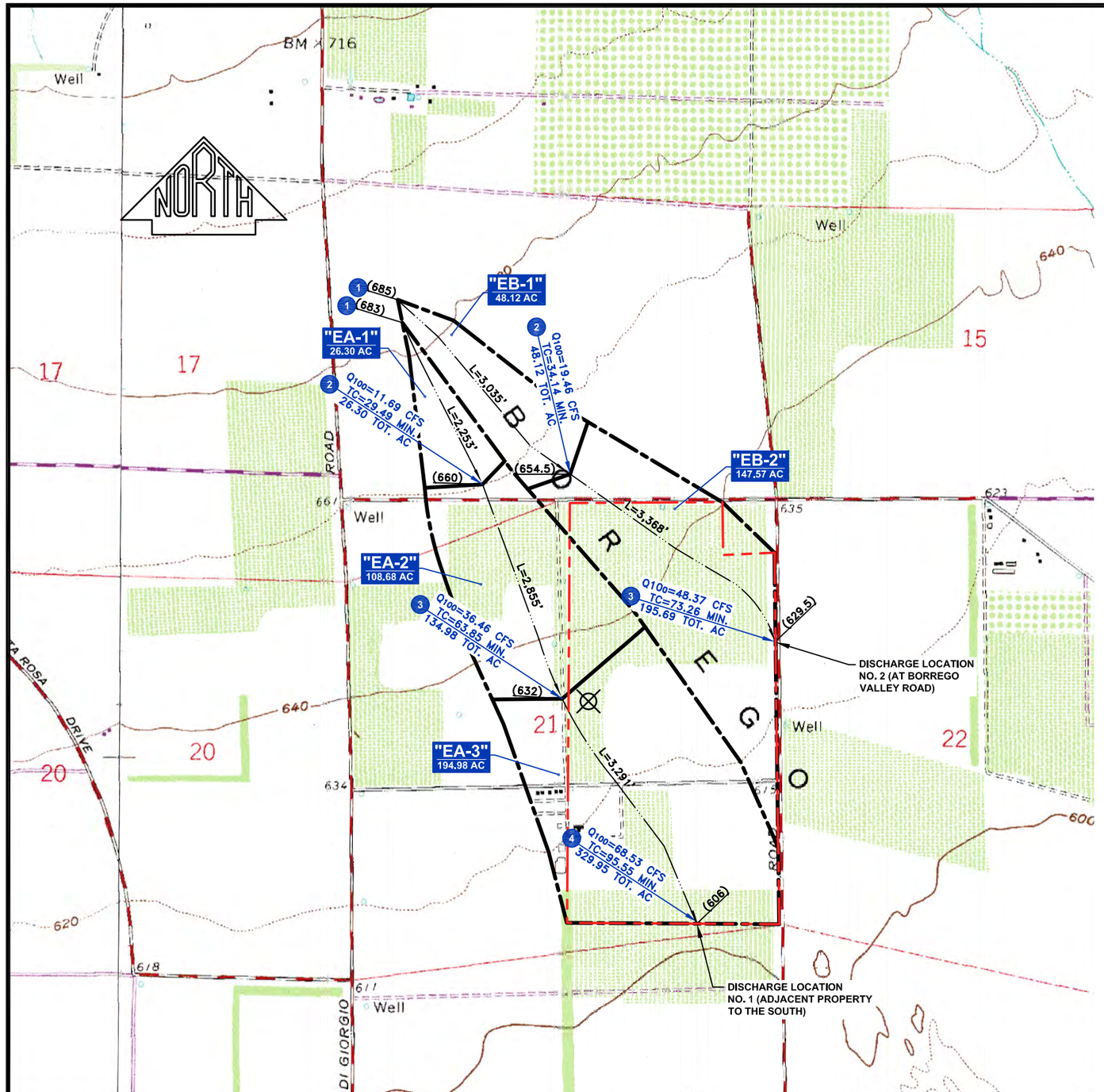
REVISIONS

NO	DESCRIPTION	BY	APPROVED	DATE

PREPARED FOR:	NRG SOLAR BORREGO I LLC		
DRAWN BY: J.T.S.	SCALE: N/A	SHEET: 4 OF 4	C1
CHECKED BY: J.T.S.	JOB NO: 103617		
DISREGARD PRINTS BEARING EARLIER REVISION DATES	05-16-11		

EXHIBIT “F”

Existing Conditions Hydrology
Study Map



1,500' 0' 1,500' 3,000' 4,500'

GRAPHIC SCALE: 1" = 1,500'

EXHIBIT "F"
EXISTING CONDITIONS

HYDROLOGY STUDY MAP
BORREGO SPRINGS UNMANNED P.V. SOLAR FARM
IN THE COUNTY OF SAN DIEGO, CA

EXISTING CONDITIONS RATIONAL METHOD INPUT PARAMETERS:

DRAINAGE SUBAREA	NODE LOCATION	SUBAREA SIZE (AC)	LAND USE TYPE	TOTAL AREA TRIBUTARY TO NODE (AC)	SOIL TYPE	SUBAREA WATERCOURSE LENGTH (FT)	ELEVATION AT NODE (FT)
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	683
EA-1	2	26.30		26.30		2,253	660
EA-2	3	108.68		134.98		2,855	632
EA-3	4	194.98		329.95		3,291	606
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	685
EB-1	2	48.12		48.12		3,035	654.5
EB-2	3	147.57		195.69		3,368	629.5

EXISTING CONDITIONS RATIONAL METHOD OUTPUT CALCULATIONS:

CONDITION	DRAINAGE SUBAREA	NODE	PEAK Q_{100} AT NODE (CFS)	VELOCITY AT NODE (FPS)	H (ELEVATION AT NODE)	L (FT)	C	Tc (MIN) AT NODE	I (IN/HR)	SUBAREA A (AC)
PRE	EA	2	11.69	-	660	70 (INITIAL)/2253 (TOTAL)	0.20	12.5 (INITIAL)/29.49 (TOTAL)	2.223	26.30
		3	36.46	1.61	632	2855.00	0.20	63.85	1.35	108.68
		4	68.53	1.88	606	3291.00	0.20	95.95	1.039	194.98
	EB	2	19.46	-	654.5	70 (INITIAL)/3035 (TOTAL)	0.20	12.5 (INITIAL)/34.14 (TOTAL)	2.02	48.12
		3	48.37	1.63	629.5	3368	0.20	73.26	1.236	147.57

