# CITIZENS IMPERIAL SOLAR CONCEPTUAL DRAINAGE STUDY AND STORM WATER QUALITY ANALYSIS

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## APPENDIX

# 1.0 INTRODUCTION

## 1.1 STUDY DESCRIPTION

The purpose of this conceptual study is to describe the existing and proposed hydrologic conditions for the Citizens Imperial Solar project (Project). The study will analyze the peak runoff flow volume from the existing condition and the proposed project, provision of runoff detention with respect to County of Imperial standards, and the potential for storm water runoff to infiltrate into underlying native soils.

This study also includes an analysis of storm water quality concerns as they pertain to the project with respect to the California Environmental Quality Act (CEQA) Guidelines.

## 1.2 PROJECT DESCRIPTION

The proposed Citizens Imperial Solar project is located between the East Highline Canal and Weist Road extending from Merkley Road to the south and Schrimpf Road to the north. Simpson Road bisects the site into northern (Site 1) and southern (Site 2) portions. The project site is located in an unincorporated area of the County of Imperial, approximately 6.7 miles north-east of Calipatria. The existing Midtown Eco Energy Substation is located within Site 1 near the intersection of Simpson Road and East Highline Canal Road. The Project proposes to construct a solar energy and grid scale energy storage power plant within a limit of work of 222.8 gross acres and 172.8 net acres. See Vicinity Map in Appendix A.

The IID has constructed a network of Canals and Drains that are located along portions of the perimeter of the project. The IID Canals convey water to customers and the IID Drains collect and convey agricultural and storm water runoff (surface and subsurface). The project site is served by IID Canals and discharges to IID Drains that are on and adjacent to the project site.

Runoff storage requirements over the project site will be satisfied by in shallow ponding areas within the project footprint. This study calculates a required volume of runoff to be stored per County of Imperial requirements. In accordance with County requirements, the site will be designed and constructed to provide storage for 3" of runoff from the contributing area. This conceptual study has been prepared based upon a preliminary layout of the project solar arrays and internal roadways. At the time of final design, a final hydrology study will be prepared and processed for approval with the County of Imperial Department of Public Works and the IID and will incorporate the final array and internal roadway layouts.

In addition, for the purpose of determining proposed changes in storm water runoff volume from the project, the existing and proposed condition runoff volume has been calculated for the 100-year storm event. The project proposes to infiltrate stored storm water runoff into underlying soils and does not propose discharge from the site to the IID Drains.

Ultimate locations and limits of storage areas will be determined at the time of final engineering. The project will not propose new connections to the existing IID Drain System. The final hydrology study will provide a more in-depth analysis of the project's hydrology, considering items such as finished ground topography, infiltration rates for underlying soils, final limits of array development.

## 1.3 HYDROLOGIC SETTING

The perimeter of the project site is surrounded by public roads, IID Canals, and IID Drains (see Appendix E, Drainage Basin Map). Based upon review of topography and perimeter conditions, it is determined that the only offsite flow that enters the project originates from adjacent unpaved roads; flow from adjacent agricultural fields and flow from east of the East Highline Canal does not enter the project. As such, this study includes consideration of runoff from adjacent unpaved roads, but runoff from adjacent areas entering the project limits need not be considered.

IID facilities that currently accept flow from the project site include the "N" Drain, "M" Drain and "L" Drain. These Drains discharge to the Alamo River approximately 8.5 miles west of the project.

The IID Drain system was not designed to convey runoff from large storm events. Rather, the primary purpose of the Drains is to convey agricultural runoff. The Drains typically have the capacity to convey peak flow from the 5-year to 10-year storm event. Runoff from larger storm events (for example the 100-year event) is detained within low lying areas of agricultural fields until the peak of the storm has passed, after which the detained runoff is slowly infiltrates into underlying soils.

To mimic the existing condition and provide storage of storm water runoff, the County of Imperial requires that projects provide storage for 3" of runoff from project sites. The County of Imperial further requires that storage areas provided with development be designed such that they are able to drain within 72 hours, either via infiltration or through discharge to IID Drains.

# 2.0 HYDROLOGIC ANALYSIS

## 2.1 METHOD OF ANALYSIS

Hydrologic calculations are made within this section of the study in accordance with the following parameters/criteria:

1. The maximum volume of water to be retained will be equal to 3" of runoff from the project per County of Imperial Public Works Department (DPW) requirements.
2. Retention will be provided in shallow ponding areas within the project footprint.
3. Infiltration of runoff into native soils is anticipated.
4. Addition of connection points to the IID Drain system is not proposed.
5. The volume of runoff from the 100-year storm is calculated by the Rational Method with weighted C value.
6. Information gained from the National Resource Conservation Service (NRCS) website is used to determine hydrologic soil classification.
7. National Oceanic and Atmospheric Administration (NOAA) precipitation data is used for determination of the 100-year storm rainfall.

See Appendix C for reference material pertaining to County standards and Rational Method parameters (including runoff coefficient).

## 2.2 RATIONAL METHOD PARAMETERS

The Rational Method, used for determination of runoff volumes, is provided by the equation below:

V = C x P x A

V = Volume of runoff, acre-feet
C = Runoff coefficient
P = Precipitation, converted to feet
A = Area, acres

### 2.2.1 RUNOFF COEFFICIENT

The runoff coefficient is an empirical value to estimate the runoff expected from rainfall. The value for the runoff coefficient is based on site characteristics that influence runoff including topography, land use, vegetation, and soil type. To assign runoff coefficients to existing and proposed conditions, multiple references were reviewed and compared for consistency. Chapter 810 of the CalTrans Highway Design Manual (HDM, which is commonly used and accepted for use in the County of Imperial) and Chapter 13 of the Wisconsin DOT Facilities Development Manual (which provides runoff coefficient reference for row crops, has been accepted for use by the County of Imperial on similar recent projects, and due to its relevance to the existing land use of farming row crops) were reviewed.

**a. Soil Group Determination:**

The runoff coefficient was determined for existing and proposed conditions through consideration of two separate sources and reference to the soil classes found onsite as given in the NRCS Soil Survey for Imperial County. From the soil survey, the following soil types are located onsite:

Table 1 – Soil Types

| Soil Map Symbol | Soil Type Name | Soil Description | Hydrologic Soil Group |
|---|---|---|---|
| 114 | Imperial | Silty clay, wet | C |
| 115 | Imperial-Glenbar | Silty clay loams, wet | C |
| 122 | Meloland | Very fine sandy loam, wet | D |
| 125 | Niland | Gravely sand, wet | C |

GIS information from the soil survey was overlaid into the project limits to determine the distribution of soil groups as a percentage of the site and to graphically determine the locations of the different hydrologic soil groups for use in hydrologic calculations. Table 2 below provides in tabular format the combined percentage of the soul groups presented on the site. The Soils Group Maps in Appendix B graphically shows the locations of soil groups through the site.

Table 2 – Soil Group Distribution

| Hydrologic Soil Group | % of Site |
|---|---|
| C | 88.2% |
| D | 11.8% |

**b. Existing Condition "C" Factor:**
For the existing condition, Figure 819.2A of the CalTrans HDM was reviewed to determine a runoff coefficient for cultivated field areas. Below is a summary of the components of the runoff coefficient per Figure 819.2A.

Table 3 – Existing "C" Factor Per HDM Figure 819.2A

| Component | Manual Description | Site Condition | "C" Contribution |
|---|---|---|---|
| Relief | Relatively flat, slopes 0%-5% | Slopes generally 5% | 0.08 |
| Soil Infiltration | Clay/shallow loams or sandy/silty loams | Sandy loam, clay loam, silty clay | 0.08 |
| Vegetal Cover | 80% of area in good cover | Well cultivated crops >= 80% cover | 0.05 |
| Surface Storage | Well defined system of small drainageways | Rows crops graded to convey irrigation well | 0.09 |
| Aggregate C Factor | | | 0.30 |

The runoff coefficient determined from Figure 819.2A of the HDM was then cross-checked against Figure 2, Detail B of Procedure 13-10-5 from the WDOT Manual for consistency with another accepted reference for runoff coefficient from cultivated areas. Figure 2, Detail B provides a range of runoff coefficients based on land use, soil group, slope of topography, and storm recurrence interval. The project site is soil groups C (88.2%), and D (11.8%), topographic slope is between 0% and 2%, and the recurrence interval being considered is the 100-year event. For a land use of row crops, the runoff coefficients for each soil group and the weighted "C" factor for the site are provided in Table 4 below.

Table 4 – Existing "C" Factor Per WDOT Manual, Figure 2, Detail B

| Hydrologic Soil Group | "C" Factor | % of Site | Weighted "C" Factor |
|---|---|---|---|
| A | 0.22 | 0 | 0 |
| B | 0.26 | 0 | 0 |
| C | 0.30 | 88.2 | 0.2646 |
| D | 0.34 | 11.8 | 0.0401 |
| Project Site Weighted "C" Factor | | | 0.3047 |

Determination of the existing condition runoff coefficient from both methods is consistent and for hydrologic calculation purposes, an existing condition average runoff coefficient of 0.30 is to be used.

**c. Proposed Condition "C" Factor:**
For the proposed condition, a study was performed on a representative portion of the project (Drainage Area B, see Appendix E, Drainage Basin Map for the location of the study area), and the results of the study were then applied throughout the project. For the study, the following elements were considered:

a. Perimeter Roadways – typical developed areas will feature a 20' wide perimeter roadways consisting of native compacted material. Figure 2, Detail B of the WDOT Manual gives a runoff coefficient range of 0.40 - 0.60 for gravel roads and shoulders and a value of 0.60 is selected for the 100-year storm. The CalTrans HDM does not provide a runoff coefficient for native material roads.

b. The geotechnical investigation for this site has not been prepared yet. Array clearing, disc-and-roll, and compaction for similar solar projects recommends that sheet graded areas may be compacted in-place to a minimum relative compaction of 85%. Since this may apply to the soils under the arrays, the array areas are assigned the same runoff coefficient (0.60) as the perimeter roadways. Note that final compaction requirements for the array footings/pilings are dependent on the recommendations of the final geotechnical report, which will be performed at the time of final engineering. Assignment of a runoff coefficient of 0.60 to arrays is a conservative, worst-case approach taken at this preliminary phase.
c. Power Conversion Station (PCS) – each array block may require an impervious PCS on impervious concrete foundation. Both Figure 2B of the HDM and Figure 2, Detail B of the WDOT Manual give a runoff coefficient range of 0.75 – 0.95 for roofs, and a value of 0.95 is selected for the 100-year storm.
d. Remaining areas – remaining areas within the developable limit of work outside of the above listed elements considered have the potential to be developed as part of the project and are therefore assigned a runoff coefficient equal to that of the gravel/base roads and areas under the arrays (0.60).

The weighted runoff coefficient for the representative portion (Drainage Area B) is determined in the table below:

Table 5 – Proposed "C" Factor

| Description | Runoff Coefficient | Area, ac | % of Total Area | Weighted C |
|---|---|---|---|---|
| Perimeter Roadways | 0.60 | 0.5 | 6.8% | 0.041 |
| Arrays | 0.60 | 6.2 | 85.0% | 0.510 |
| PCS Shelters | 0.95 | 0.1 | 1.4% | 0.013 |
| Remaining Areas | 0.60 | 0.5 | 6.8% | 0.041 |
| Total | | 7.3 | 100.0% | 0.605 |

The runoff coefficient for the proposed condition to be used in hydrologic calculations is 0.6. As the proposed project site is similar in composition across the site, this weighted coefficient is used for the entire site.

### 2.2.2 PRECIPITATION

A precipitation estimate for the 100-year storm is obtained through referencing data available on the NOAA website for Imperial Valley. Storm duration of 24-hours is assumed, and the corresponding precipitation estimate is 3.90 inches. NOAA data is provided in Appendix D.

### 2.2.3 AREA

The project site has been delineated into tributary drainage basins for the existing and proposed conditions (see Appendix E for Drainage Basin Maps).

In the existing condition, the project site is divided by existing roads, berms, local brow ditches into seven watersheds that are infiltrate into underlying soils and/or tributary into IID Drains. In Site 1 the Drainage Area E tributary to the earthen brow ditch. Than the flow confluents with the flow from Drainage Area D and Drainage Area A, collects at the southwest corner and enters "M" IID Drain. Drainage Areas B and C tributary directly to the "M" Drain.

In Site 2 the Drainage Areas E and G tributary first to the local brow ditches and then discharges into the IID "L" Drain.
Ultimately, "M" and "L" IID Drains discharge to the Alamo River approximately 8.5 miles west of the project.

In the proposed condition, the conveyance situation described above will remain unchanged, except, the runoff will not be discharged into IID Drains it will be detained under the arrays and infiltrate into the soil.
The volume of 3" runoff from the project area will be stored in 18 retention basins. To minimize the earthwork quantities, all 12" deep basins will have the triangular shape with longest side facing the incoming flow and boarded by raised maintenance roads on south and west sides.
The Drainage Areas S and T reside outside of array layout. The flow from these areas will not be detained. The runoff will be discharged into IID drains as in pre-developed condition.

## 2.3 CALCULATIONS/RESULTS

### 2.3.1 EXISTING CONDITIONS

**a. Storm Water Runoff:**
Volumes of storm water runoff for the existing condition are provided in Table 6. The volume reported as "County Storage" is the volume based on 3" of runoff. The volume reported as "100-year Runoff" is the estimated volume anticipated based on a "C" factor of 0.3 and 100-year 24-hour precipitation of 3.90 inches.

Table 6: Existing Condition Storm Water Runoff

| Receiving Drain: "M" Drain | | | |
|---|---|---|---|
| Drainage Area Name | Area (ac) | County Storage (ac-ft) | 100-Year Runoff (ac-ft) |
| A | 8.6 | 2.1 | 0.9 |
| B | 26.1 | 6.5 | 2.5 |
| C | 31.5 | 7.9 | 3.1 |
| D | 12.9 | 3.2 | 1.3 |
| E | 18.9 | 4.7 | 1.8 |
| Total | 98.0 | 24.4 | 9.6 |

| Receiving Drain: "L" Drain | | | |
|---|---|---|---|
| Drainage Area Name | Area (ac) | County Storage (ac-ft) | 100-Year Runoff (ac-ft) |
| F | 34.4 | 8.6 | 3.4 |
| G | 69.5 | 17.4 | 6.8 |
| Total | 103.9 | 26.0 | 10.2 |

### 2.3.2 PROPOSED CONDITIONS

**a. Storm Water Runoff:**
Under proposed conditions, the existing drainage characteristics of the project site will remain substantially the same. The general flow of water from northeast to southwest will remain unchanged. Due to the presence of internal and perimeter roadways between and around arrays, there is opportunity for a higher number of locations to store runoff in the proposed condition, when compared to the existing condition. Section 2.2.3 discusses the areas of existing and proposed

drainage basins and sub-basins. As discussed in Section 2.3.2.b, on-site soils appear to have the potential to infiltrate runoff. Therefore, there will be no resultant discharge of runoff to IID Drains from the proposed project.

