PRELIMINARY DRAINAGE STUDY

FOR

BIG ROCK CLUSTER SOLAR FARMS

8minutenergy
RENEWABLES
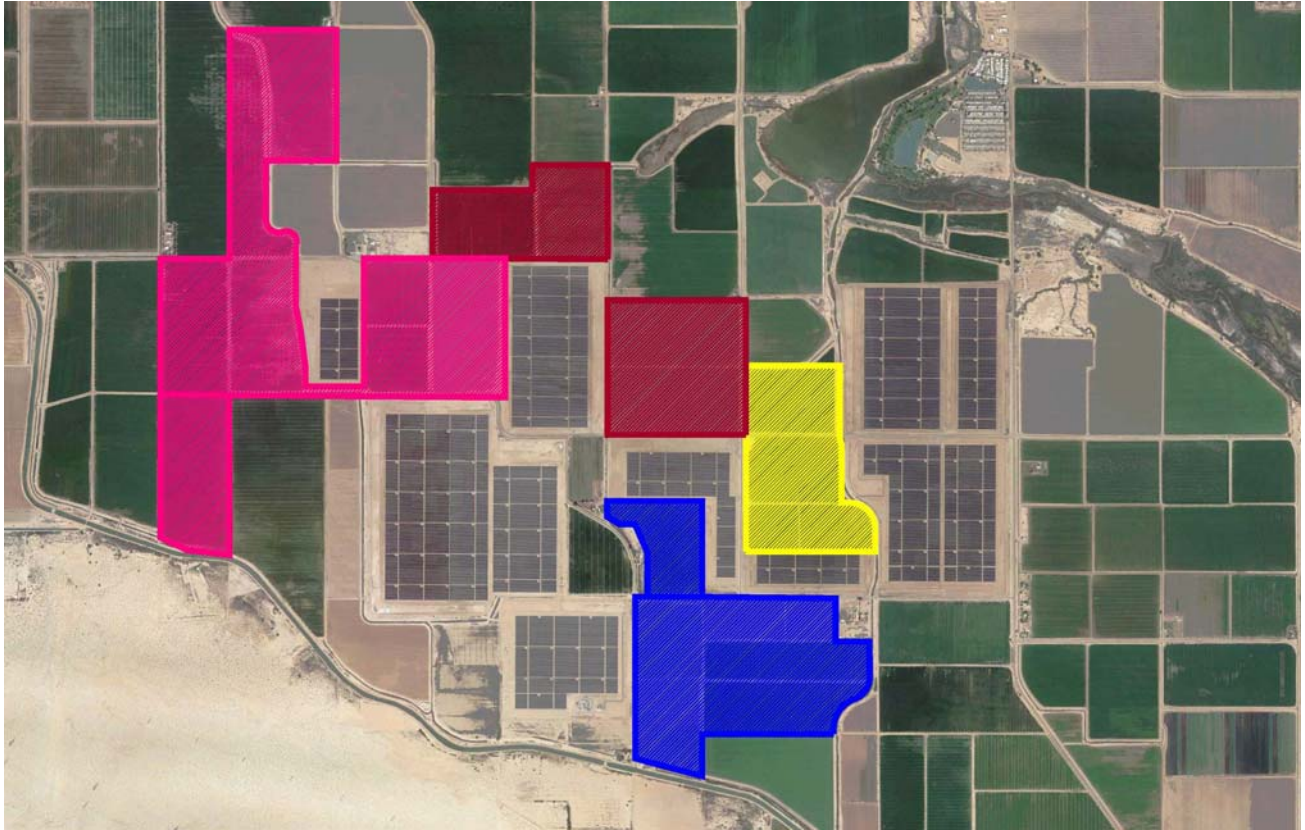
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DESIGN &
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Prepared 5-15-17
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Revised 10-03-17

Table of Contents

List of Figures

List of Tables

Exhibits

1   INTRODUCTION

1.1   PURPOSE

The purpose of this drainage report is to present the drainage criteria, methodology and analysis of on-site drainage conditions, in support of the Big Rock Cluster Solar Farms, and to provide recommendations for drainage and grading concepts for the proposed site development. This report addresses the recommended on-site drainage facilities by:

- Establishing drainage design criteria and concepts.

- Describing the existing and proposed drainage patterns.

- It is established in this drainage study that each field will act as its own retention basin and supported by the hydrology and hydraulic calculation it is determined that each field has the capacity to retain the volume resulting from calculating a laminar flow of 3 inches of rain over the entire tributary area to each agricultural field.

- The drainage design will be conducted in accordance with the County of Imperial's design criteria, which establishes that 100% of the 100-year storm (3 inches of rain) will be stored on-site and released into the IID drainage system using existing drainage connections.

Calculations were performed according to the methodology and procedures outlined in the *County of Imperial Department of Public Works Engineering Design Guidelines Manual for the Preparation and Checking of Street Improvements, Drainage and Grading Plans with Imperial County, 2008.*

Included in the appendices are the on-site drainage maps and retention calculations.