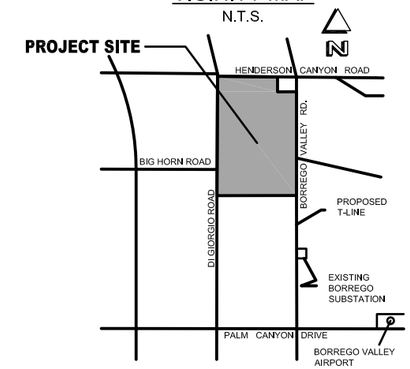
MAP LEGEND:

- PROJECT SITE LIMITS
- DRAINAGE AREA LIMITS
- FLOW PATHS
- U.S.G.S. TOPOGRAPHIC MAP

MAP NOTES:

1. EXISTING TOPOGRAPHY (USGS QUADRANGLE) OBTAINED FROM THE USGS SEAMLESS DATA DISTRIBUTION RESOURCE.
2. HORIZONTAL COORDINATE SYSTEM FOR THIS MAP IS CALIFORNIA STATE PLANE, N.A.D. 1983, ZONE VI.

VICINITY MAP
N.T.S.



REVISIONS				
NO	DESCRIPTION	BY	APPROVED	DATE
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EXISTING CONDITIONS
HYDROLOGY STUDY MAP
BORREGO SPRINGS UNMANNED P.V. SOLAR FARM
IN THE COUNTY OF SAN DIEGO, CA

PREPARED FOR: U.S. SOLAR ONE, LLC

DRAWN BY: JDN	SCALE: 1" = 1,500'	SHEET: 1 OF 1	F
CHECKED BY: JTS	JOB NO: 103617		
DISREGARD PRINTS BEARING EARLIER REVISION DATES →	03-22-11		

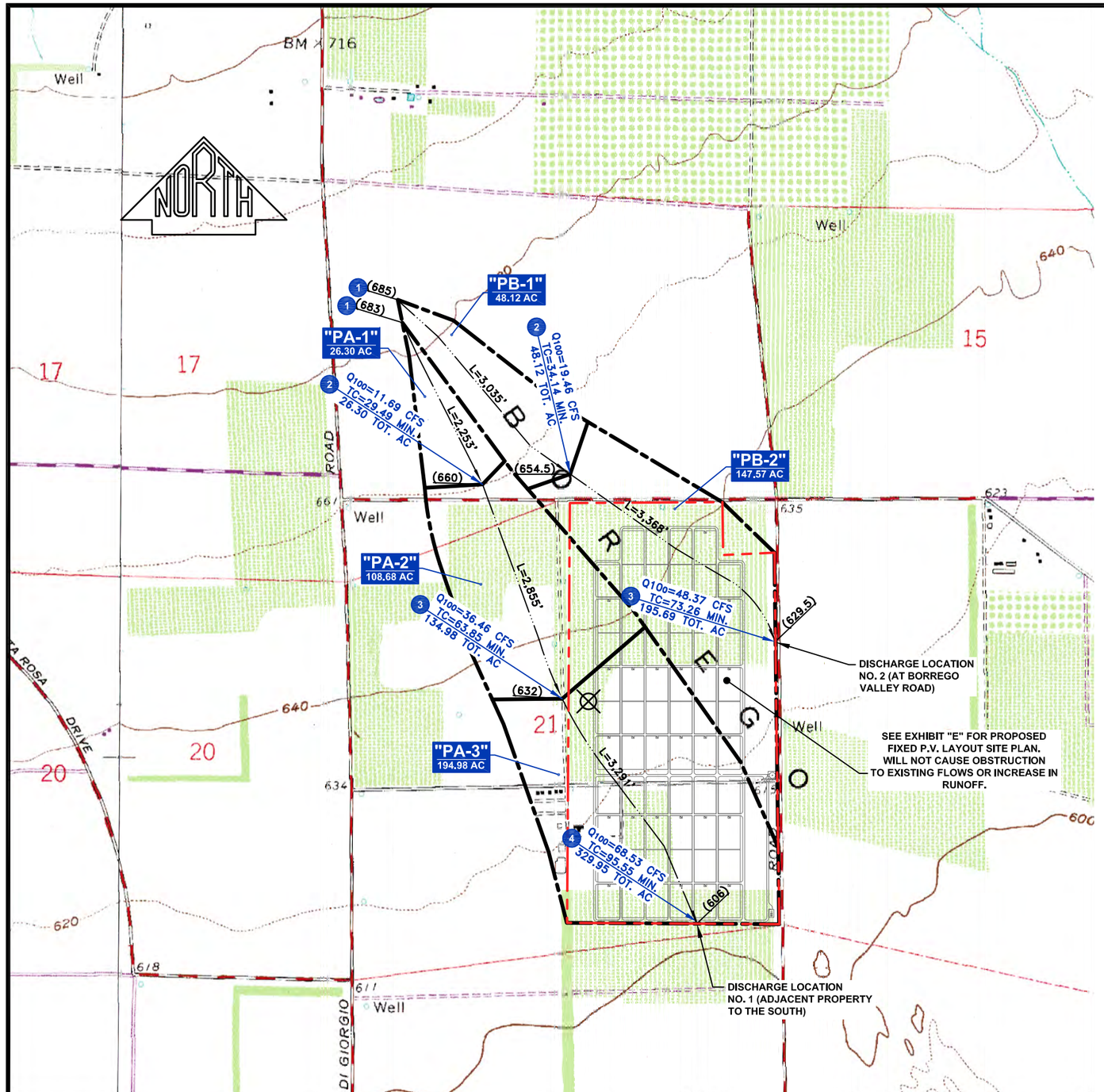
EXHIBIT “G”

Proposed Conditions Hydrology
Study Map

EXHIBIT "G.1"

PROPOSED CONDITIONS (FIXED P.V.)