To enable the development of the solar arrays, private dirt roads and ditches within the project will be re-graded as necessary, and, if necessary, cultivated areas may be re-graded to provide smooth transitions across arrays and to produce positive surface drainage to the designated shallow ponding areas, which will provide storm water detention. A private perimeter access road will be constructed around the arrays and internal access roads will be constructed between arrays. As discussed previously, this conceptual study calculates the volume of runoff that shall be retained in accordance with the County standard of 3" of runoff from the project site. Retention requirements over the project site will be satisfied by shallow ponding areas within the project footprint. Ultimate locations, volumes, and limits of retention areas will be determined at the time of final engineering.

Table 7 provides the required and proposed volumes of retention to meet both the County standard of 3" of runoff from the project and the 100-year runoff. The 100-year runoff is the estimated volume based on a "C" factor of 0.60 and a 100-year 24-hour precipitation of 3.90 inches.

Table 7: Proposed Condition Storm Water Runoff

| Receiving Drain: "M" Drain | | | | |
|---|---|---|---|---|
| Drainage Area Name | Area (ac) | County Storage (ac-ft) 3" | 100-Year Runoff (ac-ft) | Proposed Storage (ac-ft) |
| A | 9.0 | 2.2 | 1.8 | 2.3 |
| B | 7.3 | 1.8 | 1.4 | 2.0 |
| C | 15.9 | 4.0 | 3.1 | 4.1 |
| D | 8.7 | 2.2 | 1.7 | 2.3 |
| E | 11.9 | 3.0 | 2.3 | 3.0 |
| F | 10.9 | 2.7 | 2.1 | 2.8 |
| G | 6.4 | 1.6 | 1.2 | 1.6 |
| H | 7.8 | 1.9 | 1.5 | 1.9 |
| S | 18.6 | NA | NA | NA |
| Total | 96.5 | 19.4 | 15.1 | 20.0 |

| Receiving Drain: "L" Drain | | | | |
|---|---|---|---|---|
| Drainage Area Name | Area (ac) | County Storage (ac-ft) 3" | 100-Year Runoff (ac-ft) | Proposed Storage (ac-ft) |
| I | 9.3 | 2.3 | 1.8 | 2.4 |
| J | 10.8 | 2.7 | 2.1 | 2.7 |
| K | 8.9 | 2.2 | 1.7 | 2.3 |
| L | 9.1 | 2.3 | 1.8 | 2.3 |
| M | 9.2 | 2.3 | 1.8 | 2.3 |
| N | 10.6 | 2.6 | 2.1 | 2.7 |
| O | 9.3 | 1.6 | 1.8 | 2.4 |
| P | 7.5 | 1.9 | 1.5 | 2.0 |
| Q | 12.7 | 3.2 | 2.5 | 3.4 |
| R | 7.4 | 1.8 | 1.4 | 1.8 |
| T | 8.4 | NA | NA | NA |
| Total | 103.2 | 22.9 | 18.5 | 24.3 |

It shall be noted that County of Imperial requirements for storage are significantly higher (approximately 33% higher) than the anticipated runoff from the 100-year storm.

**b. Potential for Infiltration of Runoff:**
As discussed in Section 2.2.1b, soil groups C and D are present on the project site. In areas where the dominate soils belong to group C, infiltration of storm water runoff may be feasible. While infiltration testing has not been done on the site at this time, group C generally consists of soils that have moderate percolation rates and are therefore suitable for infiltration. Soil group C is generally present in the majority (approximately 88%) of the project site. (Refer to Appendix B for an NRCS soils resource report and an exhibit showing the location of the various soil groups on the project site.)

At the time of final engineering, infiltration tests will be performed to confirm infiltration feasibility and calculate drawdown times at the proposed ponding locations. The proposed depth of ponding under arrays is 1.0'. For ponded water to infiltrate into underlying soils within 72 hours after a rain event, the required infiltration rate is approximately 0.2 inches per hour. Given the absence of soils classified as clays or fat clays, and the general presence of group C soils, it is anticipated that underlying soils will exhibit adequate infiltrative capacity to draw down the planned 1' deep areas of ponding.

Should the underlying soils prove to not be conducive to infiltration, then drawdown of stored runoff may exceed 72 hours. In said condition, the project will prepare a Mosquito Abatement Plan and process it for approval with the County of Imperial Department of Environmental Health.

**c. FEMA Zone**
The project is located within FEMA flood hazard Zone X. There are no project areas subject to inundation by the 100-year storm event. Please see Appendix F for illustration of the project location with respect to FEMA flood hazard zones.

# 3.0 STORM WATER QUALITY ANALYSIS

## 3.1 HYDROLOGIC UNIT CONTRIBUTION

The project is located in the Brawley Hydrologic Area, in the Imperial Hydrologic Unit. The corresponding number designation is 723.10.

The Imperial Hydrologic Unit consists of the majority of the Imperial Valley, encompassing over 1.3 million acres of land. The watershed includes vast acreages of agricultural land; towns such as El Centro, Calexico, and Brawley, along with a large network of IID operated Canals and Drains. The watershed is atypical of most watersheds in California, as it currently and historically has been shaped by man-made forces. The watershed's primary watercourses, the New and Alamo rivers, flow north, from the Mexican border toward their final destination, the Salton Sea. The Salton Sea, a 376 square mile closed inland lake was created in 1905 through a routing mistake and subsequent flood on the Colorado River. The Sea has been fed primarily by agricultural runoff from the New and Alamo Rivers ever since.

303(d) listed water quality impairments and TMDLs are present for the receiving waters of the project, and are discussed in Section 3.3.2.

## 3.2 WATER QUALITY ENVIRONMENT

### 3.2.1 BENEFICIAL USES

According to Table 2-3 of the Water Quality Control Plan for the Colorado River Basin Region (WQCP), the beneficial uses for the project's receiving waters are:

**a. Imperial Valley Drains:**
FRSH – Freshwater Replenishment
REC I – Water Contact Recreation (unauthorized, infrequent fishing activity)
REC II – Non-Contact Water Recreation (unauthorized)
WARM – Warm Freshwater Habitat
WILD – Wildlife Habitat
RARE – Preservation of Rare, Threatened or Endangered Species (only exists in some of the waterways)

It shall be noted that the above beneficial uses for the Imperial Valley Drain system are broadly based considering the fact that many of the Drains are maintained and operated as open channel conveyance systems.

**b. Alamo River:**
FRSH – Freshwater Replenishment
REC I – Water Contact Recreation (hazardous due to contamination)
REC II – Non-Contact Water Recreation
WARM – Warm Freshwater Habitat
WILD – Wildlife Habitat
POW- Hydropower Generation (potential)
RARE – Preservation of Rare, Threatened or Endangered Species

**c. Salton Sea:**
AQUA- Aquaculture
IND- Industrial Service Supply (potential)
REC I – Water Contact Recreation

REC II – Non-Contact Water Recreation
WARM – Warm Freshwater Habitat
WILD – Wildlife Habitat
RARE – Preservation of Rare, Threatened or Endangered Species

### 3.2.2 303(d) STATUS

According to the California 2006 303d list published by the State Water Resources Control Board (SWRCB), the project's receiving waters have beneficial use impairments as follows.

Table 8: 303(d) Impairments

| RECEIVING WATER | HYDROLOGIC UNIT CODE | 303(d) IMPAIRMENT(S) | DISTANCE FROM PROJECT (miles) |
|---|---|---|---|
| Imperial Valley Drains (Mt. Signal Drain , Greeson Drain) | 723.10 | DDT<br>Dieldrin<br>Endosulfan<br>PCBs<br>Selenium<br>Toxaphene | <0.1 miles |
| Alamo River | 723.10 | Chlorpyrifos<br>DDT<br>Dieldrin<br>PCBs<br>Selenium<br>Toxaphene | 8.5 miles |
| Salton Sea | 728.00 | Nutrients<br>Salinity<br>Selenium | 10 miles |

### 3.2.3 TMDL STATUS

TMDLs established for receiving waters of the project are summarized in Tables 9 and 10 below.

Table 9: TMDLs

| RECEIVING WATER | HYDROLOGIC UNIT CODE | TMDLs | DISTANCE FROM PROJECT (miles) |
|---|---|---|---|
| Imperial Valley Drains | 723.10 | Sediment/Siltation | <0.1 mile |

The Imperial Valley Drains' 2005 Sediment/Siltation TMDL sets numeric targets on the Imperial Valley Drains for Total Suspended Solids (TSS). The target is 200 mg/L which would achieve a low to moderate level of protection. According to the 2005 TMDL implementation plan, an overall 63% reduction from the current TSS level is required to meet the minimum targets set forth by the TMDL.

High sedimentation in the Imperial Valley Drains has led to increased mobilization of agricultural pesticides and a highly turbid environment for sensitive aquatic species.

## 3.3 REGULATORY FRAMEWORK

### 3.3.1 State Water Resources Control Board

In the State of California, the State Water Resources Control Board (SWRCB) and local Regional Water Quality Control Boards (RWQCBs) have assumed the responsibility of implementing the US EPA's NPDES Program and other programs under the CWA such as the Impaired Waters Program and the Antidegradation Policy. The primary water quality control law in California is the Porter-Cologne Water Quality Act (Water Code Sections 13000 et seq.). Under Porter-Cologne, the SWRCB issues joint federal NPDES Storm Water permits and state Waste Discharge Requirements (WDRs) to operators of municipal separate storm sewer systems (MS4s), industrial facilities, and construction sites to obtain coverage for the storm water discharges from these operations.

**a. Basin Plan Requirement:**

In addition to its permitting programs, the SWRCB, through its nine RWQCBs, developed Regional Water Quality Control Plans (or Basin Plans) that designate beneficial uses and water quality objectives for California's surface waters and groundwater basins, as mandated by both the CWA and the state's Porter-Cologne Water Quality Control Act. Water quality standards are thus established in these Basin Plans and provide the foundation for the regulatory programs implemented by the state. The Colorado River Basin RWQCB Basin Plan, which covers the project area, designates beneficial uses for surface waters and ground waters.

**b. Construction General Permit:**

The Construction General Permit (CGP), (Order 2009-0009-DWQ as modified by Order 2010-0014-DWQ, NPDES Permit No. CAS000002), issued by the SWRCB, regulates storm water and non-storm water discharges associated with construction activities disturbing 1 acre or greater of soil. Construction sites that qualify must submit a Notice of Intent (NOI) with the SWRCB to gain permit coverage or otherwise be in violation of the CWA and California Water Code.

The CGP requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) for each individual construction project greater than or equal to 1 acre of disturbed soil area. The SWPPP must list Best Management Practices (BMPs) that the discharger will use to control sediment and other pollutants in storm water and non-storm water runoff. The CGP requires that the

SWPPP is prepared by a Qualified SWPPP Developer (QSD) and implemented at the site under the review/direction of a Qualified SWPPP Practioner (QSP).

The project includes over 1 acre of grading within the County of Imperial and is therefore subject to the storm water discharge requirements of the CGP. The Project will submit a NOI and prepare a SWPPP prior to the commencement of soil disturbing activities. In the Colorado River Basin Region, where the project resides, the SWRCB is the permitting authority, while the County of Imperial and Colorado River Basin RWQCB provide local oversight and enforcement of the CGP.

**c. Phase II MS4 Permit:**
In 2003, the State Water Resources Control Board issued the Phase II regulations concerning Small Municipal Storm Sewer Systems (MS4) (Water Quality Order No. 2003-0005-DWQ). This NPDES permit was issued to all qualifying municipalities and agencies that operate a storm drain system and meet certain size criteria for MS4 system discharges into waters of the United States. Pursuant to the Permit, dischargers are required to develop a Storm Water Management Plan (SWMP) and enroll in the program. The County of Imperial has enrolled in the Permit, but does not have specific storm water related criterion for new development, related to the NPDES Program. If and when the County does develop said criterion, new development projects will be required to comply with the provisions set forth by the County of Imperial.

**d. Industrial Storm Water Permit:**
In 2014, the State Water Resources Control Board adopted a new Industrial General Permit (Water Quality Order No. 2014-0057-DWQ). This NPDES permit was issued by the State of California to all qualifying industrial facilities based upon land use and Standard Industrial Code (SIC). Within the County of Imperial, the IGP is administered by the Colorado River Basin Regional Water Quality Control Board. Per Attachment A of Order 2014-0057-DWQ, facilities covered by the IGP include any facility that generates steam for electric power through the combustion of coal, oil, wood, etc. The project is a solar power plant utilizing traditional photovoltaic (PV) panels for the generation of electricity. The project does not involve the generation of steam for electric power and does not match the description of any other facility given on Attachment A. As such the project will **not** be required to enroll in the IGP. See Appendix G for Attachment A of the IGP.

## 3.4 POTENTIAL POLLUTANTS

There is no sampling data available for the existing site condition. The following constituents have commonly been found on agricultural areas and could potentially affect water quality:

- Organic compounds found in pesticides used on agricultural fields
- Agricultural waste
- Loose sediments
- Excess nutrients from fertilizers

In addition to potential pollutants due to the existing agricultural land use, potential pollutants due to the proposed land use of a solar power station include the following:

- Heavy metals from infrastructure and vehicular use
- Trash and debris from human activity
- Oil and grease from vehicular use

Potential pollutants are summarized in Table 11 below.

Table 11: Potential Pollutants

| |
|---|
| SEDIMENT |
| HEAVY METALS |
| ORGANIC COMPOUNDS |
| TRASH & DEBRIS |
| OXYGEN DEMANDING SUBSTANCES |
| NUTRIENTS |
| OIL & GREASE |

In examining these anticipated pollutants, the proposed project has the potential to be a source of pollutants based on historic/existing land use and typical activities involved in operating a solar power station. Through proper planning and operation of the facility however, the concentrations can be reduced to levels which will not contribute to the impairment of beneficial uses in downstream surface waters. In addition, through the source control BMPs outlined in Table 16 of Section 3.7.2., the amounts of these pollutants will be reduced to the maximum extent practicable, through behavioral and programmatic means.