2   LOCATION
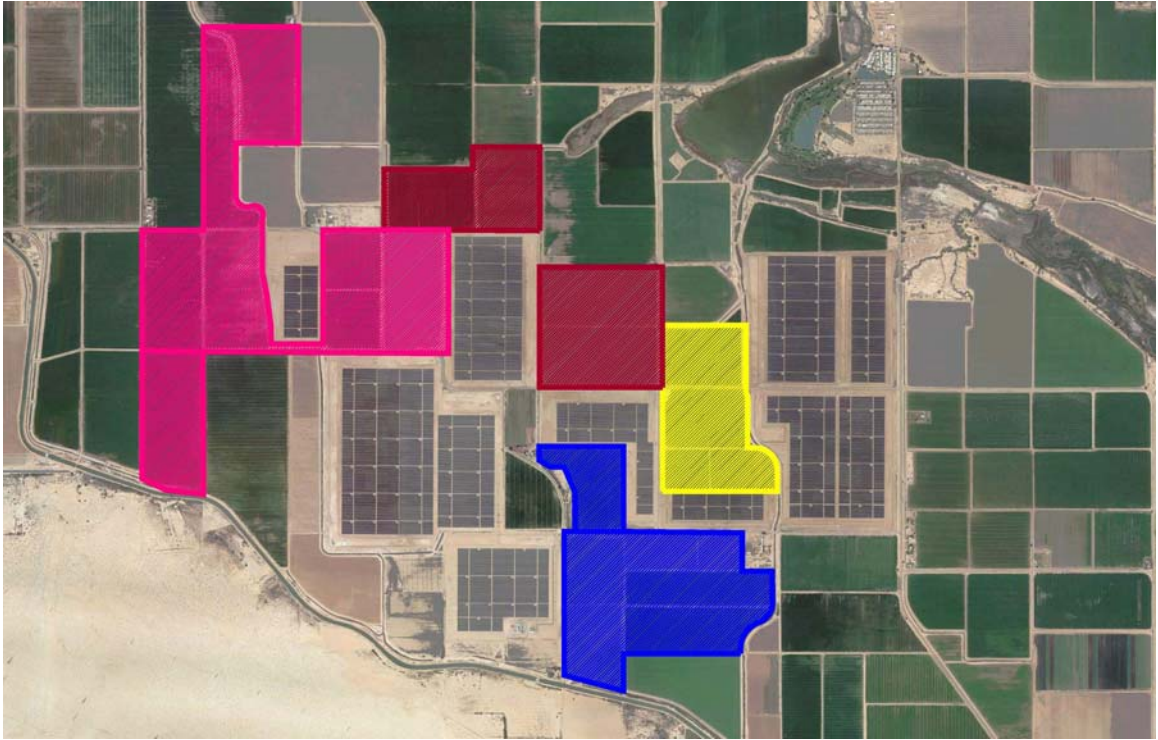
The Big Rock Cluster Solar Farms consist of four Solar Sites; Big Rock Site, Laurel 1, Laurel 2 and Laurel 3 Sites. The Project Sites are located south of Interstate 8, west of Drew Road and Vogel Road, north of Mandrapa Road and east of Hyde Road in the Imperial Irrigation District Area. The Project Sites are approximately eight miles southwest of the City of El Centro, three miles south of

Seeley and fourteen miles west of Calexico, in the unincorporated area of the Imperial County, in the State of California. The project lies within Sections 21, 22, 26, 27, 28, 34, and 35 of Township 16 South, Range 12 East, San Bernardino Meridian. The Project Vicinity Map, and the Project Site Map are graphically shown in figure 1 and Figure 2.

Figure 1: Project Vicinity Map

Figure 2: Project Site Map

3 SITE CONDITIONS AND PROPOSED DEVELOPMENT

The project area consists of eighteen (18) agricultural parcels, encompassing approximately 1380 gross acres (see table 1). The topography of the Project Sites is relatively flat The Project Sites have been historically used as farmland. On the high side of each farm field are concrete lined or earthen irrigation canals used to flood irrigate the farm fields. Tailwater ditches generally flow north or south to convey the excess irrigation water and storm water runoff to existing concrete drain boxes and 12" concrete discharge pipes that drain into Imperial Irrigation District (IID) drains. Elevated dirt field access roads run along the perimeter of the farm fields. There are existing houses/buildings in the vicinity of the project area, and one existing abandoned farm homestead is located just outside the southwesterly corner of the Big Rock Site project boundary that is not part of the project.