HYDROLOGY STUDY MAP
BORREGO SPRINGS UNMANNED P.V. SOLAR FARM
IN THE COUNTY OF SAN DIEGO, CA



1,500' 0' 1,500' 3,000' 4,500'

GRAPHIC SCALE: 1" = 1,500'

PROPOSED CONDITIONS RATIONAL METHOD INPUT PARAMETERS:

DRAINAGE SUBAREA	NODE LOCATION	SUBAREA SIZE (AC)	LAND USE TYPE	TOTAL AREA TRIBUTARY TO NODE (AC)	SOIL TYPE	SUBAREA WATERCOURSE LENGTH (FT)	ELEVATION AT NODE (FT)
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	683
PA-1	2	26.30		26.30		2,253	660
PA-2	3	108.68		134.98		2,855	632
PA-3	4	194.98		329.95		3,291	606
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	685
PB-1	2	48.12		48.12		3,035	654.5
PB-2	3	147.57		195.69		3,368	629.5

PROPOSED CONDITIONS RATIONAL METHOD OUTPUT CALCULATIONS:

CONDITION	DRAINAGE SUBAREA	NODE	PEAK Q_{100} AT NODE (CFS)	VELOCITY AT NODE (FPS)	H (ELEVATION AT NODE)	L (FT)	C	Tc (MIN) AT NODE	I (IN/HR)	SUBAREA A (AC)
POST	PA	2	11.69	-	660	70 (INITIAL)/2253 (TOTAL)	0.20	12.5 (INITIAL)/29.49 (TOTAL)	2.223	26.30
		3	36.46	1.61	632	2855.00	0.20	63.85	1.35	108.68
		4	68.53	1.88	606	3291.00	0.20	95.95	1.039	194.98
	PB	2	19.46	-	654.5	70 (INITIAL)/3035 (TOTAL)	0.20	12.5 (INITIAL)/34.14 (TOTAL)	2.02	48.12
		3	48.37	1.63	629.5	3368	0.20	73.26	1.236	147.57

MAP LEGEND:

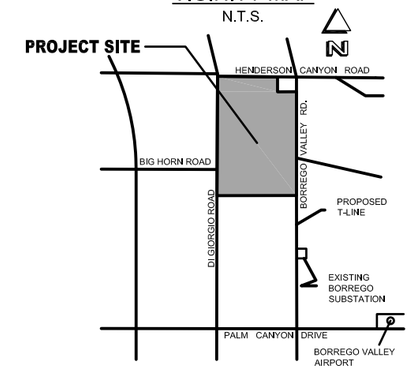
- PROJECT SITE LIMITS
- DRAINAGE AREA LIMITS
- FLOW PATHS
- U.S.G.S. TOPOGRAPHIC MAP

MAP NOTES:

1. EXISTING TOPOGRAPHY (USGS QUADRANGLE) OBTAINED FROM THE USGS SEAMLESS DATA DISTRIBUTION RESOURCE.
2. HORIZONTAL COORDINATE SYSTEM FOR THIS MAP IS CALIFORNIA STATE PLANE, N.A.D. 1983, ZONE VI.

VICINITY MAP

N.T.S.



REVISIONS

NO	DESCRIPTION	BY	APPROVED	DATE
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PROPOSED CONDITIONS (FIXED P.V.)
HYDROLOGY STUDY MAP
BORREGO SPRINGS UNMANNED P.V. SOLAR FARM
IN THE COUNTY OF SAN DIEGO, CA

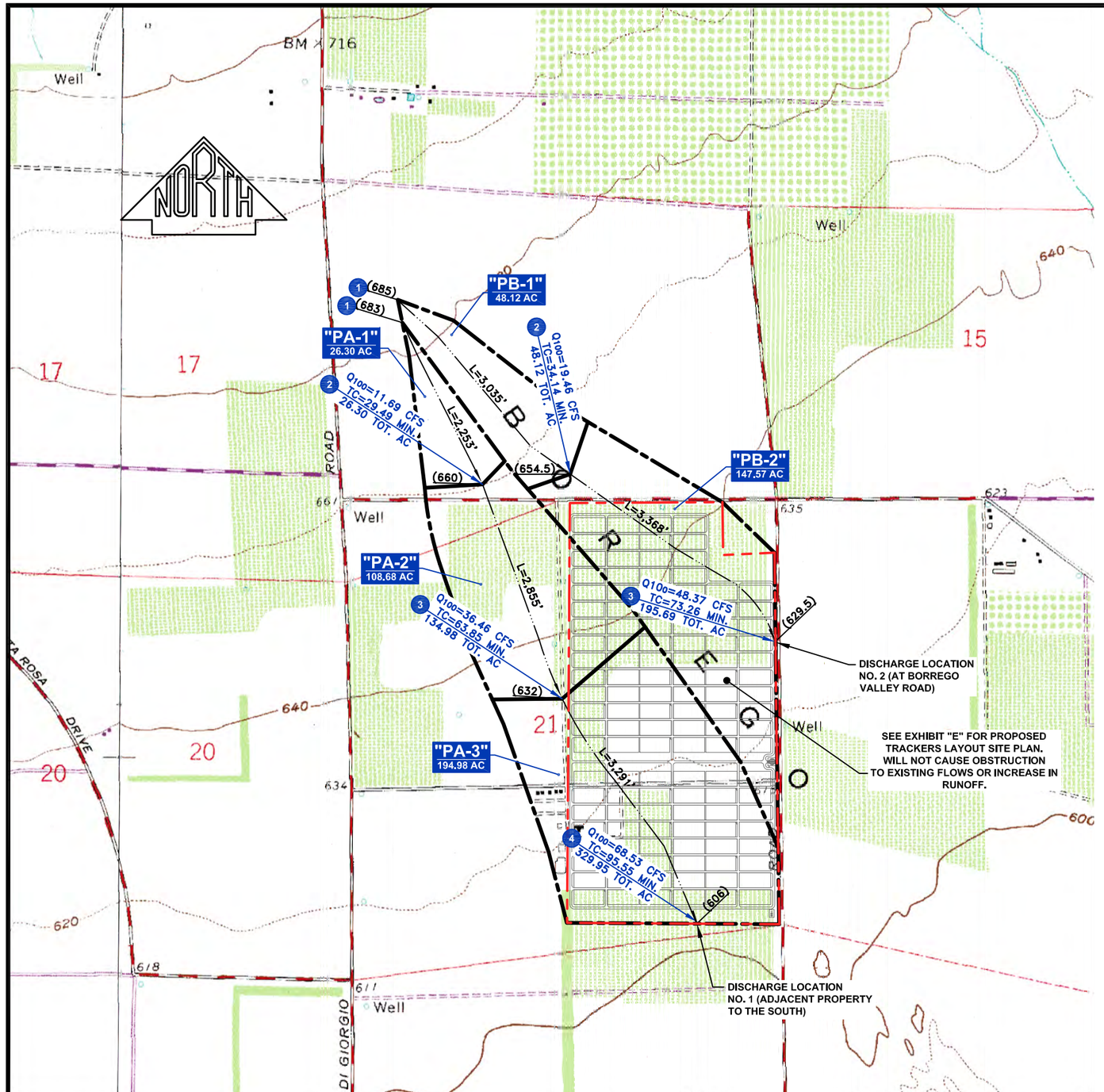
PREPARED FOR: U.S. SOLAR ONE, LLC

DRAWN BY: JDN	SCALE: 1" = 1,500'	SHEET: 1 OF 1	G.1
CHECKED BY: JTS	JOB NO: 103617		
DISREGARD PRINTS BEARING EARLIER REVISION DATES →	05-01-11		