Primary pollutants of concern consist of those pollutants which are anticipated onsite, and are coupled with an existing impairment on surface waters downstream of the project site. Table 12 on the following page provides the primary pollutants of concern for the Citizens Imperial Solar project site.

Table 12: Primary Pollutants of Concern

| PRIMARY POLLUTANTS OF CONCERN | SPECIFIC 303(D) IMPAIRMENT |
|---|---|
| SEDIMENT | Sedimentation/Siltation |
| HEAVY METALS | Arsenic, Copper, Mercury, Selenium, Zinc |
| OXYGEN DEMANDING SUBSTANCES | Organic/Low DO |
| TRASH AND DEBRIS | Trash |
| ORGANIC COMPOUNDS | PCBs |
| NUTRIENTS | Nutrients |

**Sediment:** Sediment can result from erosion during storm events, as well as from dust generated by wind erosion and vehicular traffic. Sediments increase the turbidity of the receiving waters, and have the potential to adversely impact aquatic species.

**Heavy Metals:** The primary sources of metals in storm water are metals typically used in transportation, buildings and infrastructure and also paints, fuels, adhesives and coatings. Potential sources of heavy metals from the project include vehicular use, building construction, solar array construction, and underground pipes. Copper, lead, and zinc are the most prevalent metals typically found in runoff from these sources. Other trace metals, such as cadmium, chromium, manganese, and mercury are typically not detected in runoff from these sources or are detected at very low levels. Trace metals have the potential to cause toxic effects on aquatic life and are a potential source of groundwater contamination.

**Oxygen Demanding Substances:** Plant debris, food waste, and some chemical wastes fall into a category of water pollutants known as oxygen demanding substances. Such substances use dissolved oxygen in water when they decay or chemically react. If dissolved oxygen levels in water become too low, aquatic animals can become stressed or die.

Animal wastes, food wastes, leaves and twigs, and other miscellaneous organic matter carried by storm water runoff into surface water can lead to reduced oxygen levels. Potential sources of oxygen demanding substances from the project include human use and landscaping. Slow-moving waters are particularly susceptible to oxygen depletion because aeration of the water by turbulence is lacking. Therefore, oxygen that is depleted in slow-moving waters due to the presence of excess organic matter or unnatural chemical compounds is not replaced. Reduced oxygen levels in these waters are often particularly severe after a storm.

**Trash and Debris:** Improperly disposed or handled trash (from human use of the site) such as paper, plastics and debris including biodegradable organic matter such as leaves, grass cuttings, and food waste can accumulate on the ground surface where it can be entrained in urban runoff. A large amount of trash and debris can have significant negative impacts on the recreational value of water body. Excessive organic matter can create a high biochemical oxygen demand in a stream and lower its water quality.

**Organic Compounds:** Organic compounds are carbon-based, and are typically found in pesticides, solvents, and hydrocarbons. Dirt, grease, and other particulates can also adsorb organic compounds in rinse water from cleaning objects, and can be harmful or hazardous to aquatic life either indirectly or directly. Organic compounds are therefore potentially present in runoff from the site due to prior agricultural use (pesticides), vehicular use (hydrocarbons and grease), and may be present in runoff after project construction due to washing of solar panels.

**Nutrients:** The primary sources of nutrients in storm water are fertilizers. Potential sources of nutrients from the project include historic agricultural land use and landscaping. Nitrogen and phosphorus are the most prevalent nutrients typically found in urban runoff. Failing septic tanks are also potential sources of nutrients in runoff.

## 3.5 GROUNDWATER QUALITY

Geographically, the project site is located within the Imperial Groundwater Basin. The Imperial Valley Groundwater basin is bounded on the east by the Sand Hills and on the west by the impermeable rocks of the Fish Creek and Coyote Mountains. To the north, the basin is bounded by the Salton Sea, which is the discharge point for groundwater in the basin. Major hydrologic features include the Alamo and New Rivers, which flow north towards the Salton Sea.

Per Table 2-5 of the WQCP, beneficial uses of groundwater within the Imperial Hydrologic Unit include:

MUN – Municipal and Domestic Supply;
IND – Industrial Service Supply.

The MUN beneficial use for groundwater within the Imperial Hydrologic Unit is limited only to a small portion of the ground water unit. Within the project area, groundwater is not used for municipal uses. Rather, all municipal and domestic water supply is obtained from the IID Canals. Per Table 2-1 of the WQCP, IND is defined as a use of water for industrial activities that do not depend on water quality. Therefore, impacts from the project on leading to a loss in beneficial uses of groundwater are not anticipated.

## 3.6 WATER QUALITY – CONSTRUCTION PHASE

Construction of the project includes site preparation, foundation construction, erection of major equipment and structures, installation of piping, electrical systems, control systems, and start-up/testing. In addition, the construction of transmission lines, utility pole pads, conductors, and associated structures will be required.

During the construction phase, sedimentation and erosion can occur because of tracking from earthmoving equipment, erosion and subsequent runoff of soil, and improperly designed stockpiles. The utilization of proper erosion and sediment control BMPs is critical in preventing discharge to surface waters/drains. The project proposes to employ proper SWPPP practices to minimize any discharges in order to meet the Best Available Technology/Best Conventional Technology (BAT/BCT) standard set forth in the Construction General Permit (CGP).

Although the project site is relatively flat, the large amount of potential disturbed area results in the potential for erosion/sediment issues.

In addition to erosion and sedimentation, the use of materials such as fuels, solvents, and paints has the potential to affect surface water quality. Many different types of hazardous compounds will be used during the construction phase, with proper containment being of high importance. Poorly managed construction materials can lead to the possibility for exposure of potential contaminants to precipitation. When this occurs, these visible and/or non-visible constituents become entrained in storm water runoff. If they are not intercepted or are left uncontrolled, the polluted runoff would otherwise freely sheet flow from the project to the IID Drains and could cause pollution accumulation in the receiving waters. A list of anticipated construction materials and their associated construction activity are provided in the table below.

Table 13: Potential Construction Related Pollutants

| CONSTRUCTION ACTIVITY | CONSTRUCTION SITE MATERIAL | VISUALLY OBSERVABLE? |
|---|---|---|
| Paving | Hot Asphalt | Yes - Rainbow Surface or Brown Suspension |
| | Asphalt Emulsion | |
| | Liquid Asphalt (tack coat) | |
| | Cold Mix | |
| | Crumb Rubber | Yes – Black, solid material |
| | Asphalt Concrete (Any Type) | Yes - Rainbow Surface or Brown Suspension |
| Substation and Transmission Line Construction | Gasoline/Diesel | No |
| | Mineral and Crankcase Oil | |
| | Lubricants | |
| | Cleaning Solvents | |
| Equipment Cleaning | Acids | No |
| | Bleaches | |
| | Detergents | Yes - Foam |
| | Solvents | No |
| Concrete Work | Portland Cement (PCC) | Yes - Milky Liquid |
| | Masonry products | No |
| | Sealant (Methyl Methacrylate - MMA) | No |
| | Incinerator Bottom Ash, Bottom Ash, Steel Slag, Foundry Sand, Fly Ash, Municipal Solid Waste | No |
| | Mortar | Yes - Milky Liquid |
| | Concrete Rinse Water | Yes - Milky Liquid |
| | Non-Pigmented Curing Compounds | No |
| | Lime | No |
| Painting | Paint | Yes |
| | Paint Strippers | No |
| | Resins | |
| | Sealants | |

| CONSTRUCTION ACTIVITY | CONSTRUCTION SITE MATERIAL | VISUALLY OBSERVABLE? |
|---|---|---|
| Painting | Solvents | |
| | Lacquers, Varnish, Enamels, and Turpentine | |
| | Thinners | |
| Portable Toilet Facilities | Portable Toilet Waste | Yes |
| Adhesives | Adhesives | No |
| Dust Control | Water | No |
| | Liquid Polymer or Polymer Blend | |
| Vehicle Maintenance | Antifreeze and Other Vehicle Fluids | Yes - Colored Liquid |
| | Batteries | No |
| | Fuels, Oils, Lubricants | Yes - Rainbow Surface Sheen and Odor |
| Soil Amendment/Stabilization | Polymer/Copolymer | No |
| | Quicklime | No |
| | Herbicide, Pesticide | No |
| | Lignin Sulfonate | No |
| | Psyllium | |
| | Guar/Plant Gums | |
| | Gypsum | |
| Wood (Treated) Work | Ammoniacal-Copper-Zinc-Arsenate, Copper-Chromium-Arsenic, Ammoniacal-Copper-Arsenate, Copper Naphthenate | No |
| | Creosote | Yes - Rainbow Surface or Brown Suspension |

Prior to the beginning of construction, a complete SWPPP will be provided to show evidence that the development of the project will comply with the CGP and associated local NPDES regulations. Also, in accordance with the CGP, a Notice of Intent (NOI) for coverage of projects under the CGP will be filed with the SWRCB. The Waste Discharge Identification (WDID) Number will be issued to the project before any land disturbance may begin. If the project is constructed in multiple phases, a NOI will be filed for each phase of construction.

Accordingly, the SWPPP will be implemented at the project site, and revised as necessary, as administrative or physical conditions change. The Region 7 Colorado River Basin RWQCB, upon request, must instruct the developer to make the SWPPP available for public review. The SWPPP will fully describe Best Management Practices (BMPs) that address pollutant source reduction and provide measures/controls necessary to mitigate potential pollutant sources. These include, but are not limited to: erosion controls, sediment controls, tracking controls, non-storm water management, materials & waste management, and good housekeeping practices. The above-mentioned BMPs for construction activities are discussed further below. The SWPPP will be prepared by a Qualified SWPPP

Developer (QSD) and implemented at the site under the review/direction of a Qualified SWPPP Practioner (QSP).

### 3.6.1 Erosion Controls

Erosion Control, also referred to as soil stabilization, is a source control measure designed to prevent soil particles from detaching and becoming transported in storm water runoff. Erosion Control BMPs protect the soil surface by covering and/or binding the soil particles. The scheduling of soil disturbing activities should be minimized during the wet season, which is Aug 1- Oct 1, and Nov 1-May 1. If such activities occur in the wet season, all exposed slopes or areas with loose soil will be stabilized. This may involve the application of soil binders, or geotextiles and mats. Due to the flat surface, creating temporary earth dikes or drainage swales may also be employed/installed prior to large, forecasted storm events to divert runoff away from exposed areas and into more suitable locations. If implemented correctly, erosion controls can effectively reduce the sediment loads entrained in storm water runoff from construction sites. Below is a list of approved construction BMPs that can be implemented for the proposed Project's SWPPP.

Erosion Controls

EC-1 Scheduling
EC-2 Preservation of Existing Vegetation
EC-5 Soil Binders
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching
EC-9 Earth Dikes and Swales
EC-10 Velocity Dissipation Devices
EC-11 Slope Drains

### 3.6.2 Sediment Controls

Sediment controls are structural measures that are intended to complement and enhance the soil stabilization/erosion control measures and reduce sediment discharges from construction areas. Sediment controls are designed to intercept and filter out soil particles that have been detached and transported by the force of water. In addition, silt fencing will be installed along the perimeter of work areas upstream of discharge points, and will also be placed around stockpiles, and areas of soil disturbance. Check dams or chevrons will be situated in areas where high velocity runoff is anticipated/potential (such as in drainage ditches/swales). Gravel bag berms or fiber rolls should be used to intercept sheet flows on streets or at the toe of slopes (such as along streets or canal and drain access roads) to minimize sediment mobilization. Street sweeping will also be scheduled in areas where sediment can be tracked from the project site onto paved streets or roads. Below is a list of approved construction BMPs that can be implemented for the proposed Project's SWPPP.

Sediment Controls

SE-1 Silt Fence
SE-2 Desilting Basin (Detention Basins)
SE-3 Sediment Trap
SE-4 Check Dam
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-7 Street Sweeping
SE-8 Sandbag Barrier
SE-9 Straw Bale Barrier
SE-10 Chemical Treatment
SE-11 Chemical Treatment

### 3.6.3 Tracking Controls

The proposed project site will stabilize all construction entrance/exit points to reduce the tracking of sediments onto paved streets and roads by construction vehicles. Construction roadways should also be stabilized to minimize off-site tracking of mud and dirt. Wind erosion controls will be employed in conjunction with tracking controls. Below is a list of approved construction BMPs that can be implemented for the proposed Project's SWPPP.

Tracking Controls

TC-1 Stabilized Construction Entrance / Exit
TC-2 Stabilized Construction Roadway
TC-3 Entrance / Outlet Tire Wash
WE-1 Wind Erosion Control

### 3.6.4 Non-Storm Water Management Controls

Non-storm water discharges consist of all discharges from a municipal storm water conveyance which do not originate from precipitation events (i.e., all discharges from a conveyance system other than storm water).

Paving and grinding operations on the project site, along with any operations which involve using water on landscape are classified as having potential for non-storm water pollutants. This also includes illegal connection and dumping on the construction site, vehicle equipment cleaning, fueling, and maintenance. The construction of project may involve the use of heavy equipment and hazardous materials. Adequate BMPs and protections will be in place at all times.

Non-Storm Water Management Controls

NS-1 Water Conservation Practices
NS-2 Dewatering Operations
NS-3 Paving and Grinding Operations
NS-4 Temporary Stream Crossing
NS-5 Clear Water Diversion
NS-6 IC/ID Detection and Reporting
NS-7 Potable Water / Irrigation
NS-8 Vehicle & Equipment Cleaning
NS-9 Vehicle & Equipment Fueling
NS-10 Vehicle & Equipment Maint.
NS-11 Pile Driving Operations
NS-12 Concrete Curing
NS-13 Concrete Finishing
NS-14 Material Use Over Water
NS-15 Demolition Over Water
NS-16 Temporary Batch Plants

### 3.6.5 Materials and Waste Management

Waste management consists of implementing procedural and structural BMPs for collecting, handling, storing and disposing of wastes generated by a construction project to prevent the release of waste materials into storm water discharges. All materials with the potential to contaminate storm water runoff should be delivered and stored in designated areas with secondary containment measures (i.e. covered and bermed). Chemicals, drums, and bagged materials will not be stored directly on soil, but on pallets instead. Personnel will also be trained on the proper use of the materials.

Construction staging areas will be located on the site. These areas will include construction yards that serve as field offices, reporting locations for workers, parking space for vehicles and equipment, and sites for material storage. Facilities will be fenced as necessary. Security guards will be stationed where needed.