Table 1 – LAUREL PROJECT PARCELS (1,038 acres)				
OWNER	APNs	AREA (ACRES)	PROJECT	ZONING
Pearl Evans, LLC	051-310-023	60	Laurel 1	A-2-R
Nancy and JC Nale	051-360-005	111	Laurel 1	A-2-R
Kuhn	051-300-032 (portion)	80	Laurel 2	A-2-R
Kuhn	051-300-036	40	Laurel 2	A-3
Kuhn	051-310-027	120	Laurel 2	A-2-R
Kuhn	051-310-028	40	Laurel 2	A-2-R
Preece	051-270-027 (portion)	58	Laurel 3	A-2-R
Preece	051-270-047	81	Laurel 3	A-2-R
Preece	051-300-008	80	Laurel 3	A-2-R
Preece	051-300-009	80	Laurel 3	A-2-R
Preece	051-300-030 (portion)	145	Laurel 3	A-2-R
Preece	051-300-039	48	Laurel 3	A-2-R
Childers	051-330-001	95	Laurel 3	A-3

Table 2 – BIG ROCK PROJECT PARCELS (342 acres)				
OWNER	APNs	AREA (ACRES)	PROJECT	ZONING
Carolyn Childers	051-350-015 051-350-016	107	Big Rock 1	A-3
Carroll Childers	051-360-038	45	Big Rock 1	A-3
Norma Hampton And Carroll Childers	051-360-028	130	Big Rock 1	A-3
Scopesi	051-330-024	60	Big Rock 1	A-2-R

The project is being developed as four photovoltaic energy solar farms. Proposed improvements to the sites will include construction of approximately 325 MW-AC photovoltaic energy facility, step up transformers, and perimeter and interior roads for operations and maintenance. The power generated by the project will be delivered from the project sites via up to 230 KV overhead and/or underground electrical transmission line(s) originating from an on-site substation(s) switchyard(s), and terminating at the proposed Imperial Irrigation District (IID) Fern Substation. In the alternative, power may be delivered to the San Diego Gas & Electric (SDG&E) Imperial Valley Substation, Drew Switchyard, or Imperial Solar Energy Center West Substation.

There are three IID delivery canals in the vicinity of the project site. The Westside Main Canal runs east/west along the south side of the Big Rock 1 Site and along the south side of Laurel 3 Site. The Fern Canal runs north/south along the west side of the Big Rock 1 Site and Laurel 2 Site and along the eastside of Laurel 3

Site. The Fig Canal runs west/east along the north side of the Big Rock 1 Site and then turning north along the west side of the Laurel 1 Site.

There are six IID drains along/near the project limits that collect excess irrigation and storm water. The Fig Drain runs north along the east side of the Big Rock 1 and Laurel 1 Sites. The Diehl Drain runs north along the west side of the Laurel 1 Site and along the east side of the Laurel 2 Site, then turns east along the north side of the Laurel 1 Site. The Wixom Drain that runs north along the west side of the easterly portion of Laurel 2 Site and along the east side of the westerly portion of the Laurel 2 Site, and along the west side of the Big Rock 1 Site. The Dixie Drain that bisects the Laurel 3 Site. The Dixie Drain No. 3C that service the easterly portion of Laurel 3 Site and runs north along the west side of the westerly portion of Laurel 2 site. The Dixie Drain 3-D runs west/east along the south side of Laurel 3 Site.

It is established in this drainage study that each field will act as its own retention basin and supported by the hydrology and hydraulic calculation it is determined that each field has the capacity to retain the volume resulting from a laminar flow of 3 inches of rain over the entire tributary area to each agricultural field.

4 FEMA FLOODPLAIN CLASSIFICATION

The project site is located on the FEMA FIRM Panel 2050 of 2300 Map Number 06025C2050C and on the FEMA FIRM Panel 1700 of 2300 Map Number 06025C1700C effective September 26, 2008 in Zone X. The FEMA un-shaded Zone X designation is an area determined to be outside the 0.2% annual chance floodplain. The FIRM panels are included in Exhibit A and Exhibit B.

5 STORM WATER MANAGEMENT

5.1 Existing Drainage Conditions

The existing farm fields are graded to compounded planar slopes. Generally, the fields slope from east to west at slope percentage rates between 0.10% to 0.20% and north or south at slope percentage rates between 0.10% to 0.20%. The very flat topography allows for the irrigation water to move slowly over the field and promote absorption in the existing clay soils.

Irrigation tailwater outlet boxes and 12" diameter concrete pipes drain the excess irrigation tailwater and storm event runoff water to the IID drains at all low areas for each farm field. Elevated field roads or drain bank maintenance roads that

are graded to about one foot above the adjacent farm field, are located at the low ends of each field.

Based upon review of the existing topography, it is determined that off-site run off does not enter the project development areas due to the presence of physical features presenting barriers to the off-site flow (County Roads, IID Canal and Drains and private field roads). Off-site storm water may pond up against these facilities and since the off-site flow patterns will be maintained it has been determined (based on existing topography) that the off-site drainage has no impacts on the project site, therefore analysis of off-site drainage run off is not part of this study. On-site retention will be provided to maintain the existing drainage conditions to handle the 100-year storm water flows to exit the site by means of the existing IID outlet discharge structures.