EXHIBIT "G.2"

PROPOSED CONDITIONS (TRACKERS)

HYDROLOGY STUDY MAP
BORREGO SPRINGS UNMANNED P.V. SOLAR FARM
IN THE COUNTY OF SAN DIEGO, CA



PROPOSED CONDITIONS RATIONAL METHOD INPUT PARAMETERS:

DRAINAGE SUBAREA	NODE LOCATION	SUBAREA SIZE (AC)	LAND USE TYPE	TOTAL AREA TRIBUTARY TO NODE (AC)	SOIL TYPE	SUBAREA WATERCOURSE LENGTH (FT)	ELEVATION AT NODE (FT)
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	683
PA-1	2	26.30		26.30		2,253	660
PA-2	3	108.68		134.98		2,855	632
PA-3	4	194.98		329.95		3,291	606
-	1	-	UNDISTURBED NATURAL TERRAIN	-	A	-	685
PB-1	2	48.12		48.12		3,035	654.5
PB-2	3	147.57		195.69		3,368	629.5

PROPOSED CONDITIONS RATIONAL METHOD OUTPUT CALCULATIONS:

CONDITION	DRAINAGE SUBAREA	NODE	PEAK Q_{100} AT NODE (CFS)	VELOCITY AT NODE (FPS)	H (ELEVATION AT NODE)	L (FT)	C	Tc (MIN) AT NODE	I (IN/HR)	SUBAREA A (AC)
POST	PA	2	11.69	-	660	70 (INITIAL)/2253 (TOTAL)	0.20	12.5 (INITIAL)/29.49 (TOTAL)	2.223	26.30
		3	36.46	1.61	632	2855.00	0.20	63.85	1.35	108.68
		4	68.53	1.88	606	3291.00	0.20	95.95	1.039	194.98
	PB	2	19.46	-	654.5	70 (INITIAL)/3035 (TOTAL)	0.20	12.5 (INITIAL)/34.14 (TOTAL)	2.02	48.12
		3	48.37	1.63	629.5	3368	0.20	73.26	1.236	147.57

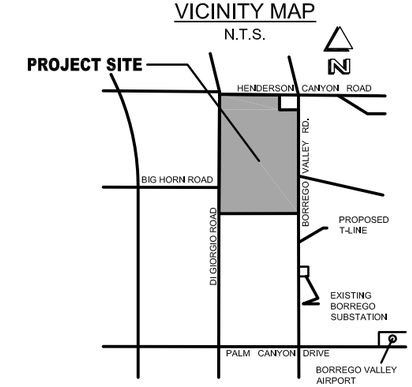
MAP LEGEND:

- PROJECT SITE LIMITS
- DRAINAGE AREA LIMITS
- FLOW PATHS
- U.S.G.S. TOPOGRAPHIC MAP

MAP NOTES:

1. EXISTING TOPOGRAPHY (USGS QUADRANGLE) OBTAINED FROM THE USGS SEAMLESS DATA DISTRIBUTION RESOURCE.
2. HORIZONTAL COORDINATE SYSTEM FOR THIS MAP IS CALIFORNIA STATE PLANE, N.A.D. 1983, ZONE VI.

VICINITY MAP
N.T.S.



REVISIONS

NO	DESCRIPTION	BY	APPROVED	DATE
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PROPOSED CONDITIONS (TRACKERS)
HYDROLOGY STUDY MAP
BORREGO SPRINGS UNMANNED P.V. SOLAR FARM
IN THE COUNTY OF SAN DIEGO, CA

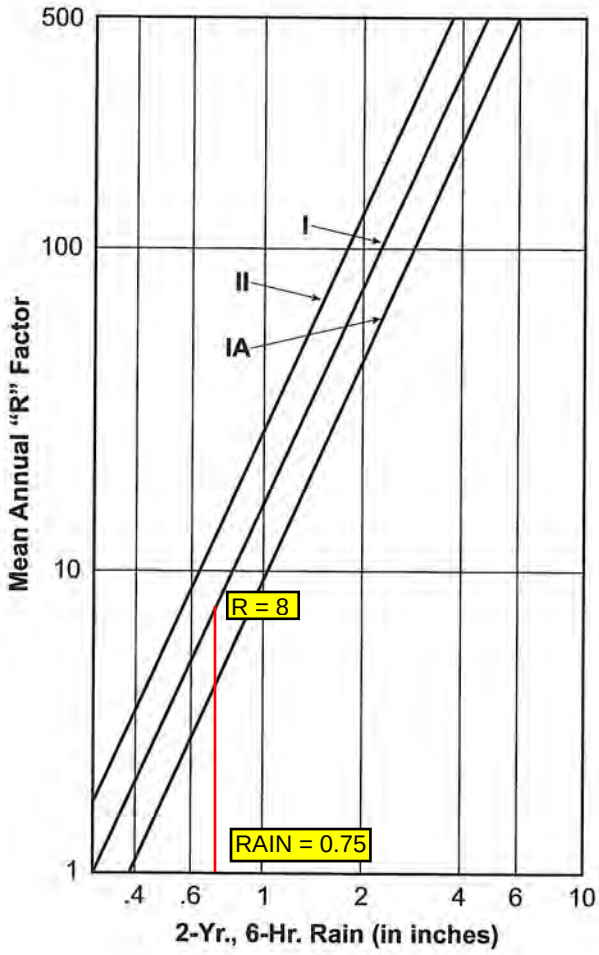
PREPARED FOR: U.S. SOLAR ONE, LLC

DRAWN BY: JDN	SCALE: 1" = 1,500'	SHEET: 1 OF 1	G.2
CHECKED BY: JTS	JOB NO: 103617		
DISREGARD PRINTS BEARING EARLIER REVISION DATES →	05-01-11		