A temporary barrier around stockpiles should be installed and a cover provided during the rainy season. Spill cleanup procedures and kits should be made readily available near hazardous materials and waste. Solid wastes, such as trash and debris, should be collected on a regular basis and stored in designated areas. Concrete and paint washout areas should be installed and properly maintained in areas conducting the associated activities. Below is a list of approved construction BMPs that can be implemented for the proposed project's SWPPP.

<u>Waste Management and Materials</u>

WM-1 Material Delivery & Storage
WM-2 Material Use
WM-3 Stockpile Management
WM-4 Spill Prevention and Control
WM-5 Solid Waste Management
WM-6 Hazardous Waste
WM-7 Contaminated Soil
WM-8 Concrete Waste
WM-9 Sanitary / Septic Waste

### 3.6.6 Monitoring Program

A monitoring program will also be included in the SWPPP that outlines storm event inspections of the project site and a sampling plan in accordance with the CGP. The monitoring program will be prepared by a QSD and implemented at the site under the review/direction of a QSP. The goals of the program are (1) to identify areas contributing to a storm water discharge; (2) to evaluate whether measures to reduce pollutant loadings identified in the SWPPP are adequate, properly installed, and functioning in accordance with the terms of the CGP; and (3) whether additional control practices or corrective maintenance activities are needed. If a discharge is observed during these inspections, a sampling and analysis of the discharge is required.

<u>Sampling and Analysis</u>

Any breach, malfunction, leakage, or spill observed which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water shall trigger the collection of a sample of discharge…The goal of the sampling and analysis is to determine whether the BMPs employed and maintained on site are effective in preventing the potential pollutants from coming in contact with storm water and causing or contributing to an exceedance of water quality objectives in the receiving waters. In any case of breakage and potential for non-visible pollution, sampling and analysis will be required to ensure that the beneficial uses of downstream receiving waters are protected. In addition, sampling is required for any site which directly discharges runoff into a receiving water listed in the CGP listed as impaired for sedimentation.

## 3.7 WATER QUALITY – POST-CONSTRUCTION

### 3.7.1 Site Design BMPs

The project is designed to include Site Design BMPs which reduce runoff, prevent storm water pollution associated with the project, and conserve natural areas onsite.

Table 14: Site Design BMPs

| | DESIGN CONCEPT | DESCRIPTION |
|---|---|---|
| #1 | MINIMIZE IMPERVIOUS FOOTPRINT | The project site will include a significant amount of undeveloped land and pervious area. The footprint for the solar arrays will be predominately pervious ground. A minimal amount of Class II base paving for access roads and parking will be constructed. Asphaltic concrete (AC) paving of driveway connections to public roads may be required per County of Imperial standards, however the limit of paving will be kept to the minimum amount required by the County. The County may also require additional paving on some public roads in accordance with PM10 requirements, but the amount of paving will be limited to the areas required by County. |
| #2 | CONSERVE NATURAL AREAS | Only a small amount of existing site area can be classified as natural landscape, and will only be disturbed in necessary areas at the project. |
| #3 | PROTECT SLOPES AND CHANNELS | The project site and surrounding areas is comprised of extremely flat topography. Erosion of slopes due to stabilization problems is not a concern. |
| #4 | MIMIMIZE DCIAS (DIRECTLY CONNECTED IMPERVIOUS AREAS) | Minimal storm drain will be constructed onsite. The impervious areas will drain and will be allowed to pond in the detention basins under the arrays. This will effectively limit all DCIAs on the project site. |

### 3.7.2 Source Control BMPs

"Source control BMPs (both structural and non-structural)" means land use or site planning practices, or structures that aim to prevent urban runoff pollution by reducing the potential for contamination at the source of pollution. Source Control BMPs minimize the contact between pollutants and urban runoff. The following table identifies source control BMPs that would be applicable to the proposed project.

Table 15: Source Control BMPs

| SOURCE CONTROL BMP | | DESCRIPTION |
|---|---|---|
| #1 | DESIGN TRASH STORAGE AREAS TO REDUCE POLLUTION INTRODUCTION | Any outdoor trash storage areas will be designed not to allow run-on from adjoining areas, screened or walled to prevent off-site transport of trash. |
| #2 | ACTIVITY RESTRICTIONS | Restrictions include activities that have the potential to create adverse impacts on water quality. |
| #3 | NON-STORM WATER DISCHARGES | Illegal dumping educational materials as well as spill response materials will be provided to employees. |
| #4 | OUTDOOR LOADING AND UNLOADING | Material handling will be conducted in a manner as to prevent any storm water pollution. |
| #5 | SPILL PREVENTION, CONTROL, AND CLEANUP | The project may require a Spill Prevention, Control, and Countermeasure (SPCC) Plan, and a Hazardous Materials Business Plan in accordance with Federal, State, or Local requirements. |
| #6 | EDUCATION | Employees will receive materials for storm water pollution prevention in the form of brochures and other information in a format approved by the County of Imperial. |
| #7 | INTEGRATED PEST MANAGEMENT | If any pesticide is required onsite, the need for pesticide use in the project design will be reduced by:<br>• Keeping pests out of buildings using barriers, screens and caulking<br>• Physical pest elimination techniques, such as squashing, trapping, washing or pruning out pests<br>• Relying on natural enemies to eat pests<br>• Proper use of pesticides as a last line of defense |
| #8 | VEHICLE AND EQUIPMENT FUELING, CLEANING, AND REPAIR | All vehicles will be serviced offsite whenever possible. If servicing is required onsite, it must be conducted in an area isolated from storm drain inlets or drainage ditch inlets. The area must be bermed and precluded from run on. Any spillage must be fully contained and captured and disposed of per County of Imperial Hazardous Waste requirements. |
| #9 | WASTE HANDLING AND DISPOSAL | Materials will be disposed of in accordance with Imperial County Hazardous Material Management guidelines, and will be sent to appropriate disposal facilities. Under no circumstances shall any waste or hazardous materials be stored outside without secondary containment. |

In addition to said Source Controls, specific precautions will be taken when handling, storing or processing any materials during all phases of the proposed project. The utmost care and planning must be taken when using materials outside, and near any storm drain/drainage ditch inlets.

### 3.7.3 Treatment Control BMPs

As discussed in the Hydrologic Analysis, runoff from the project will be directed towards shallow ponding areas to meet the County requirements for storage of 3" of runoff within the project limits. The ponding areas will drain through infiltration into the underlying soils or be managed in accordance with the project's Mosquito Abatement Plan. As discussed previously, the County required 3" of runoff from the project will either be infiltrated or drain to the IID system within 72 hours. In a case that stored runoff under the arrays will not drawdown in under 72 hours, a Mosquito Abatement Plan will be prepared for review and approval by the Environmental Health Department prior to issuance of grading permit. Precise drawdown times and outlet configurations will be determined at the time of final engineering.

The ponding areas will also have the capacity to store runoff from the more frequent storm events, which typically lead to storm water quality concerns. The runoff volume for the water quality storm event was calculated based on the Urban Runoff Quality Management Approach outlined in the California Stormwater BMP Handbook for New Development and Redevelopment. Based on this approach, a runoff coefficient for the site is calculated using the following regression equation:

$$C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$$

where i is the impervious fraction of the site. However, given the fact that the site impervious percentage is nearly negligible (approaches 0.1% of the developed site), use of the above regression equation is impractical (in that it yields a runoff coefficient that approaches a value of 0.04) with the proposed project. For the purpose of calculations and analysis, the Rational Method C value of 0.60 is used for water quality purposes. The depth of runoff, $P_O$, is then calculated as:

$$P_O = (a * C) * P_6$$

Where:
a = regression constant = 1.582 for a 24 hour draw down time
$P_6$ = mean annual runoff-producing rainfall depth, in watershed inches

The value for $P_6$ is determined using tables provided in the California Stormwater BMP Handbook. Using the table provided for the Palm Springs Thermal Airport, the location which is most representative of conditions in Imperial Valley, the value of $P_6$ is approximately 0.43 inches. These values then yield a depth of runoff of $P_O$ = 0.41 inches or 0.034 feet.

To determine the volume of runoff from the water quality storm event, the depth of runoff is multiplied by the tributary area. Table 16 on the following page provides the volume of runoff for the water quality storm event, the Water Quality Control Volume (WQCV), for each drainage basin.

Table 16: WQCV

| Receiving Drain: "M" Drain | | |
|---|---|---|
| Drainage Area Name | Area (ac) | Water Quality Control Volume (ac-ft) |
| A | 9.0 | 0.3 |
| B | 7.3 | 0.2 |
| C | 15.9 | 0.5 |
| D | 8.7 | 0.3 |
| E | 11.9 | 0.4 |
| F | 10.9 | 0.4 |
| G | 6.4 | 0.3 |
| H | 7.8 | 0.3 |
| S | 18.6 | NA |
| Total | 96.5 | 2.7 |

| Receiving Drain: "L" Drain | | |
|---|---|---|
| Drainage Area Name | Area (ac) | Water Quality Control Volume (ac-ft) |
| I | 9.3 | 0.3 |
| J | 10.8 | 0.4 |
| K | 8.9 | 0.3 |
| L | 9.1 | 0.3 |
| M | 9.2 | 0.4 |
| N | 10.6 | 0.4 |
| O | 9.3 | 0.3 |
| P | 7.5 | 0.3 |
| Q | 12.7 | 0.4 |
| R | 7.4 | 0.3 |
| T | 8.4 | NA |
| Total | 103.2 | 3.4 |

As discussed in Section 2.3.2b, the County required runoff volume will be designed to infiltrate into the underlying soils. Therefore, the basins are deemed adequate as treatment control BMPs for the project.

# 4.0 ENVIRONMENTAL IMPACTS

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would meet any of the criteria listed in the table below.

The following discussions are based on the proposed drainage system within the proposed and potential development area. The impact assessments are based on the significance criteria listed below for hydrology/water quality.

## 4.1 THRESHOLDS OF SIGNIFICANCE

Table 17: CEQA Thresholds of Significance

| THRESHOLDS OF SIGNIFICANCE – VIII. HYDROLOGY AND WATER QUALITY | |
|---|---|
| **Would the Project:** | |
| A | Violate any water quality standards or waste discharge requirements? |
| B | Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table? |
| C | Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or in a manner which would result in a substantial erosion or siltation on- or off-site? |
| D | Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site? |
| E | Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff? |
| F | Otherwise substantially degrade water quality? |
| G | Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map? |
| H | Place within a 100- year flood area structures which would impede or redirect flood flows? |
| I | Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam? |
| J | Be subject to inundation by seiche, tsunami, or mudflow? |

### 4.1.1 Impact A

Would the Project violate any water quality standards or waste discharge requirements?

Impact Analysis: As a result of the recommended site design and source control measures, and the provision of shallow ponding areas, water quality exceedances are not anticipated, and pollutants are not expected within project runoff that would adversely affect beneficial uses in downstream receiving waters. Although specific County of Imperial regulations regarding storm water NPDES and new development do not exist, the project plans to institute controls designed to limit discharges to the appropriate standard. The project will comply with the requirements of the State Regional Water Quality Control Board concerning coverage under the Construction General Permit. If the project is phased, each phase of construction will be required to submit a Notice of Intent and SWPPP, and apply for coverage under the Construction General Permit. It is concluded that this issue is considered a less than significant impact.

#### 4.1.2 Impact B

Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).

**Impact Analysis:** Groundwater recharge in the area will not be significantly affected due to the fact that the majority of the site will feature a pervious landscape in both the existing and proposed conditions. Retention basins will also provide infiltration and groundwater recharge. In the post construction condition, no pumping of groundwater is anticipated. During the construction phase, a significant amount of construction dewatering is not expected to be required.

Potential construction that may require dewatering includes footings and foundations for the project substation and overhead collection system poles. Dewatering associated with these portions of construction will be localized to transmission pole locations or the substation and will not result in a significant decrease in production rates of existing or planned wells.

As discussed in Section 3.5, groundwater at/near the project site is not used for beneficial uses, such as municipal, domestic, or industrial supply. Water needs will be provided by adjacent IID Canals, and are expected to be much less than the needs of the existing agricultural land. It is concluded that this issue is considered no impact.

#### 4.1.3 Impact C

Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.

**Impact Analysis:** The proposed drainage patterns and general drainage system will be similar to the existing site. Drainage from the construction zone will be routed to the detention basins for detention and infiltration. The remainder of the site will follow existing drainage patterns with storm flows conveyed toward existing IID Drains. Due to the postponement of agricultural irrigation during the life of the project, it is anticipated that the annual runoff from the proposed project site will decrease when compared to the existing condition, which is similar to when agricultural fields are fallowed and/or abandoned. It is concluded that this issue is considered no impact.

#### 4.1.4 Impact D

Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.

**Impact Analysis:** Existing drainage patterns will not be substantially altered due to the proposed project. The majority of the site will sheet flow through the pervious native soils, toward the shallow ponding areas.

Peak flow runoff from the project will be collected in shallow ponding areas. The project facilities will be designed in anticipation of this ponding, and there is no potential for increased flooding onsite or in offsite IID Drains. Due to the use of infiltration, it is anticipated that the annual runoff from the proposed project site will decrease when compared to the existing condition. The project will be designed to meet County of Imperial storage requirements for storm water runoff, which will result in an impoundment of runoff in excess of the anticipated volume of runoff to be generated by the 100-year storm event. It is concluded that this issue is considered no impact.

#### 4.1.5 Impact E

Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

**Impact Analysis:** Runoff from the project will be controlled by shallow ponding areas to not exceed existing peak storm water flow rates as discussed previously. Due to the implementation of infiltration, it is anticipated that the annual runoff from the proposed project site will decrease when compared to the existing condition. As such, it is concluded that this issue is considered no impact.

#### 4.1.6 Impact F

Otherwise substantially degrade water quality

**Impact Analysis:** Refer to the water quality discussion included in the Impact A analysis above.

#### 4.1.6 Impact G

Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation.

**Impact Analysis:** There is no housing proposed for the project. It is concluded that there is no impact related to this issue.

#### 4.1.7 Impact H

Place within a 100-year flood hazard area structures which would impede or redirect flood flows.

**Impact Analysis:** There is no area structures which would impede or redirect flood flows within a 100-year flood hazard. Please see Appendix F for illustration of the project location with respect to FEMA flood hazard zones. It is concluded that there is no impact related to this issue.

#### 4.1.8 Impact I

Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.

**Impact Analysis:** See response to Impact H and the FIRMettes in Appendix F. The proposed project does not propose development within the bank of the East Highline Canal, which is the limit of the mapped Zone A. The project proposes to provide the ponding under arrays (approximately 1′ deep). These areas of ponding will not contain habitable structures where significant numbers of people would be put at high risk. The project substation and construction trailers will not be located in proposed areas of ponding or detention.