In most of the farm fields there is an existing subsurface tile drain system used to remove salts accumulating from agricultural irrigation and crop production. The existing tile drain pipes are located approximately 5' to 8' below existing grade. The tile drain system is not used in the agricultural fields of the projects. The existing site tile drain systems will remained in place and will only be removed from the site if they are in conflict with permanent structures (such as transmission power poles, collection systems, substation equipment etc.)

5.2   Proposed Drainage Conditions

In proposed conditions, the site will be developed with solar arrays, fencing, access road and O&M Buildings. The private irrigation delivery ditches within the project sites may be removed for the installation of the solar arrays, but the farm fields will generally remain at their existing grades and flow patterns will remain unchanged. The ground below the solar panels will not be an impermeable surface; rainwater will run off of the panels and fall to the earthen surface. Within and around the arrays 20' wide fire access roads will be constructed. The drainage analysis is based on on-site volumes and will include the amount of storm water generated by the 100-year storm (3 inches of rain) and it is assumed that 100% of the 100-year storm (a "C" factor of 1) will be retained on site.

Each field was analyzed separately based on the volume of runoff generated from 100-year storm (3 inches of rain). The division of each field is presented on Exhibits C to G, of the On-site Drainage Maps.

The existing IID drain connections and existing 12" diameter concrete discharge pipes will be utilized to drain out the fields. Based on the calculated retention

volumes required, the existing perimeter roads and berms will be maintained (some berms will need to be raised during the grading activities to provide sufficient detention in the sub-sites where the existing perimeter roads and berms are not high enough). This design maintains the existing drainage patterns for each field and the raised roads and berms will retain the runoff volume resulting from 100-year storm (3 inches of rain). Retention basin calculations have been provided in Exhibits C to G and in Table 3.

All on-site storm water contributions will be handled individually by every parcel that comprises the project. No storm water contributions will be disposed on to any County Public Right of Way.

The field after a 100 year storm event should empty within 72 hours in order to provide mosquito abatement. If this is not possible then the owner should provide a mosquito abatement plan to the satisfaction of the Environmental Health Services Department (EHS).

All existing outlet discharge pipes will be upgraded (if required) in accordance with IID Standards to satisfy the requirements of the Hydrology/Hydraulic analysis preformed by IID for the agricultural base flow conditions and the modeling scenario for the 100yr-24hr rainfall event contributions to the existing drain systems within the project area.

5.3   Retention Basin Calculation Parameters

Hydrologic calculations are made in accordance with the following parameters:

1. The total volume retained will be 100% of the 100 year storm (3 inches of rain).
2. Retention will be provided in ponding areas within the project under the proposed solar panel arrays, next to the existing IID drain connection for each field.

5.4   Retention Basin Sizing

The retention basins are sized according to the County of Imperial Public Works Department Drainage Design Criteria:

The volume is calculated using the following equation:

V=A x P x C

Where
V= Required storage volume in Cubic Feet
A= Area of the basin in Acres
P= Precipitation depth in inches
C= Runoff coefficient reduction factor (1)

Table 3 - Retention Basin Sizing			
Basin	Drainage Area (AC)	Storage Required (AC-FT)	Storage Provided (AC-FT)
Big Rock Site			
B-1	45.00	11.25	11.62
B-2	48.00	12.00	12.07
B-3	59.00	14.75	14.83
B-4	61.00	15.25	16.22
B-5	69.00	17.25	17.25
B-6	60.00	15.00	16.52
Laurel Site			
L1-1	60.00	15.00	15.01
L1-2	56.00	14.00	14.00
L1-3	23.00	5.75	5.76
L1-4	32.00	8.00	8.01
L2-1	79.00	19.75	19.89
L2-2	79.00	19.75	20.83
L2-3	59.00	14.75	14.75
L2-4	63.00	15.75	15.75
L3-1	84.00	21.00	21.01
L3-2	38.00	9.50	10.12
L3.-3	38.00	9.50	10.12
L3-4	79.00	19.75	21.12
L3-5	91.00	22.75	22.95
L3-6	83.00	20.75	22.39
L3-7	79.00	19.75	22.39*
L3-8	95.00	23.75	23.76

6   CONCLUSIONS

This drainage study report was prepared in accordance with the County of Imperial's design criteria that establishes that 100% of the 100-year storm (3 inches of rain) will be stored on-site and drainage be released into the IID drainage system using an existing drainage connection. Additionally the following facts were considered in the preparation of the drainage report:

- Each Sub-Site basins will retain its own drainage and the field will act as a retention basin.
- The drainage stored in the parcel will be released in less than 72 hours or else a mosquito abatement plan shall be implemented.
- Earthen berms will be provided to ensure the drainage is retained on-site.
- Connections to existing IID drainage facilities will be done according to the Imperial Irrigation District standards and according to the encroachment document conditions.
- It has been determined that off-site drainage from existing roads and adjacent fields have minimal or no impacts on the on-site drainage retention capacity.