ATTACHMENT 1

Preliminary Erosion Calculations Documentation

ATTACHMENT 1.1



SOURCE: Wischmeier, 1977

R Factors based on 2-Year, 6-Hour Storm Event (Intensity)

FIGURE

5-2

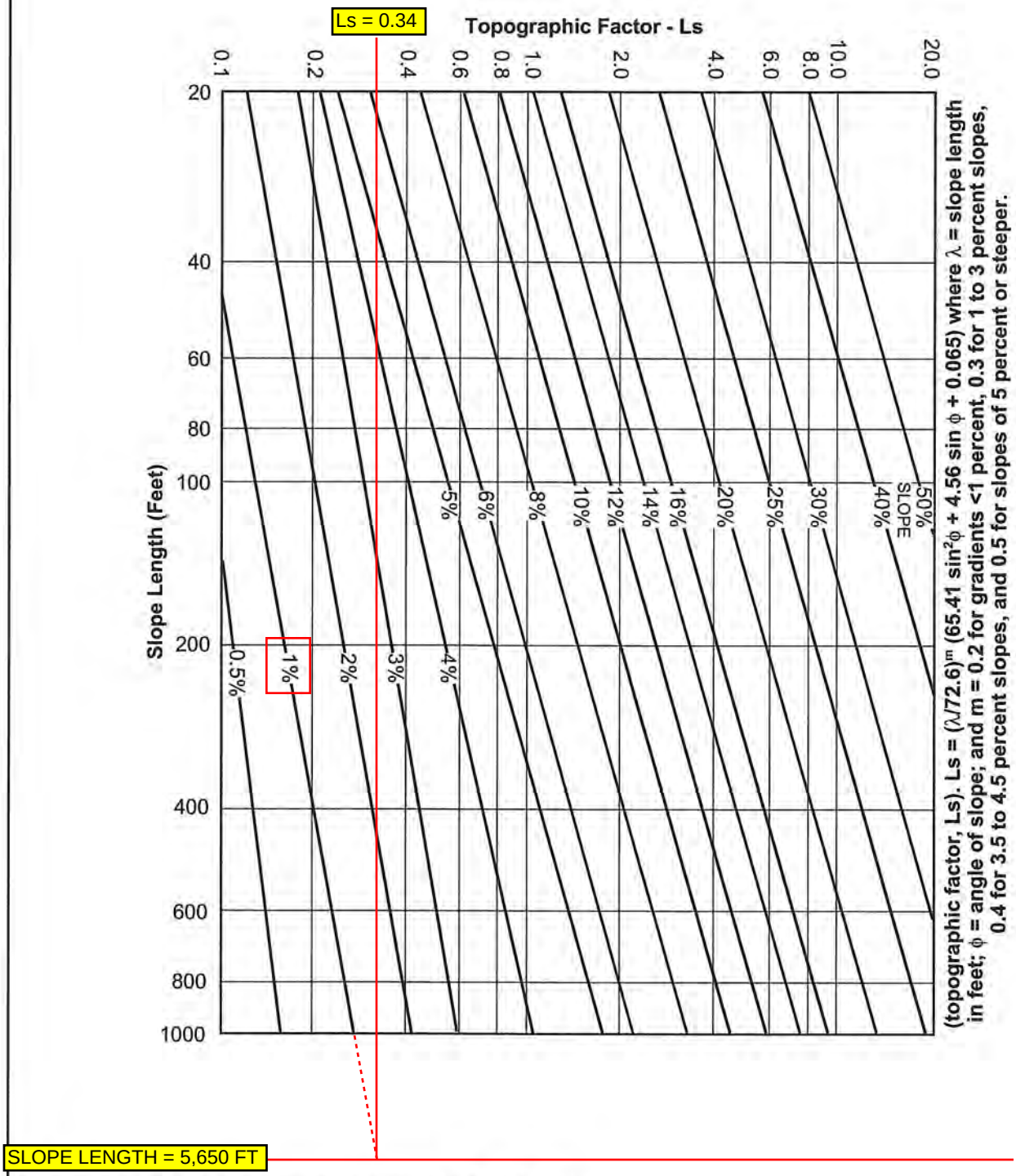
ATTACHMENT 1.2

Table 5-2 (Continued)

K FACTORS FOR SOILS IN THE SAN DIEGO REGION AND OTHERS

MAPPING UNIT		K FACTOR
87.	Rm (riverwash)	*
88.	RoA (fine sand 0-2%)	.17
	RrC (fine sand 5-9%)	.17
89.	RsA (loamy coarse sand 0-2%)	.20
	RsC (loamy coarse sand 2-9%)	.20
	RsD (loamy coarse sand 9-15%)	.20
90.	(rough broken land)	*
91.	SbA (clay loam 0-2%)	.37
	SbC (clay loam 2-9%)	.37
92.	ScA (clay 0-2%)	.24
	ScB (clay 2-5%)	.24
93.	SmE (rocky silt loam 9-30%)	.43
94.	SnG (rocky silt loam 9-70%)	.43
95.	SpE2 (rocky fine sandy loam 9-30%)	.28
	SpG2 (rocky fine sandy loam 30-65%)	.28
96.	SrD (sloping gullied land)	*
97.	SsE (stony loamy sand 9-30%)	.15
98.	StG (steep gullied land)	*
99.	SuA (gravelly clay loam 0-2%)	.24
	SuB (gravelly clay loam 2-5%)	.24
100.	SvE (stony land)	*
101.	TeF (terrace escarpments)	*
102.	Tf (tidal flats)	*
103.	ToE2 (rocky coarse sandy loam 5-30%)	.24
	ToG (rocky coarse sandy loam 30-65%)	.24
104.	TuB (sand 0-5%)	.17
105.	Urban land	*

ATTACHMENT 1.3



SOURCE: SEA, USDA, Agricultural Handbook Number 537, December 1978

FIGURE

Chart for determining Topographic Factors (L,s)