There are no dams immediately upstream of the project; therefore dam breakage is not a risk concerning the project site.

The Imperial Valley with its low-lying canal/drain systems, lack of relief, and infrequent, intense storm periods can lead to high intensity runoff events. However, the project site does not include any residential development or significant populations of people. It is concluded that there is no impact related to this issue.

#### 4.1.9 Impact J

Inundation by seiche, tsunami, or mudflow.

**Impact Analysis:** The site is approximately 10 miles from the Salton Sea, which is the nearest large water body. Due to the distance, the Salton Sea is does not pose a particularly significant danger of inundation from seiche or tsunami as related to the proposed project site.

The site is approximately 11 miles from the nearest raised and significantly sloped terrain, located northeast of the site. The East Highline Canal protects the site from offsite flow. The project site is not in any danger of inundation by mudflow. It is concluded that no impact associated with this issue will occur.

# 5.0 MAINTENANCE

The operation and maintenance requirements for each type of BMP are contained in the following sections. The project developer/owner/applicant will maintain all onsite site design, source control, and treatment control features.

## 5.1 POST-CONSTRUCTION BMPs

Post-construction BMPs will be maintained in perpetuity. Maintenance requirements for source control BMPs as well as treatment control BMPs are shown below. It shall be noted that preventative maintenance such as removal of trash and debris from the site will help ensure proper function of the BMPs.

Table 18: O&M Summary

| SUMMARY OF BMP O&M | |
|---|---|
| BMP NAME | FREQUENCY |
| DESIGN TRASH STORAGE AREAS TO REDUCE POLLUTION INTRODUCTION | Inspect Monthly |
| ACTIVITY RESTRICTIONS | Review Bi-Yearly |
| NON-STORM WATER DISCHARGES | Review Bi-Yearly |
| OUTDOOR LOADING AND UNLOADING | Supervisors/Workers Shall Monitor Continuously |
| SPILL PREVENTION, CONTROL, AND CLEANUP | Supervisors/Workers Shall Monitor Continuously |
| EDUCATION | Review and Distribute Bi-Yearly |
| INTEGRATED PEST MANAGEMENT | Review Protocols and Educate Bi-Yearly |
| WASTE HANDLING AND DISPOSAL | Inspect Monthly |
| VEHICLE AND EQUIPMENT FUELING, CLEANING, AND REPAIR | Inspect/Review Monthly |
| HAZARDOUS MATERIAL MANAGEMENT | Supervisors/Workers Shall Monitor Continuously |
| DETENTION BASINS | Inspect Quarterly |

Maintenance of the project site will be conducted by the project developer/owner/applicant. All construction and post construction BMPs will be the responsibility of the owner during the lifetime of the project. The owners of the project are required to perform maintenance in perpetuity, keeping maintenance records for submittal to the County of Imperial and Regional Water Quality Control Board, if requested. In addition, the following maintenance activities will be conducted.

- Continued education of staff responsible for hazardous material hauling, loading, and use.
- Periodic visual monitoring to ensure materials are not contaminating areas exposed to storm water.

If a transfer of the property area occurs, the owner will notify the County of Imperial, and the Region 7 Colorado River Basin Regional Water Quality Control Board. The new owner will assume all responsibilities for BMP maintenance.

# 6.0 SUMMARY AND CONCLUSIONS

## 6.1 HYDROLOGY

From the analysis provided in this study, it is concluded that the project will not have a substantial impact on the hydrology of the surrounding area or on the IID Drain system. Post project site conditions reflect increases in unattenuated peak runoff generated by the project. However, the provision of retention through the shallow areas of ponding under arrays will attenuate peak discharges from the project. Retained runoff will be infiltrated into the underlying soils, resulting in a decrease of flow to the receiving IID Drain system.

This conceptual study calculates the volume of runoff that shall be retained in accordance with the County standard of 3" of runoff within the project site. At the time of final design and engineering, ultimate locations, volumes, and limits of retention basins will be determined.

## 6.2 STORM WATER QUALITY

Prior to the beginning of construction, a complete SWPPP will be provided to show evidence that the development of the project will comply with the CGP and associated local NPDES regulations. Also, in accordance with the CGP, a Notice of Intent (NOI) for coverage of projects under the CGP will be filed with the SWRCB. The Waste Discharge Identification (WDID) Number will be issued to the project before any land disturbance may begin. If the project is constructed in multiple phases, a NOI will be filed for each phase of construction.

The use of source control and site design BMPs in practice through the day to day function of the project will result in a decreased potential for storm water pollution.

Maintenance will be the responsibility of the owner, who will maintain the Site Design, and Source Control, and Treatment Control BMPs throughout the lifetime of the project. In the event of sale of the site, the new owner will be required to maintain BMPs, ensuring proper function in perpetuity.

Long-term funding for BMP maintenance shall be funded by the owner. The private owner entity assumes responsibility for operation and maintenance of BMPs.

### 6.3 CEQA Impact Summary

The development of Project SWPPP and adherence to its prescribed BMPs will minimize the potential for a net increase in sediment loads in storm water discharges, relative to pre-construction levels. Furthermore, the SWPPP will prevent or minimize the discharges of polluted storm water and prohibited non-storm waters at levels that would cause or contribute to the exceedance of applicable water quality standards of downstream receiving waters during the construction period.

Based on the proposed Project improvements and associated BMPs, no substantial water quality impairments or significant increases in Project runoff are anticipated, and no adverse levels of pollutants are expected in Project runoff that would violate water quality standards or adversely affect beneficial uses of the downstream receiving waters.

Table 19: CEQA Impact Summary

| CEQA IMPACTS AND MITIGATION MEASURES | | |
|---|---|---|
| CEQA SIGNIFICANCE CRITERIA | SIGNIFICANT IMPACT (YES/NO) | MITIGATION MEASURE |
| Impact A: Violate any water quality standards or waste discharge requirements? | NO | N/A |
| Impact B: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table? | NO | N/A |
| Impact C: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or in a manner which would result in a substantial erosion or siltation on- or off-site? | NO | N/A |
| Impact D: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site? | NO | N/A |
| Impact E: Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff? | NO | N/A |
| Impact F: Otherwise substantially degrade water quality? | NO | N/A |
| Impact G: Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map? | NO | N/A |
| Impact H: Place within a 100- year flood area structures which would impede or redirect flood flows? | NO | N/A |

| CEQA IMPACTS AND MITIGATION MEASURES | | |
|---|---|---|
| CEQA SIGNIFICANCE CRITERIA | SIGNIFICANT IMPACT (YES/NO) | MITIGATION MEASURE |
| Impact I: Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam? | NO | N/A |
| Impact J: Be subject to inundation by seiche, tsunami, or mudflow? | NO | N/A |

# APPENDIX - A

## Vicinity Map

# APPENDIX - B

## Soils Data

# APPENDIX - C

## County Standards and Rational Method Parameters

# APPENDIX - D

## NOAA Data

# APPENDIX - E

## Drainage Basin Map

# APPENDIX - F

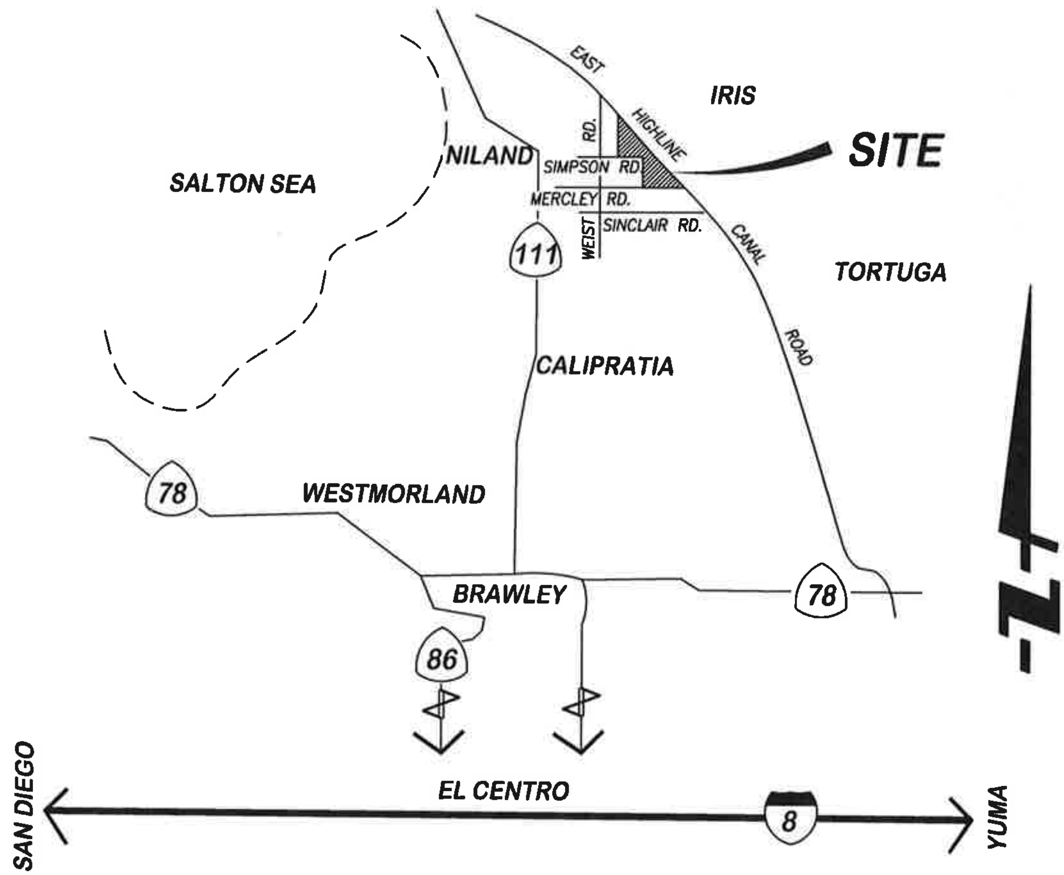
## FEMA FIRMettes

# APPENDIX - G

## Industrial General Permit Attachment A

APPENDIX - A

Vicinity Map




# VICINITY MAP

NOT TO SCALE

# APPENDIX - B

## Soils Data

USDA United States Department of Agriculture

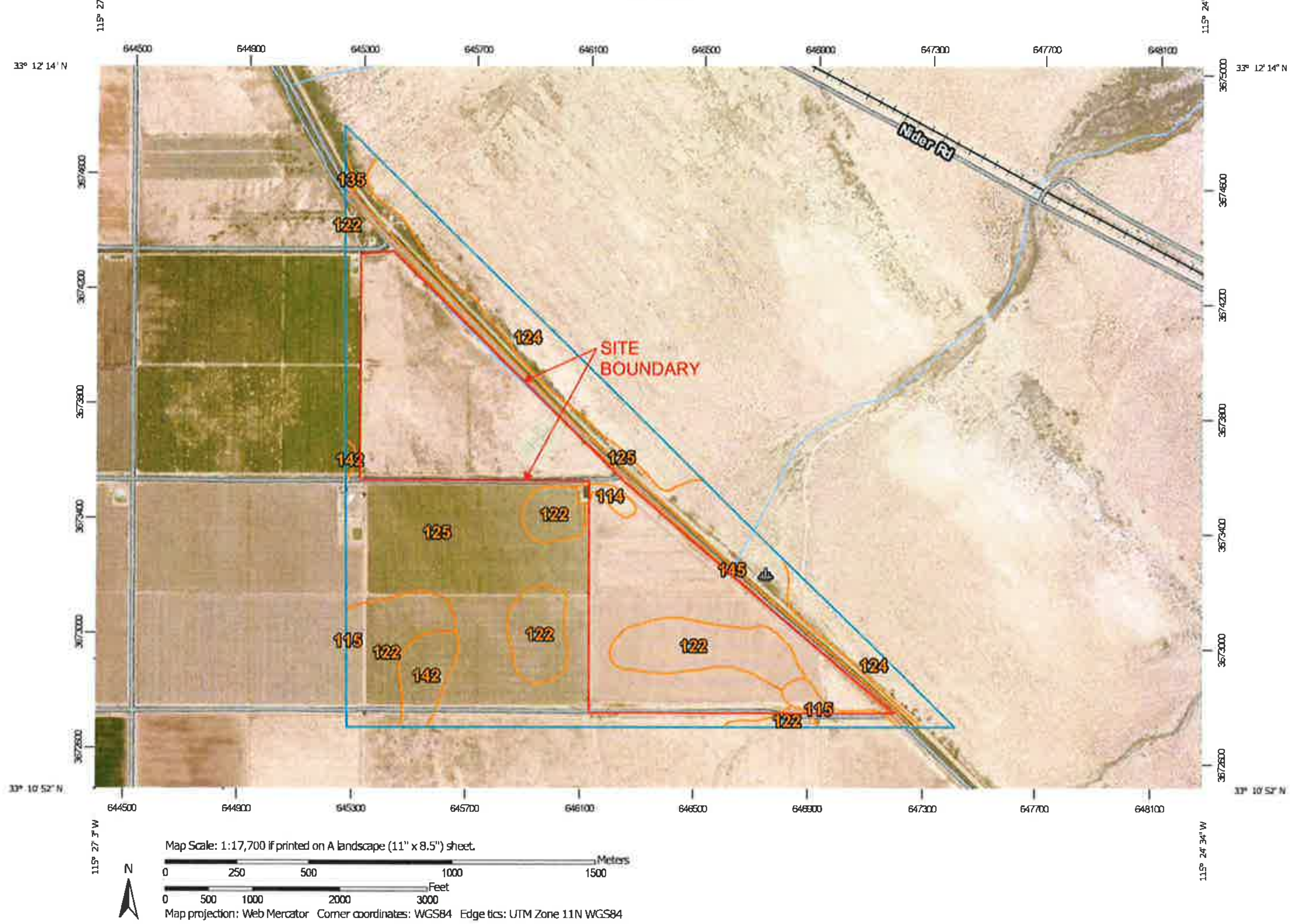
NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Imperial County, California, Imperial Valley Area


April 6, 2018

Soil Map



115° 27' 3" W
115° 24' 34" W
33° 12' 14" N
33° 10' 52" N
644500
644900
645300
645700
646100
646500
646900
647300
647700
648100
3675000
3674600
3674200
3673800
3673400
3673000
3672600
Nider Rd
SITE BOUNDARY
135
122
124
125
142
114
145
115
Map Scale: 1:17,700 if printed on A landscape (11" x 8.5") sheet.
N
0 250 500 1000 1500 Meters
0 500 1000 2000 3000 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**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