7   REFERENCES

County of Imperial Department of Public Works, Engineering Design Guidelines Manual for the Preparation and Checking of Street Improvements, Drainage and Grading Plans within Imperial County, September 2008.

Exhibits

EXHIBIT A FEMA FIRM PANEL
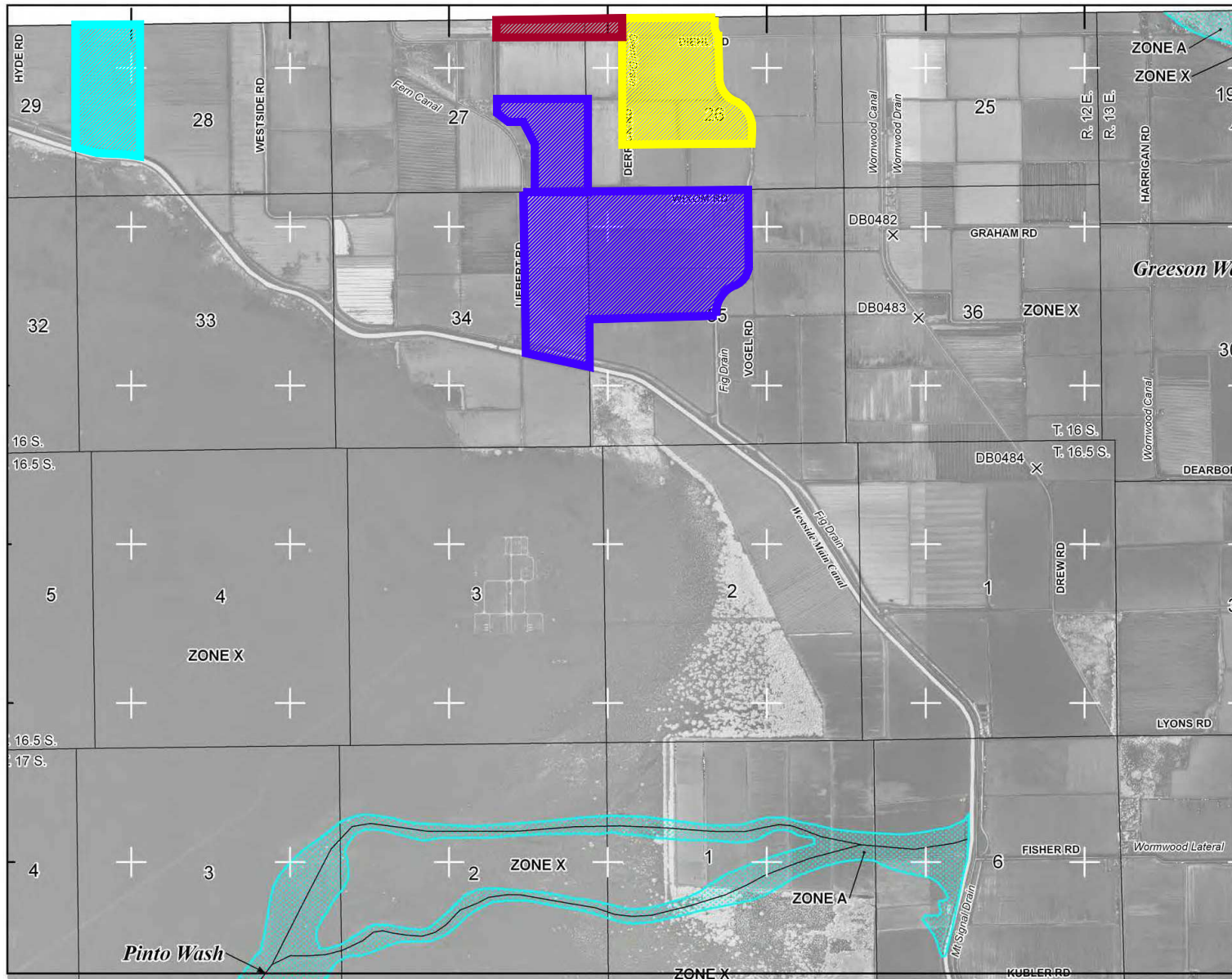
Legend
- BIG ROCK 1
- LAUREL 1
- LAUREL 2
- LAUREL 3

MAP SCALE 1" = 2000'

FEET
METE

NFIP

PANEL 2050C

FIRM
FLOOD INSURANCE RATE MAP

IMPERIAL COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 2050 OF 2300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
IMPERIAL COUNTY, UNINCORPORATED AREAS	060065	2050	C

Notice to User: The Map Number shown below should be used when placing map orders. the Community Number shown above should be used on insurance applications for the subject