5-5

ATTACHMENT 1.4

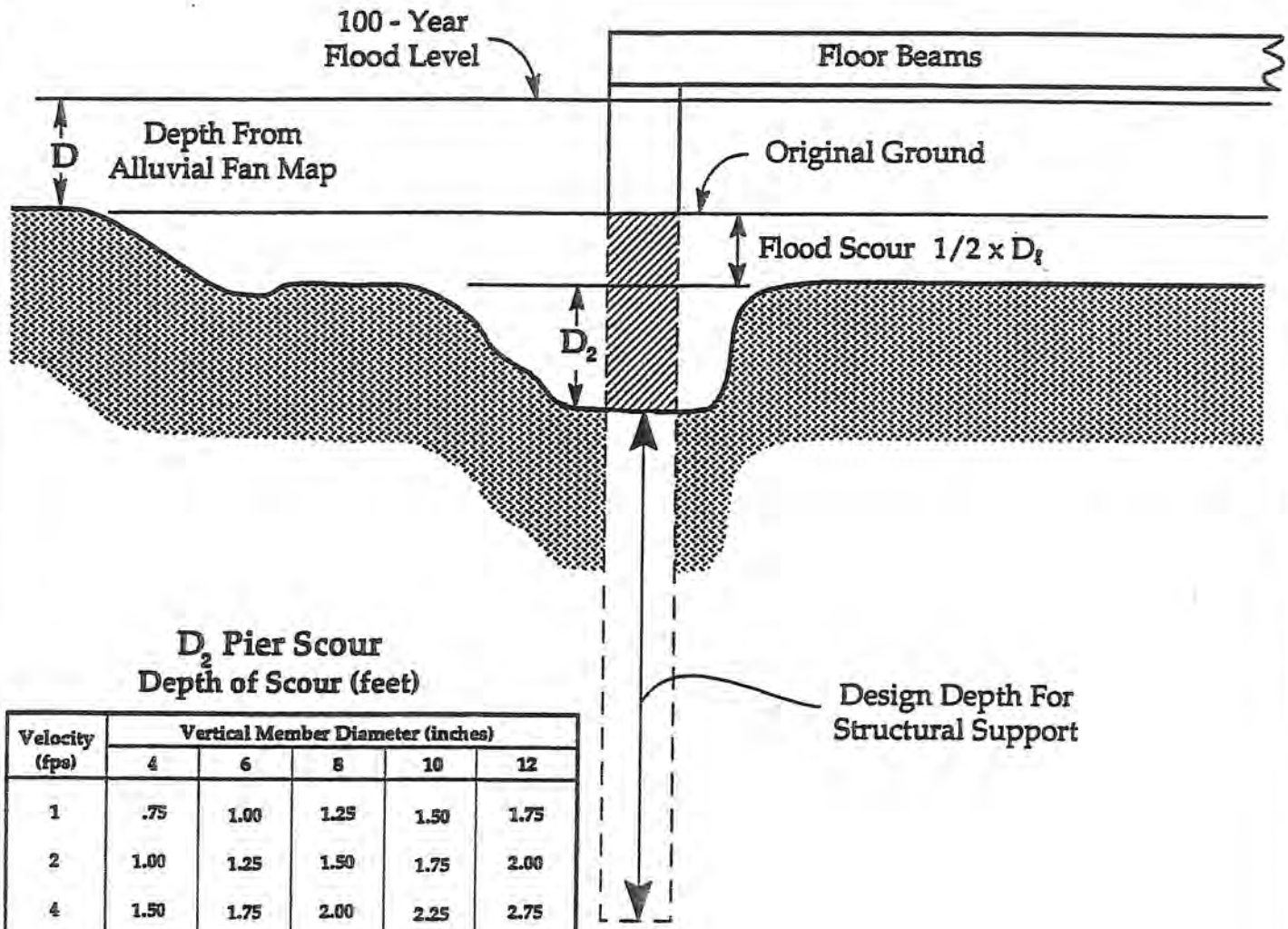
Table 5-6 (Page 1 of 2)

C FACTOR AND P FACTOR VALUES FOR RAINFALL EROSION CONTROL MEASURES

Treatment	C Factor	P Factor
BARE SOIL		
Packed and Smooth	1.00	1.00
Freshly Disked	1.00	0.90
Rough Irregular Surface	1.00	0.90
SEDIMENT BASIN/TRAP	1.00	0.50[A]
STRAW BALE BARRIER, GRAVEL FILTER, SAND BAGS	1.00	0.80
SILT FENCE BARRIER	1.00	0.50
ASPHALT/CONCRETE PAVEMENT	1.00	1.00
GRAVEL (¼" to 1½") @ 135 TONS/ACRE	0.05	1.00
SOD GRASS	0.01	1.00
TEMPORARY VEGETATION/COVER CROP	0.45[B]	1.00
HYDRAULIC MULCH @ 2 TONS/ACRE	0.10[C]	1.00
SOIL SEALANT	0.01 - 0.60[D]	1.00
EROSION CONTROL MATS/BLANKETS	0.10	1.00
HAY OR STRAW DRY MULCH @ 2 TONS/ACRE & ANCHORED		
Assumes planting of grass seed has occurred prior to application, otherwise C Factor = 1.00.		
Slope (%)		
1 to 10	0.06	1.00
11 to 15	0.07	1.00
16 to 20	0.11	1.00
21 to 25	0.14	1.00
25 to 33	0.17	1.00
> 33	0.20	1.00

ATTACHMENT 2

Flood Hazard Protection Details
from Boyle Report



D_2 Pier Scour
Depth of Scour (feet)

Velocity (fps)	Vertical Member Diameter (inches)				
	4	6	8	10	12
1	.75	1.00	1.25	1.50	1.75
2	1.00	1.25	1.50	1.75	2.00
4	1.50	1.75	2.00	2.25	2.75
6	1.75	2.00	2.50	2.75	3.25
8	2.00	2.25	2.75	3.25	3.50
10	2.25	2.50	3.00	3.50	4.00
15	2.50	3.00	3.50	4.00	4.50

FIGURE II - 4. ADDITION OF SCOUR DEPTHS FOR PILINGS

ATTACHMENT 3

Existing Conditions Hydrology
Calculations (Area “EA”)

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2006 Version 7.7

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 03/24/11
----------------------------------------------------------------------
103617 - BORREGO SPRINGS P.V. SOLAR - COUNTY OF SAN DIEGO, CA
EXISTING CONDITIONS - AREA "EA"
100-YEAR STORM EVENT
BY: JDN, DATE: 12-13-10
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------