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Imperial County, California, Imperial Valley Area
Survey Area Data: Version 9, Sep 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 23, 2011—Jun 25, 2011

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

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 114 | Imperial silty clay, wet | 3.0 | 0.5% |
| 115 | Imperial-Glenbar silty clay loams, wet, 0 to 2 percent slopes | 6.8 | 1.2% |
| 122 | Meloland very fine sandy loam, wet | 80.0 | 14.5% |
| 124 | Niland gravelly sand | 65.1 | 11.8% |
| 125 | Niland gravelly sand, wet | 371.3 | 67.1% |
| 135 | Rositas fine sand, wet, 0 to 2 percent slopes | 0.7 | 0.1% |
| 142 | Vint loamy very fine sand, wet | 13.2 | 2.4% |
| 145 | Water | 13.0 | 2.4% |
| **Totals for Area of Interest** | | **553.2** | **100.0%** |

# Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not

# Imperial County, California, Imperial Valley Area

## 114—Imperial silty clay, wet

### Map Unit Setting

*National map unit symbol:* h8zn
*Elevation:* -230 to 200 feet
*Mean annual precipitation:* 0 to 3 inches
*Mean annual air temperature:* 72 to 75 degrees F
*Frost-free period:* 300 to 350 days
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Imperial, wet, and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Imperial, Wet

#### Setting

*Landform:* Basin floors
*Landform position (three-dimensional):* Talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Clayey alluvium derived from mixed and/or clayey lacustrine deposits derived from mixed

#### Typical profile

*H1 - 0 to 12 inches:* silty clay
*H2 - 12 to 60 inches:* silty clay loam

#### Properties and qualities

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 5 percent
*Salinity, maximum in profile:* Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 20.0
*Available water storage in profile:* Moderate (about 8.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3w
*Land capability classification (nonirrigated):* 7w
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

### Minor Components

#### Glenbar

*Percent of map unit:* 4 percent

*Hydric soil rating:* No

**Meloland**

*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Holtville**

*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Niland**

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

## 115—Imperial-Glenbar silty clay loams, wet, 0 to 2 percent slopes

**Map Unit Setting**

*National map unit symbol:* h8zp
*Elevation:* -230 to 200 feet
*Mean annual precipitation:* 0 to 3 inches
*Mean annual air temperature:* 72 to 75 degrees F
*Frost-free period:* 300 to 350 days
*Farmland classification:* Farmland of statewide importance

**Map Unit Composition**

*Imperial, wet, and similar soils:* 40 percent
*Glenbar, wet, and similar soils:* 40 percent
*Minor components:* 20 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Imperial, Wet**

**Setting**

*Landform:* Basin floors
*Landform position (three-dimensional):* Talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Clayey alluvium derived from mixed and/or clayey lacustrine deposits derived from mixed

**Typical profile**

*H1 - 0 to 12 inches:* silty clay loam
*H2 - 12 to 60 inches:* silty clay loam

**Properties and qualities**

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
*Depth to water table:* More than 80 inches

*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 5 percent
*Salinity, maximum in profile:* Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 20.0
*Available water storage in profile:* Moderate (about 8.6 inches)

**Interpretive groups**
*Land capability classification (irrigated):* 3w
*Land capability classification (nonirrigated):* 7w
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

**Description of Glenbar, Wet**

**Setting**
*Landform:* Basin floors
*Landform position (three-dimensional):* Talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium derived from mixed

**Typical profile**
*H1 - 0 to 13 inches:* silty clay loam
*H2 - 13 to 60 inches:* clay loam

**Properties and qualities**
*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 5 percent
*Salinity, maximum in profile:* Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 15.0
*Available water storage in profile:* High (about 10.8 inches)

**Interpretive groups**
*Land capability classification (irrigated):* 3w
*Land capability classification (nonirrigated):* 7w
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

**Minor Components**

**Holtville**
*Percent of map unit:* 10 percent
*Hydric soil rating:* No

**Meloland**
*Percent of map unit:* 10 percent
*Hydric soil rating:* No

## 122—Meloland very fine sandy loam, wet

### Map Unit Setting

*National map unit symbol:* h8zx
*Elevation:* -230 to 200 feet
*Mean annual precipitation:* 0 to 3 inches
*Mean annual air temperature:* 72 to 75 degrees F
*Frost-free period:* 300 to 350 days
*Farmland classification:* Prime farmland if irrigated and drained

### Map Unit Composition

*Meloland, wet, and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Meloland, Wet

#### Setting

*Landform:* Basin floors
*Landform position (three-dimensional):* Talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium derived from mixed and/or eolian deposits derived from mixed

#### Typical profile

*H1 - 0 to 12 inches:* very fine sandy loam
*H2 - 12 to 26 inches:* stratified loamy fine sand to silt loam
*H3 - 26 to 71 inches:* clay

#### Properties and qualities

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 5 percent
*Salinity, maximum in profile:* Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 13.0
*Available water storage in profile:* Moderate (about 7.8 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3w
*Land capability classification (nonirrigated):* 7w

*Hydrologic Soil Group:* D
*Hydric soil rating:* No

### Minor Components

#### Imperial

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

#### Indio

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

#### Holtville

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

#### Glenbar

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

#### Vint

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

## 124—Niland gravelly sand

### Map Unit Setting

*National map unit symbol:* h8zz
*Elevation:* -230 to 300 feet
*Mean annual precipitation:* 0 to 3 inches
*Mean annual air temperature:* 72 to 75 degrees F
*Frost-free period:* 300 to 350 days
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Niland and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Niland

#### Setting

*Landform:* Basin floors
*Landform position (three-dimensional):* Talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium derived from mixed

#### Typical profile

*H1 - 0 to 23 inches:* gravelly sand
*H2 - 23 to 60 inches:* silty clay

**Properties and qualities**

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 5 percent
*Salinity, maximum in profile:* Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 10.0
*Available water storage in profile:* Moderate (about 6.6 inches)

**Interpretive groups**

*Land capability classification (irrigated):* 4s
*Land capability classification (nonirrigated):* 7e
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

### Minor Components

**Imperial**

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

**Meloland**

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

**Carsitas**

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

**Indio**

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

**Vint**

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

**Rositas**

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

**Aquents**

*Percent of map unit:* 1 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

## 125—Niland gravelly sand, wet

### Map Unit Setting

*National map unit symbol:* h900
*Elevation:* -230 to 200 feet
*Mean annual precipitation:* 0 to 3 inches
*Mean annual air temperature:* 72 to 75 degrees F
*Frost-free period:* 300 to 350 days
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Niland, wet, and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Niland, Wet

#### Setting

*Landform:* Basin floors
*Landform position (three-dimensional):* Talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium derived from mixed sources

#### Typical profile

*H1 - 0 to 23 inches:* gravelly sand
*H2 - 23 to 60 inches:* silty clay

#### Properties and qualities

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 5 percent
*Salinity, maximum in profile:* Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 10.0
*Available water storage in profile:* Moderate (about 6.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 4w
*Land capability classification (nonirrigated):* 7w
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

**Minor Components**

**Imperial**

*Percent of map unit:* 6 percent
*Hydric soil rating:* No

**Unnamed**

*Percent of map unit:* 3 percent
*Landform:* Levees
*Hydric soil rating:* Yes

**Carsitas**

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

**Meloland**

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

## 135—Rositas fine sand, wet, 0 to 2 percent slopes

**Map Unit Setting**

*National map unit symbol:* h90b
*Elevation:* -230 to 350 feet
*Mean annual precipitation:* 0 to 3 inches
*Mean annual air temperature:* 70 to 75 degrees F
*Frost-free period:* 300 to 350 days
*Farmland classification:* Farmland of statewide importance

**Map Unit Composition**

*Rositas, wet, and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Rositas, Wet**

**Setting**

*Landform:* Basin floors
*Landform position (three-dimensional):* Talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium derived from mixed and/or eolian deposits derived from mixed

**Typical profile**

*H1 - 0 to 9 inches:* fine sand
*H2 - 9 to 60 inches:* sand

**Properties and qualities**

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Moderately well drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 5 percent
*Salinity, maximum in profile:* Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
*Available water storage in profile:* Low (about 3.6 inches)

**Interpretive groups**

*Land capability classification (irrigated):* 3w
*Land capability classification (nonirrigated):* 7w
*Hydrologic Soil Group:* A
*Hydric soil rating:* No

### Minor Components

**Vint**

*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Superstition**

*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Carsitas**

*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Antho**

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

## 142—Vint loamy very fine sand, wet

### Map Unit Setting

*National map unit symbol:* h90k
*Elevation:* -230 to 150 feet
*Mean annual precipitation:* 0 to 3 inches
*Mean annual air temperature:* 72 to 75 degrees F
*Frost-free period:* 300 to 350 days
*Farmland classification:* Prime farmland if irrigated and drained

### Map Unit Composition

*Vint, wet, and similar soils:* 90 percent
*Minor components:* 10 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Vint, Wet

#### Setting

*Landform:* Basin floors
*Landform position (three-dimensional):* Talf
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Alluvium derived from mixed and/or eolian deposits derived from mixed

#### Typical profile

*H1 - 0 to 10 inches:* loamy very fine sand
*H2 - 10 to 60 inches:* loamy fine sand

#### Properties and qualities

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 5 percent
*Salinity, maximum in profile:* Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
*Available water storage in profile:* Low (about 5.5 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 2w
*Land capability classification (nonirrigated):* 7w
*Hydrologic Soil Group:* A
*Hydric soil rating:* No

### Minor Components

#### Indio

*Percent of map unit:* 5 percent
*Hydric soil rating:* No

#### Meloland

*Percent of map unit:* 5 percent
*Hydric soil rating:* No

## 145—Water

### Map Unit Composition

*Water:* 100 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

# APPENDIX - C

## County Standards and Rational Method Parameters

## Detail A - Runoff Coefficients (C), Rational Formula

| Land Use | Percent Impervious Area | Hydrologic Soil Group | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | | | B | | | C | | | D | | |
| | | Slope Range Percent | | | Slope Range Percent | | | Slope Range Percent | | | Slope Range Percent | | |
| | | 0-2 | 2-6 | 6 & over | 0-2 | 2-6 | 6 & over | 0-2 | 2-6 | 6 & over | 0-2 | 2-6 | 6 & over |
| Industrial | 90 | 0.67 | 0.68 | 0.68 | 0.68 | 0.68 | 0.69 | 0.68 | 0.69 | 0.69 | 0.69 | 0.69 | 0.70 |
| | | 0.85 | 0.85 | 0.86 | 0.85 | 0.86 | 0.86 | 0.86 | 0.86 | 0.87 | 0.86 | 0.86 | 0.88 |
| Commercial | 95 | 0.71 | 0.71 | 0.72 | 0.71 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 |
| | | 0.88 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.90 | 0.89 | 0.89 | 0.90 |
| High Density Residential | 60 | 0.47 | 0.49 | 0.50 | 0.48 | 0.50 | 0.52 | 0.49 | 0.51 | 0.54 | 0.51 | 0.53 | 0.56 |
| | | 0.58 | 0.60 | 0.61 | 0.59 | 0.61 | 0.64 | 0.60 | 0.62 | 0.66 | 0.62 | 0.64 | 0.69 |
| Med. Density Residential | 30 | 0.25 | 0.28 | 0.31 | 0.27 | 0.30 | 0.35 | 0.30 | 0.33 | 0.38 | 0.33 | 0.36 | 0.42 |
| | | 0.33 | 0.37 | 0.40 | 0.35 | 0.39 | 0.44 | 0.38 | 0.42 | 0.49 | 0.41 | 0.45 | 0.54 |
| Low Density Residential | 15 | 0.14 | 0.19 | 0.22 | 0.17 | 0.21 | 0.26 | 0.20 | 0.25 | 0.31 | 0.24 | 0.28 | 0.35 |
| | | 0.22 | 0.26 | 0.29 | 0.24 | 0.28 | 0.34 | 0.28 | 0.32 | 0.40 | 0.31 | 0.35 | 0.46 |
| Agriculture | 5 | 0.08 | 0.13 | 0.16 | 0.11 | 0.15 | 0.21 | 0.14 | 0.19 | 0.26 | 0.18 | 0.23 | 0.31 |
| | | 0.14 | 0.18 | 0.22 | 0.16 | 0.21 | 0.28 | 0.20 | 0.25 | 0.34 | 0.24 | 0.29 | 0.41 |
| Open Space | 2 | 0.05 | 0.10 | 0.14 | 0.08 | 0.13 | 0.19 | 0.12 | 0.17 | 0.24 | 0.16 | 0.21 | 0.28 |
| | | 0.11 | 0.16 | 0.20 | 0.14 | 0.19 | 0.26 | 0.18 | 0.23 | 0.32 | 0.22 | 0.27 | 0.39 |
| Freeways & Expressways | 70 | 0.57 | 0.59 | 0.60 | 0.58 | 0.60 | 0.61 | 0.59 | 0.61 | 0.63 | 0.60 | 0.62 | 0.64 |
| | | 0.70 | 0.71 | 0.72 | 0.71 | 0.72 | 0.74 | 0.72 | 0.73 | 0.76 | 0.73 | 0.75 | 0.78 |

## Detail B - Runoff Coefficients for Specific Land Use

| Land Use | Hydrologic Soil Group | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | | B | | | C | | | D | | |
| | Slope Range Percent | | | Slope Range Percent | | | Slope Range Percent | | | Slope Range Percent | | |
| | 0-2 | 2-6 | 6 & over | 0-2 | 2-6 | 6 & over | 0-2 | 2-6 | 6 & over | 0-2 | 2-6 | 6 & over |
| Row Crops | .08<br>.22 | .16<br>.30 | .22<br>.38 | .12<br>.26 | .20<br>.34 | .27<br>.44 | .15<br>.30 | .24<br>.37 | .33<br>.50 | .19<br>.34 | .28<br>.41 | .38<br>.56 |
| Median Stripturf | .19<br>.24 | .20<br>.26 | .24<br>.30 | .19<br>.25 | .22<br>.28 | .26<br>.33 | .20<br>.26 | .23<br>.30 | .30<br>.37 | .20<br>.27 | .25<br>.32 | .30<br>.40 |
| Side Slopeturf | | | .25<br>.32 | | | .27<br>.34 | | | .28<br>.36 | | | .30<br>.38 |
| **PAVEMENT** | | | | | | | | | | | | |
| Asphalt | .70 - .95 | | | | | | | | | | | |
| Concrete | .80 - .95 | | | | | | | | | | | |
| Brick | .70 - .80 | | | | | | | | | | | |
| Drives, Walks | .75 - .85 | | | | | | | | | | | |
| Roofs | .75 - .95 | | | | | | | | | | | |
| Gravel Roads Shoulders | .40 - .60 | | | | | | | | | | | |

**NOTE:** The lower C values in each range should be used with the relatively low intensities associated with 2 to 10 year design recurrence intervals whereas the higher C values should be used for intensities associated with the longer 25 to 100 year deign recurrence intervals.