MAP NUMBER
06025C2050C

EFFECTIVE DATE
SEPTEMBER 26, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov
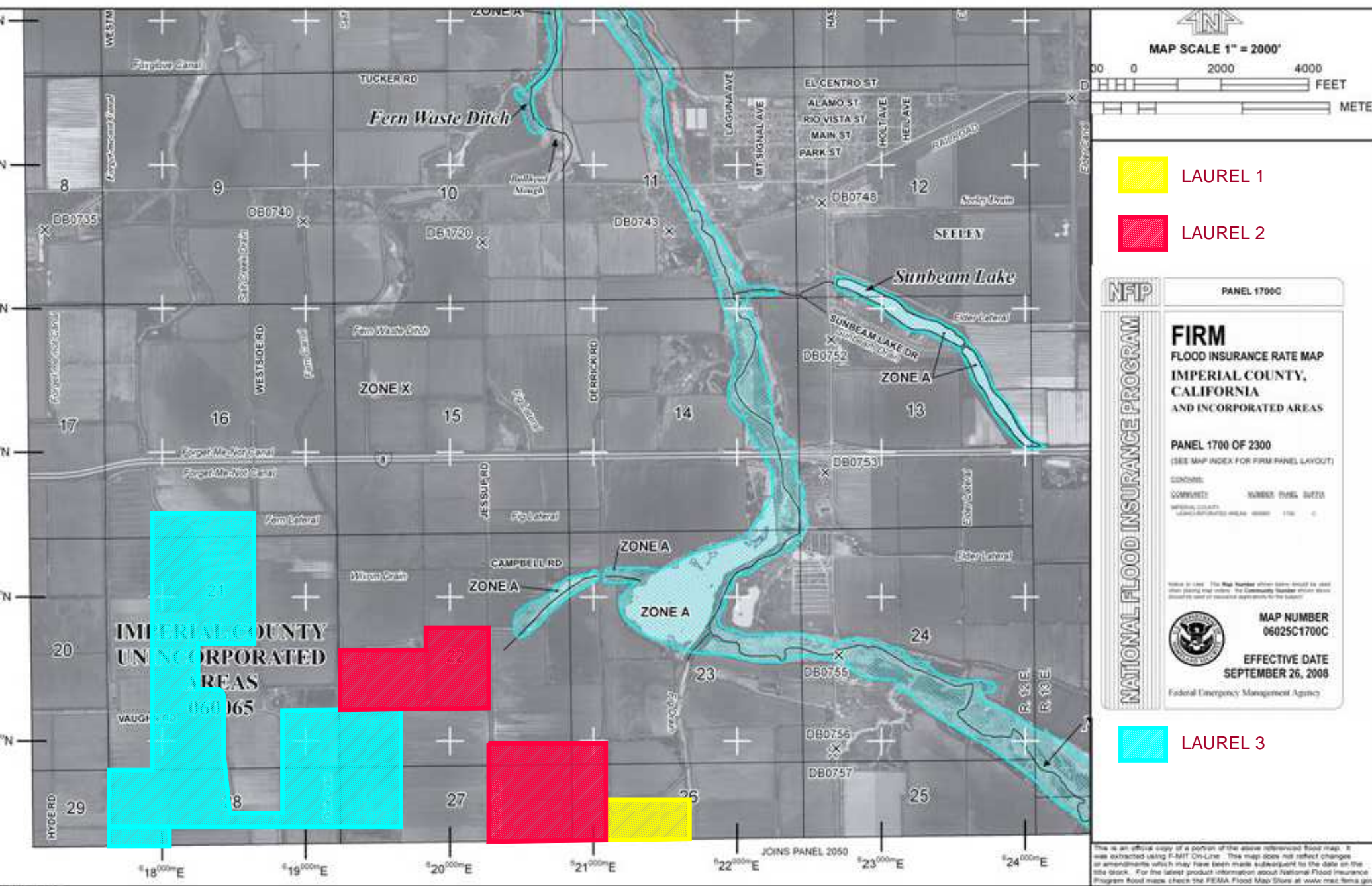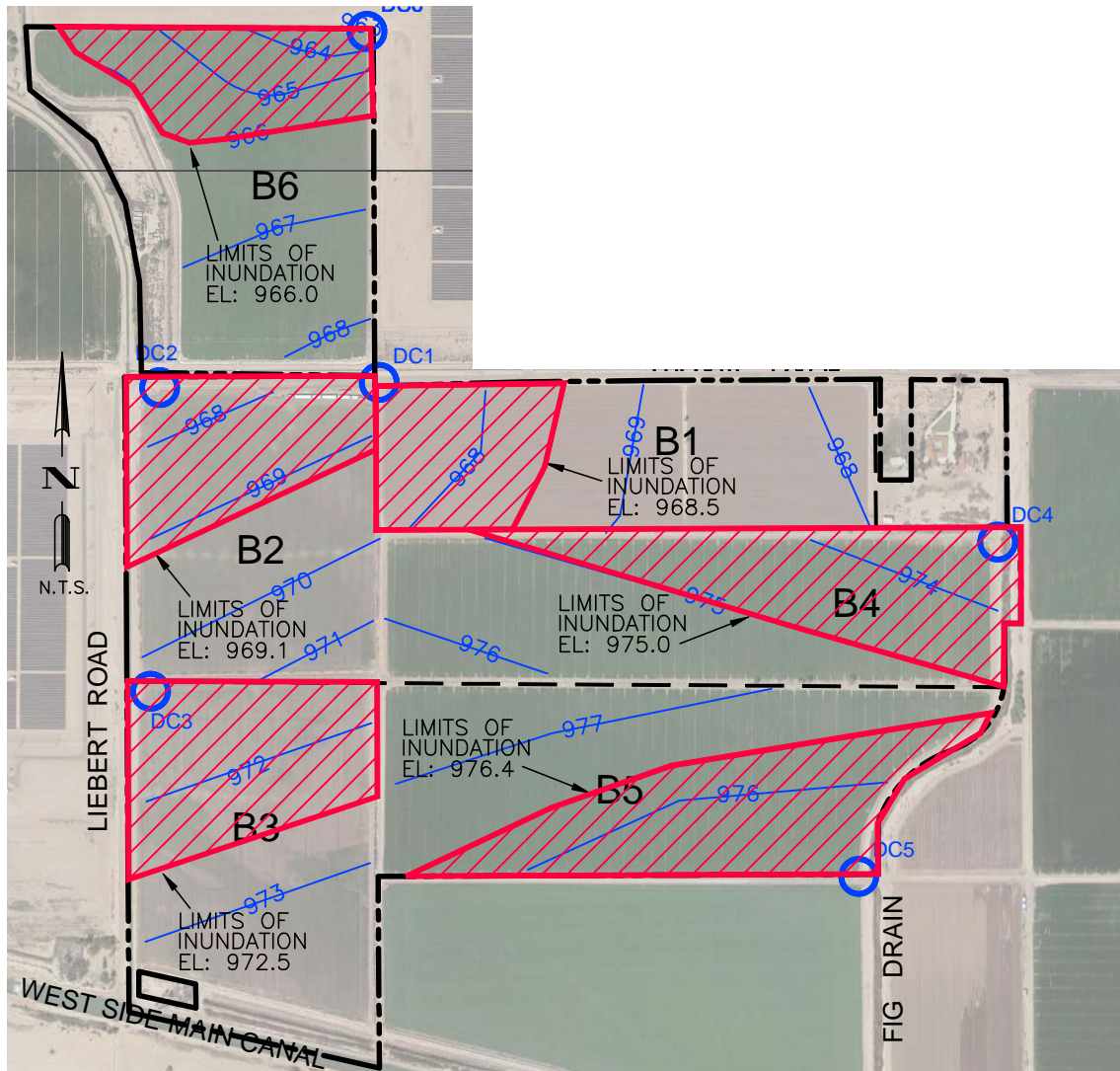
EXHIBIT B FEMA FIRM PANEL