Program License Serial Number 6221

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  2.650
24 hour precipitation(inches) =  4.250
P6/P24 =    62.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance  = 2253.000(Ft.)
Highest elevation =  683.000(Ft.)
Lowest elevation =  660.000(Ft.)
Elevation difference =   23.000(Ft.) Slope =  1.021 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.02 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.50 minutes
 (for slope value of   1.00 %)
The initial area total distance of 2253.00 (Ft.) entered leaves a
remaining distance of 2183.00 (Ft.)
Using Figure 3-4, the travel time for this distance is  16.99 minutes
for a distance of 2183.00 (Ft.) and a slope of  1.02 %
with an elevation difference of  22.29(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   16.990 Minutes
Tt=[(11.9*0.4134^3)/( 22.29)]^.385= 16.99
```

```
Total initial area Ti =  12.50 minutes from Table 3-2 plus
 16.99 minutes from the Figure 3-4 formula =  29.49 minutes
Rainfall intensity (I) =      2.223(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff =     11.691(CFS)
Total initial stream area =       26.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     24.120(CFS)
Depth of flow =   0.161(Ft.), Average velocity =   1.385(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            150.00              0.00
        4            200.00              1.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =     24.120(CFS)
  '     '        flow top width =    116.119(Ft.)
  '     '    velocity=    1.385(Ft/s)
  '     '        area =     17.418(Sq.Ft)
  '     '        Froude number =     0.630

Upstream point elevation =   660.000(Ft.)
Downstream point elevation =   632.000(Ft.)
Flow length =  2855.000(Ft.)
Travel time  =   34.36 min.
Time of concentration =   63.85 min.
Depth of flow =   0.161(Ft.)
Average velocity =   1.385(Ft/s)
Total irregular channel flow =    24.120(CFS)
Irregular channel normal depth above invert elev. =   0.161(Ft.)
Average velocity of channel(s) =   1.385(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      1.350(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Rainfall intensity =      1.350(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.200  CA =     26.996
Subarea runoff =     24.766(CFS) for    108.680(Ac.)
Total runoff =     36.457(CFS)  Total area =     134.980(Ac.)
Depth of flow =   0.205(Ft.), Average velocity =   1.609(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     52.525(CFS)
```

```
Depth of flow =   0.271(Ft.), Average velocity =   1.709(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            150.00              0.00
        4            200.00              1.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =     52.525(CFS)
  '     '        flow top width =    127.070(Ft.)
  '     '    velocity=    1.709(Ft/s)
  '     '        area =     30.733(Sq.Ft)
  '     '        Froude number =     0.612

Upstream point elevation =   632.000(Ft.)
Downstream point elevation =   606.000(Ft.)
Flow length =  3291.000(Ft.)
Travel time  =   32.09 min.
Time of concentration =   95.95 min.
Depth of flow =   0.271(Ft.)
Average velocity =   1.709(Ft/s)
Total irregular channel flow =    52.525(CFS)
Irregular channel normal depth above invert elev. =   0.271(Ft.)
Average velocity of channel(s) =   1.709(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      1.039(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Rainfall intensity =      1.039(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.200  CA =     65.992
Subarea runoff =     32.077(CFS) for    194.980(Ac.)
Total runoff =     68.534(CFS)  Total area =     329.960(Ac.)
Depth of flow =   0.316(Ft.), Average velocity =   1.875(Ft/s)
End of computations, total study area =         329.960 (Ac.)
```

ATTACHMENT 4

Existing Conditions Hydrology Calculations (Area “EB”)

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2006 Version 7.7

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 03/24/11
----------------------------------------------------------------------
103617 - BORREGO SPRINGS P.V. SOLAR - COUNTY OF SAN DIEGO, CA
EXISTING CONDITIONS - AREA "EB"
100-YEAR STORM EVENT
BY: JDN, DATE: 12-13-10
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------


Program License Serial Number 6221

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  2.650
24 hour precipitation(inches) =  4.250
P6/P24 =    62.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance  = 3035.000(Ft.)
Highest elevation =  685.000(Ft.)
Lowest elevation =  654.500(Ft.)
Elevation difference =   30.500(Ft.) Slope =  1.005 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.50 minutes
 (for slope value of   1.00 %)
The initial area total distance of 3035.00 (Ft.) entered leaves a
remaining distance of 2965.00 (Ft.)
Using Figure 3-4, the travel time for this distance is  21.64 minutes
for a distance of 2965.00 (Ft.) and a slope of  1.00 %
with an elevation difference of  29.80(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   21.638 Minutes
Tt=[(11.9*0.5616^3)/( 29.80)]^.385= 21.64
```

```
Total initial area Ti =  12.50 minutes from Table 3-2 plus
 21.64 minutes from the Figure 3-4 formula =  34.14 minutes
Rainfall intensity (I) =      2.022(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff =     19.464(CFS)
Total initial stream area =       48.120(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     33.947(CFS)
Depth of flow =   0.214(Ft.), Average velocity =   1.435(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            150.00              0.00
        4            200.00              1.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =     33.948(CFS)
  '     '        flow top width =    121.376(Ft.)
  '     '    velocity=    1.435(Ft/s)
  '     '        area =     23.661(Sq.Ft)
  '     '        Froude number =     0.573

Upstream point elevation =   654.500(Ft.)
Downstream point elevation =   629.500(Ft.)
Flow length =  3368.000(Ft.)
Travel time  =   39.12 min.
Time of concentration =   73.26 min.
Depth of flow =   0.214(Ft.)
Average velocity =   1.435(Ft/s)
Total irregular channel flow =    33.947(CFS)
Irregular channel normal depth above invert elev. =   0.214(Ft.)
Average velocity of channel(s) =   1.435(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      1.236(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Rainfall intensity =      1.236(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.200  CA =     39.138
Subarea runoff =     28.905(CFS) for    147.570(Ac.)
Total runoff =     48.369(CFS)  Total area =     195.690(Ac.)
Depth of flow =   0.263(Ft.), Average velocity =   1.627(Ft/s)
End of computations, total study area =         195.690 (Ac.)
```

ATTACHMENT 5

Proposed Conditions Hydrology Calculations (Area “PA”)