# Figure 819.2A

## Runoff Coefficients for Undeveloped Areas

### Watershed Types

| | Extreme | High | Normal | Low |
|---|---|---|---|---|
| Relief | .28 -.35<br>Steep, rugged terrain with average slopes above 30% | .20 -.28<br>Hilly, with average slopes of 10 to 30% | .14 -.20<br>Rolling, with average slopes of 5 to 10% | .08 -.14<br>Relatively flat land, with average slopes of 0 to 5% |
| Soil Infiltration | .12 -.16<br>No effective soil cover, either rock or thin soil mantle of negligible infiltration capacity | .08 -.12<br>Slow to take up water, clay or shallow loam soils of low infiltration capacity, imperfectly or poorly drained | .06 -.08<br>Normal; well drained light or medium textured soils, sandy loams, silt and silt loams | .04 -.06<br>High; deep sand or other soil that takes up water readily, very light well drained soils |
| Vegetal Cover | .12 -.16<br>No effective plant cover, bare or very sparse cover | .08 -.12<br>Poor to fair; clean cultivation crops, or poor natural cover, less than 20% of drainage area over good cover | .06 -.08<br>Fair to good; about 50% of area in good grassland or woodland, not more than 50% of area in cultivated crops | .04 -.06<br>Good to excellent; about 90% of drainage area in good grassland, woodland or equivalent cover |
| Surface Storage | .10 -.12<br>Negligible surface depression few and shallow; drainageways steep and small, no marshes | .08 -.10<br>Low; well defined system of small drainageways; no ponds or marshes | .06 -.08<br>Normal; considerable surface depression storage; lakes and pond marshes | .04 -.06<br>High; surface storage, high; drainage system not sharply defined; large flood plain storage or large number of ponds or marshes |

Given An undeveloped watershed consisting of;
1) rolling terrain with average slopes of 5%,
2) clay type soils,
3) good grassland area, and
4) normal surface depressions.

Solution:

| | |
|---|---|
| Relief | 0.14 |
| Soil Infiltration | 0.08 |
| Vegetal Cover | 0.04 |
| Surface Storage | 0.06 |
| C= | 0.32 |

Find The runoff coefficient, C, for the above watershed.

# APPENDIX - D

## NOAA Data

**NOAA Atlas 14, Volume 6, Version 2**
**Location name: Brawley, California, USA***
**Latitude: 33.1107°, Longitude: -115.254°**
**Elevation: 246.39 ft****
* source: ESRI Maps
** source: USGS

## POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

## PF tabular

**PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]**

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.073 (0.062-0.088) | 0.115 (0.096-0.138) | 0.176 (0.147-0.212) | 0.231 (0.192-0.281) | 0.317 (0.254-0.399) | 0.392 (0.308-0.504) | 0.478 (0.366-0.630) | 0.577 (0.429-0.784) | 0.732 (0.521-1.04) | 0.871 (0.598-1.28) |
| 10-min | 0.105 (0.088-0.126) | 0.164 (0.138-0.197) | 0.252 (0.211-0.303) | 0.331 (0.275-0.403) | 0.454 (0.364-0.572) | 0.562 (0.441-0.723) | 0.685 (0.524-0.904) | 0.827 (0.615-1.12) | 1.05 (0.747-1.49) | 1.25 (0.857-1.84) |
| 15-min | 0.127 (0.107-0.153) | 0.199 (0.167-0.239) | 0.304 (0.255-0.367) | 0.401 (0.333-0.487) | 0.549 (0.441-0.691) | 0.680 (0.534-0.874) | 0.828 (0.634-1.09) | 1.00 (0.743-1.36) | 1.27 (0.903-1.80) | 1.51 (1.04-2.22) |
| 30-min | 0.176 (0.148-0.212) | 0.275 (0.232-0.331) | 0.422 (0.354-0.508) | 0.555 (0.461-0.675) | 0.761 (0.611-0.958) | 0.942 (0.740-1.21) | 1.15 (0.878-1.52) | 1.39 (1.03-1.88) | 1.76 (1.25-2.50) | 2.09 (1.44-3.08) |
| 60-min | 0.244 (0.206-0.293) | 0.382 (0.321-0.459) | 0.585 (0.490-0.704) | 0.770 (0.640-0.935) | 1.06 (0.847-1.33) | 1.31 (1.02-1.68) | 1.59 (1.22-2.10) | 1.92 (1.43-2.61) | 2.44 (1.74-3.46) | 2.90 (1.99-4.27) |
| 2-hr | 0.338 (0.284-0.405) | 0.508 (0.427-0.610) | 0.758 (0.635-0.913) | 0.984 (0.817-1.20) | 1.33 (1.07-1.68) | 1.63 (1.28-2.10) | 1.97 (1.51-2.61) | 2.37 (1.76-3.22) | 2.98 (2.12-4.23) | 3.53 (2.42-5.19) |
| 3-hr | 0.389 (0.327-0.467) | 0.577 (0.485-0.693) | 0.851 (0.714-1.03) | 1.10 (0.914-1.34) | 1.48 (1.19-1.86) | 1.81 (1.42-2.33) | 2.18 (1.67-2.88) | 2.61 (1.94-3.54) | 3.27 (2.33-4.64) | 3.86 (2.65-5.68) |
| 6-hr | 0.479 (0.403-0.575) | 0.703 (0.591-0.844) | 1.03 (0.862-1.24) | 1.32 (1.10-1.61) | 1.77 (1.42-2.22) | 2.15 (1.69-2.77) | 2.58 (1.98-3.41) | 3.08 (2.29-4.18) | 3.83 (2.73-5.44) | 4.50 (3.09-6.62) |
| 12-hr | 0.559 (0.471-0.671) | 0.826 (0.694-0.993) | 1.21 (1.02-1.46) | 1.56 (1.30-1.90) | 2.09 (1.67-2.63) | 2.54 (1.99-3.26) | 3.04 (2.33-4.01) | 3.61 (2.68-4.91) | 4.48 (3.19-6.35) | 5.23 (3.59-7.70) |
| 24-hr | 0.703 (0.621-0.811) | 1.05 (0.927-1.21) | 1.55 (1.37-1.80) | 2.00 (1.75-2.34) | 2.68 (2.27-3.23) | 3.26 (2.71-4.00) | 3.90 (3.17-4.90) | 4.63 (3.67-5.97) | 5.72 (4.36-7.67) | 6.67 (4.92-9.23) |
| 2-day | 0.799 (0.707-0.922) | 1.20 (1.06-1.39) | 1.78 (1.57-2.06) | 2.30 (2.01-2.68) | 3.08 (2.61-3.70) | 3.73 (3.11-4.58) | 4.46 (3.63-5.60) | 5.28 (4.18-6.80) | 6.50 (4.95-8.71) | 7.55 (5.57-10.5) |
| 3-day | 0.846 (0.749-0.977) | 1.27 (1.13-1.47) | 1.89 (1.67-2.19) | 2.44 (2.13-2.85) | 3.26 (2.77-3.92) | 3.96 (3.29-4.85) | 4.72 (3.84-5.93) | 5.58 (4.42-7.19) | 6.85 (5.22-9.18) | 7.95 (5.86-11.0) |
| 4-day | 0.888 (0.785-1.02) | 1.34 (1.18-1.54) | 1.98 (1.75-2.29) | 2.55 (2.23-2.98) | 3.41 (2.89-4.10) | 4.13 (3.43-5.06) | 4.92 (4.00-6.17) | 5.80 (4.59-7.48) | 7.12 (5.42-9.53) | 8.24 (6.08-11.4) |
| 7-day | 0.942 (0.833-1.09) | 1.41 (1.25-1.63) | 2.08 (1.83-2.41) | 2.67 (2.34-3.12) | 3.55 (3.01-4.27) | 4.29 (3.57-5.27) | 5.10 (4.15-6.41) | 6.01 (4.76-7.74) | 7.35 (5.60-9.85) | 8.50 (6.27-11.8) |
| 10-day | 0.971 (0.859-1.12) | 1.45 (1.28-1.68) | 2.13 (1.88-2.47) | 2.74 (2.39-3.19) | 3.63 (3.07-4.36) | 4.37 (3.64-5.37) | 5.19 (4.22-6.52) | 6.10 (4.83-7.86) | 7.45 (5.67-9.97) | 8.59 (6.34-11.9) |
| 20-day | 1.06 (0.934-1.22) | 1.58 (1.40-1.83) | 2.32 (2.04-2.68) | 2.96 (2.59-3.45) | 3.89 (3.30-4.68) | 4.67 (3.88-5.73) | 5.51 (4.48-6.91) | 6.43 (5.09-8.29) | 7.79 (5.94-10.4) | 8.94 (6.59-12.4) |
| 30-day | 1.13 (0.998-1.30) | 1.70 (1.50-1.96) | 2.49 (2.19-2.89) | 3.17 (2.77-3.70) | 4.16 (3.53-5.01) | 4.97 (4.13-6.10) | 5.84 (4.75-7.33) | 6.80 (5.38-8.76) | 8.19 (6.24-11.0) | 9.35 (6.90-12.9) |
| 45-day | 1.24 (1.10-1.43) | 1.88 (1.66-2.18) | 2.76 (2.44-3.20) | 3.51 (3.07-4.10) | 4.58 (3.88-5.51) | 5.45 (4.53-6.69) | 6.38 (5.18-8.00) | 7.38 (5.85-9.51) | 8.84 (6.73-11.8) | 10.0 (7.41-13.9) |
| 60-day | 1.34 (1.18-1.55) | 2.05 (1.81-2.36) | 3.00 (2.65-3.48) | 3.81 (3.33-4.45) | 4.95 (4.20-5.96) | 5.87 (4.88-7.20) | 6.84 (5.56-8.59) | 7.89 (6.25-10.2) | 9.40 (7.16-12.6) | 10.6 (7.85-14.7) |

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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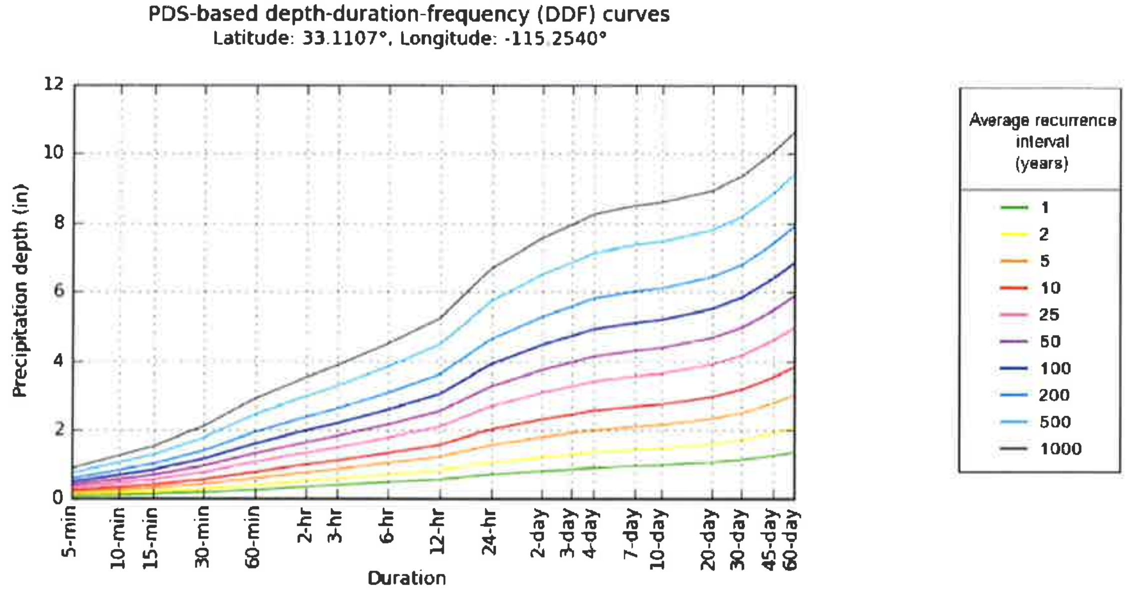
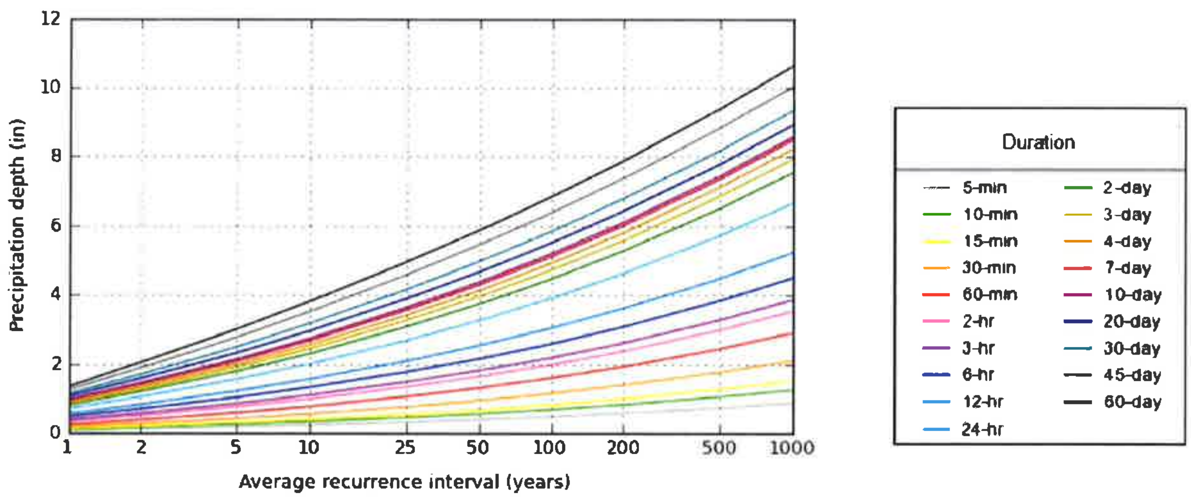
## PF graphical