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2006 Version 7.7

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 03/24/11
----------------------------------------------------------------------
103617 - BORREGO SPRINGS P.V. SOLAR - COUNTY OF SAN DIEGO, CA
PROPOSED CONDITIONS - AREA "PA"
100-YEAR STORM EVENT
BY: JDN, DATE: 12-13-10
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------


Program License Serial Number 6221

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  2.650
24 hour precipitation(inches) =  4.250
P6/P24 =    62.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance  = 2253.000(Ft.)
Highest elevation =  683.000(Ft.)
Lowest elevation =  660.000(Ft.)
Elevation difference =   23.000(Ft.) Slope =  1.021 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.02 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.50 minutes
 (for slope value of   1.00 %)
The initial area total distance of 2253.00 (Ft.) entered leaves a
remaining distance of 2183.00 (Ft.)
Using Figure 3-4, the travel time for this distance is  16.99 minutes
for a distance of 2183.00 (Ft.) and a slope of  1.02 %
with an elevation difference of  22.29(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   16.990 Minutes
Tt=[(11.9*0.4134^3)/( 22.29)]^.385= 16.99
```

```
Total initial area Ti =  12.50 minutes from Table 3-2 plus
 16.99 minutes from the Figure 3-4 formula =  29.49 minutes
Rainfall intensity (I) =      2.223(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff =     11.691(CFS)
Total initial stream area =       26.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     24.120(CFS)
Depth of flow =   0.161(Ft.), Average velocity =   1.385(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            150.00              0.00
        4            200.00              1.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =     24.120(CFS)
  '     '        flow top width =    116.119(Ft.)
  '     '    velocity=    1.385(Ft/s)
  '     '        area =     17.418(Sq.Ft)
  '     '        Froude number =     0.630

Upstream point elevation =   660.000(Ft.)
Downstream point elevation =   632.000(Ft.)
Flow length =  2855.000(Ft.)
Travel time  =   34.36 min.
Time of concentration =   63.85 min.
Depth of flow =   0.161(Ft.)
Average velocity =   1.385(Ft/s)
Total irregular channel flow =    24.120(CFS)
Irregular channel normal depth above invert elev. =   0.161(Ft.)
Average velocity of channel(s) =   1.385(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      1.350(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Rainfall intensity =      1.350(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.200  CA =     26.996
Subarea runoff =     24.766(CFS) for    108.680(Ac.)
Total runoff =     36.457(CFS)  Total area =     134.980(Ac.)
Depth of flow =   0.205(Ft.), Average velocity =   1.609(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     52.525(CFS)
```

```
Depth of flow =   0.271(Ft.), Average velocity =   1.709(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            150.00              0.00
        4            200.00              1.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =     52.525(CFS)
  '     '        flow top width =    127.070(Ft.)
  '     '    velocity=    1.709(Ft/s)
  '     '        area =     30.733(Sq.Ft)
  '     '        Froude number =     0.612

Upstream point elevation =   632.000(Ft.)
Downstream point elevation =   606.000(Ft.)
Flow length =  3291.000(Ft.)
Travel time  =   32.09 min.
Time of concentration =   95.95 min.
Depth of flow =   0.271(Ft.)
Average velocity =   1.709(Ft/s)
Total irregular channel flow =    52.525(CFS)
Irregular channel normal depth above invert elev. =   0.271(Ft.)
Average velocity of channel(s) =   1.709(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      1.039(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Rainfall intensity =      1.039(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.200  CA =     65.992
Subarea runoff =     32.077(CFS) for    194.980(Ac.)
Total runoff =     68.534(CFS)  Total area =     329.960(Ac.)
Depth of flow =   0.316(Ft.), Average velocity =   1.875(Ft/s)
End of computations, total study area =         329.960 (Ac.)
```

ATTACHMENT 6

Proposed Conditions Hydrology Calculations (Area “PB”)

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2006 Version 7.7

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 03/24/11
----------------------------------------------------------------------
103617 - BORREGO SPRINGS P.V. SOLAR - COUNTY OF SAN DIEGO, CA
PROPOSED CONDITIONS - AREA "PB"
100-YEAR STORM EVENT
BY: JDN, DATE: 12-13-10
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------


Program License Serial Number 6221

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  2.650
24 hour precipitation(inches) =  4.250
P6/P24 =    62.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance  = 3035.000(Ft.)
Highest elevation =  685.000(Ft.)
Lowest elevation =  654.500(Ft.)
Elevation difference =   30.500(Ft.) Slope =  1.005 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.50 minutes
 (for slope value of   1.00 %)
The initial area total distance of 3035.00 (Ft.) entered leaves a
remaining distance of 2965.00 (Ft.)
Using Figure 3-4, the travel time for this distance is  21.64 minutes
for a distance of 2965.00 (Ft.) and a slope of  1.00 %
with an elevation difference of  29.80(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   21.638 Minutes
Tt=[(11.9*0.5616^3)/( 29.80)]^.385= 21.64
```

```
Total initial area Ti =  12.50 minutes from Table 3-2 plus
 21.64 minutes from the Figure 3-4 formula =  34.14 minutes
Rainfall intensity (I) =      2.022(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff =     19.464(CFS)
Total initial stream area =       48.120(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     33.947(CFS)
Depth of flow =   0.214(Ft.), Average velocity =   1.435(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            150.00              0.00
        4            200.00              1.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =     33.948(CFS)
  '     '        flow top width =    121.376(Ft.)
  '     '    velocity=    1.435(Ft/s)
  '     '        area =     23.661(Sq.Ft)
  '     '        Froude number =     0.573

Upstream point elevation =   654.500(Ft.)
Downstream point elevation =   629.500(Ft.)
Flow length =  3368.000(Ft.)
Travel time  =   39.12 min.
Time of concentration =   73.26 min.
Depth of flow =   0.214(Ft.)
Average velocity =   1.435(Ft/s)
Total irregular channel flow =    33.947(CFS)
Irregular channel normal depth above invert elev. =   0.214(Ft.)
Average velocity of channel(s) =   1.435(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      1.236(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Rainfall intensity =      1.236(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.200  CA =     39.138
Subarea runoff =     28.905(CFS) for    147.570(Ac.)
Total runoff =     48.369(CFS)  Total area =     195.690(Ac.)
Depth of flow =   0.263(Ft.), Average velocity =   1.627(Ft/s)
End of computations, total study area =         195.690 (Ac.)
```

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