NOAA Atlas 14, Volume 6, Version 2 Created (GMT): Thu Mar 22 13:51:30 2018

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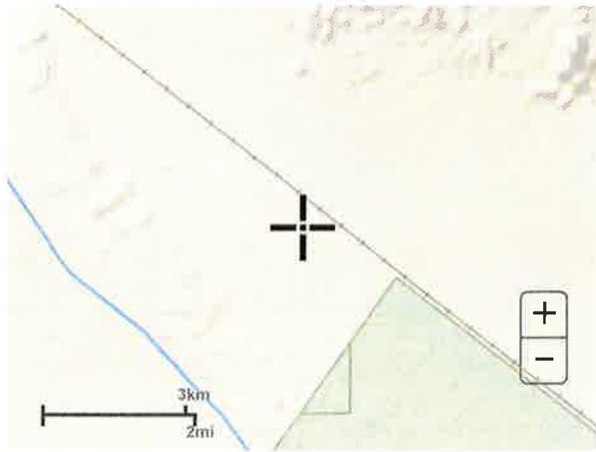
## Maps & aerials

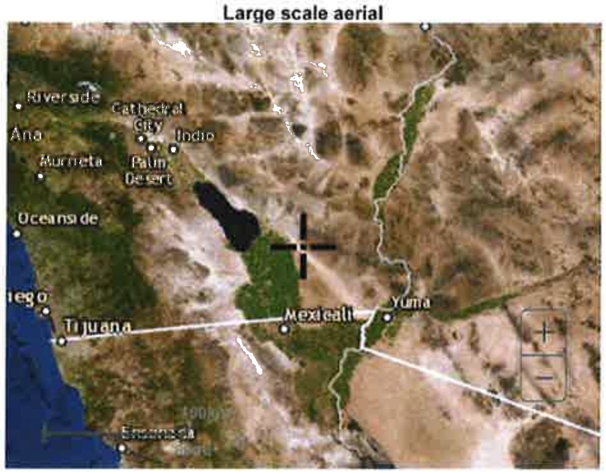
**Small scale terrain**




**Large scale terrain**


**Large scale map**

Large scale aerial

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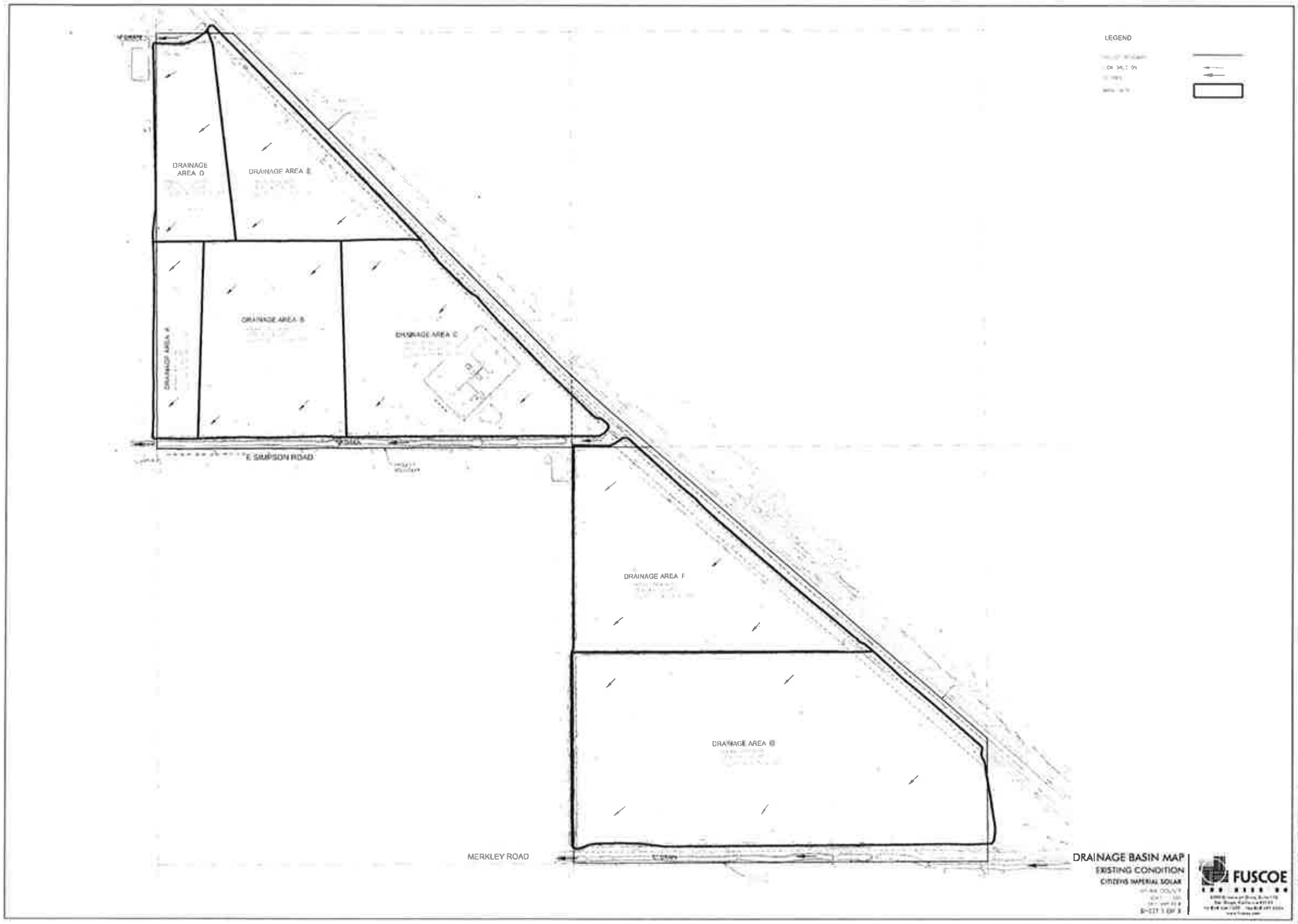
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX - E

Drainage Basin Map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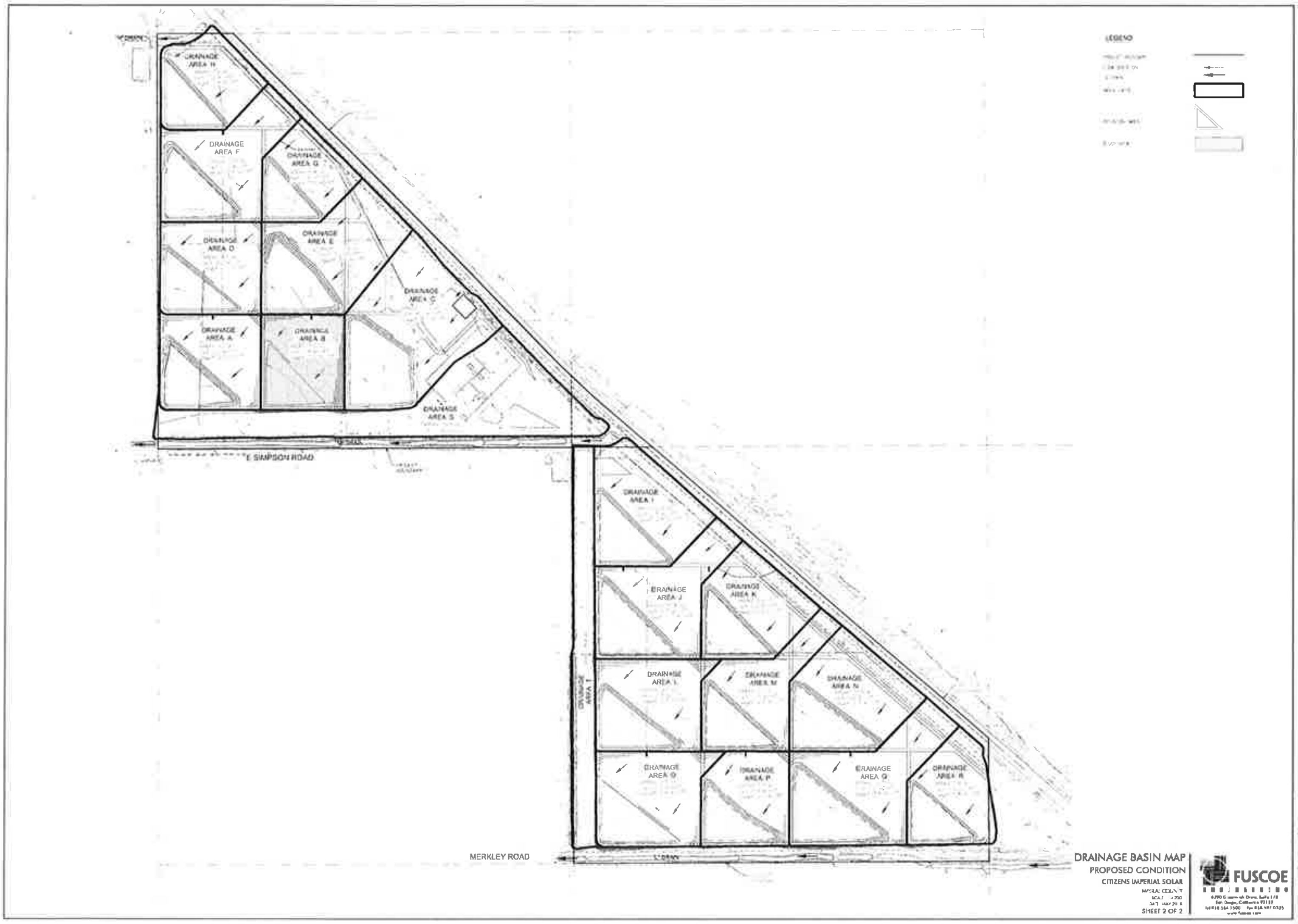
DRAINAGE AREA D
DRAINAGE AREA E
DRAINAGE AREA A
DRAINAGE AREA B
DRAINAGE AREA C
E SIMPSON ROAD
DRAINAGE AREA F
DRAINAGE AREA G
MERKLEY ROAD
DRAINAGE BASIN MAP
EXISTING CONDITION
CITIZENS IMPERIAL SOLAR
FUSCOE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DRAINAGE AREA D
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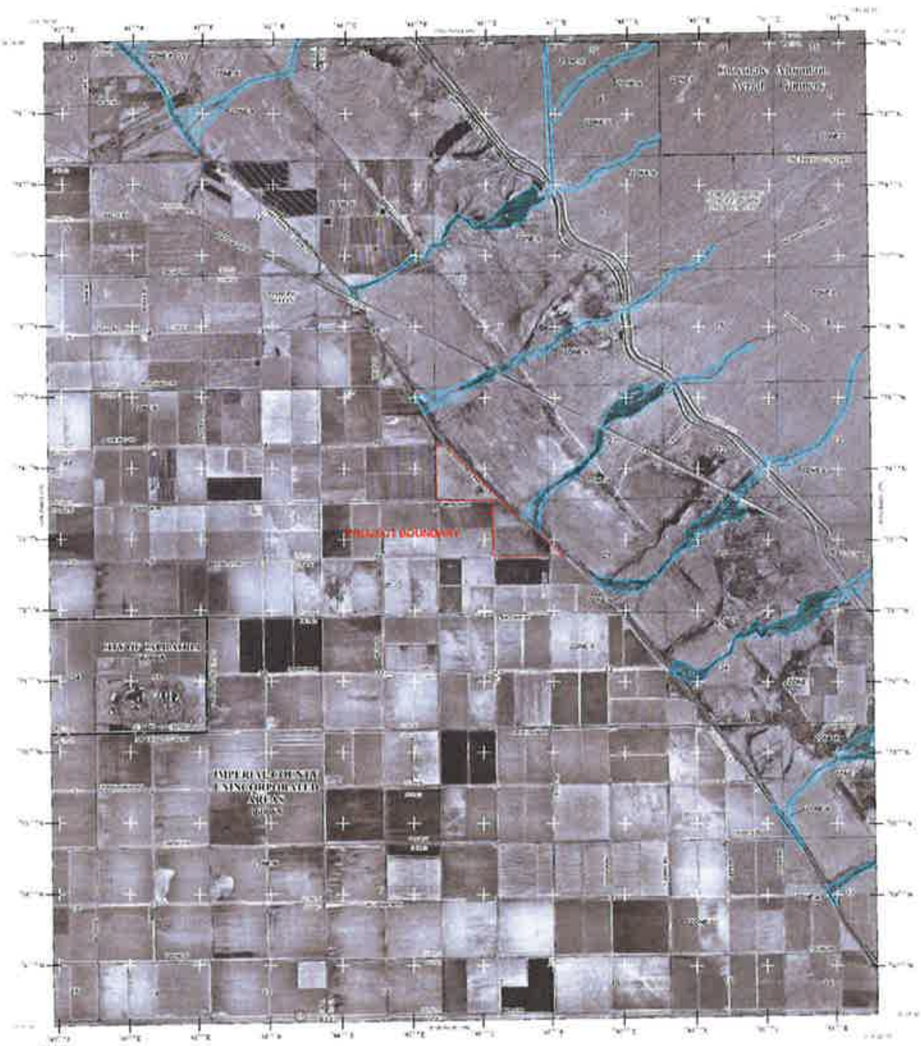
DRAINAGE AREA C
DRAINAGE AREA A
DRAINAGE AREA B
DRAINAGE AREA S
E SIMPSON ROAD
DRAINAGE AREA I
DRAINAGE AREA J
DRAINAGE AREA K
DRAINAGE AREA L
DRAINAGE AREA M
DRAINAGE AREA N
DRAINAGE AREA T
DRAINAGE AREA O
DRAINAGE AREA P
DRAINAGE AREA Q
DRAINAGE AREA R
MERKLEY ROAD
DRAINAGE BASIN MAP
PROPOSED CONDITION
CITIZENS IMPERIAL SOLAR
SHEET 2 OF 2
FUSCOE

# APPENDIX - F

## FEMA FIRMettes

## NOTES TO USERS




## LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

OTHER FLOOD AREAS

OTHER AREAS

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

150 0 150 300 METERS

PANEL 0750C

NATIONAL FLOOD INSURANCE PROGRAM

# FIRM

## FLOOD INSURANCE RATE MAP

## IMPERIAL COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 750 OF 2300

MAP NUMBER 06025C0750C

EFFECTIVE DATE SEPTEMBER 26, 2008

Federal Emergency Management Agency

# National Flood Hazard Layer FIRMette

FEMA


## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

**SPECIAL FLOOD HAZARD AREAS**
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

- NO SCREEN: Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs

**OTHER AREAS**
- Area of Undetermined Flood Hazard *Zone D*

**GENERAL STRUCTURES**
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

**OTHER FEATURES**
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

**MAP PANELS**
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/6/2018 at 2:44:28 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.