AREA: B1
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 45.00 Ac.
V=490 050 CF

RETENTION PROVIDED AT 968.5 ELEVATION

V=0.50(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.5 FT
AREA OF INUNDATION= 674 792 SF
VOL. PROVIDED= 506 094 CF

AREA: B2
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 48.00 Ac.
V=522 720 CF

RETENTION PROVIDED AT 969.1 ELEVATION

V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.6 FT
AREA OF INUNDATION= 782 144 SF
VOL. PROVIDED= 525 600 CF

AREA: B3
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 59 Ac.
V=645 510 CF

RETENTION PROVIDED AT 972.5 ELEVATION

V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.5 FT
AREA OF INUNDATION= 1 025 400 SF
VOL. PROVIDED= 646 000 CF

AREA: B4
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 61 Ac.
V=664 290 CF

RETENTION PROVIDED AT 975.0 ELEVATION

V=0.33(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 2.0 FT
AREA OF INUNDATION= 1 060 000 SF
VOL. PROVIDED= 706 596 CF

AREA: B5
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
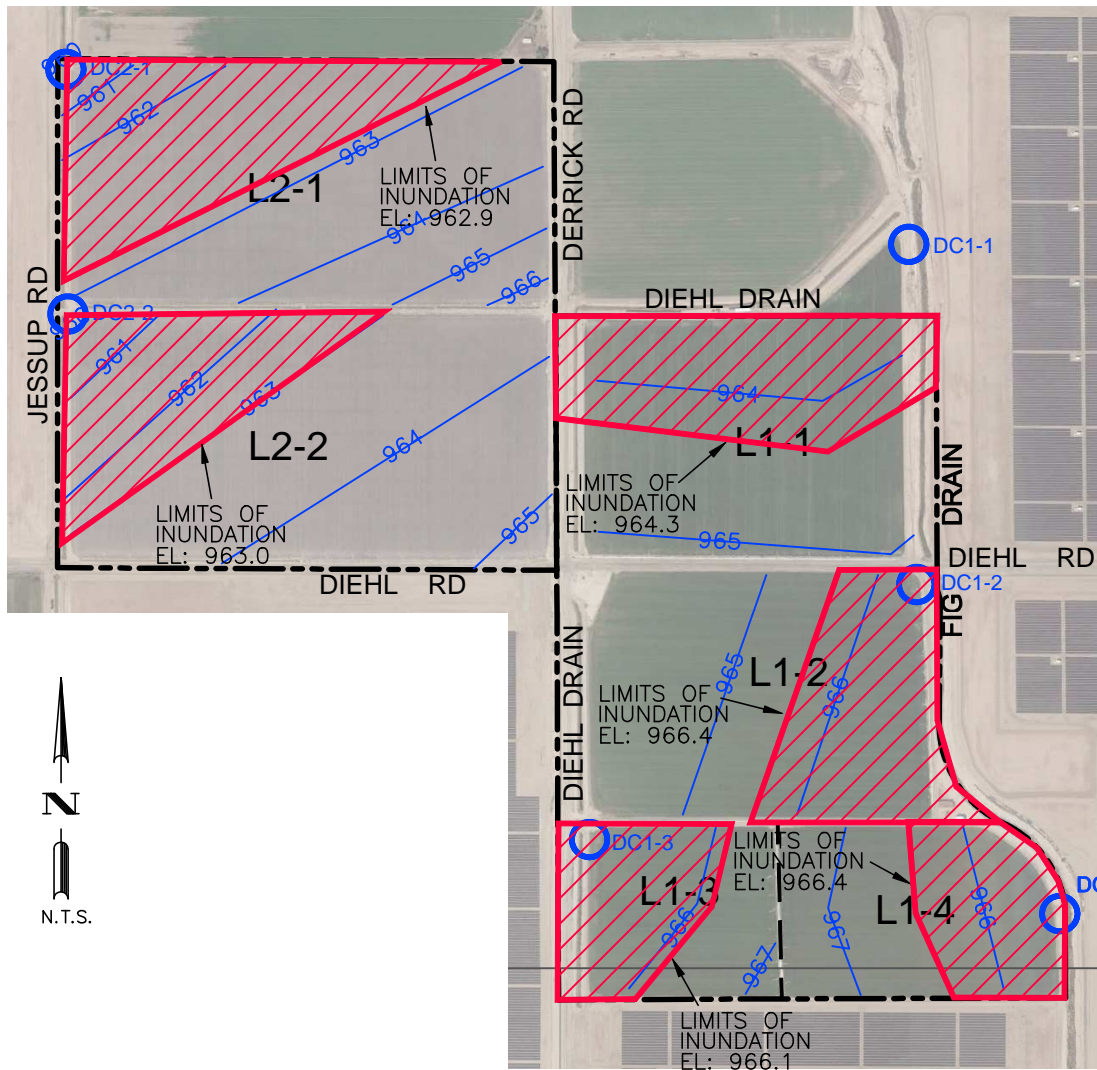A=AREA OF CONTRIBUTION (ACRES)= 69 Ac.
V=751 410 CF

RETENTION PROVIDED AT 976.4 ELEVATION

V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.4 FT
AREA OF INUNDATION= 1 278 060 SF
VOL. PROVIDED= 751 500 CF

AREA: B6
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 60 Ac.
V=653 400 CF

RETENTION PROVIDED AT 966.0 ELEVATION

V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 2.3 FT
AREA OF INUNDATION= 745 000 SF
VOL. PROVIDED= 719 670 CF

X:\Projects (Active)\17030-00 (8minutenergy-Drainage Study)\17030-02 BR-Laurel-Revised\17030-02EXHB.dwg   09/28/2017 17:13

Map labels:
DC2-1, DC2-2, DC1-1, DC1-2, DC1-3, DC1-
JESSUP RD, DERRICK RD, FIG DRAIN, DIEHL DRAIN, DIEHL DRAIN, DIEHL RD, DIEHL RD, DIEHL DRAIN
L2-1, L2-2, L1-1, L1-2, L1-3, L1-4

LIMITS OF INUNDATION EL: 962.9
LIMITS OF INUNDATION EL: 963.0
LIMITS OF INUNDATION EL: 964.3
LIMITS OF INUNDATION EL: 966.4
LIMITS OF INUNDATION EL: 966.4
LIMITS OF INUNDATION EL: 966.1

Contour labels: 961, 962, 963, 964, 965, 966, 967

N
N.T.S.

AREA: L1-1
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 60 Ac.
V=653 400 CF

RETENTION PROVIDED AT 964.3 ELEVATION
V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.3 FT
AREA OF INUNDATION= 1 197 800 SF
VOL. PROVIDED= 654 000 CF

AREA: L1-2
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 56 Ac.
V=609 840 CF

RETENTION PROVIDED AT 966.4 ELEVATION
V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.4 FT
AREA OF INUNDATION= 1 037 415 SF
VOL. PROVIDED= 610 000 CF

AREA: L1-3
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
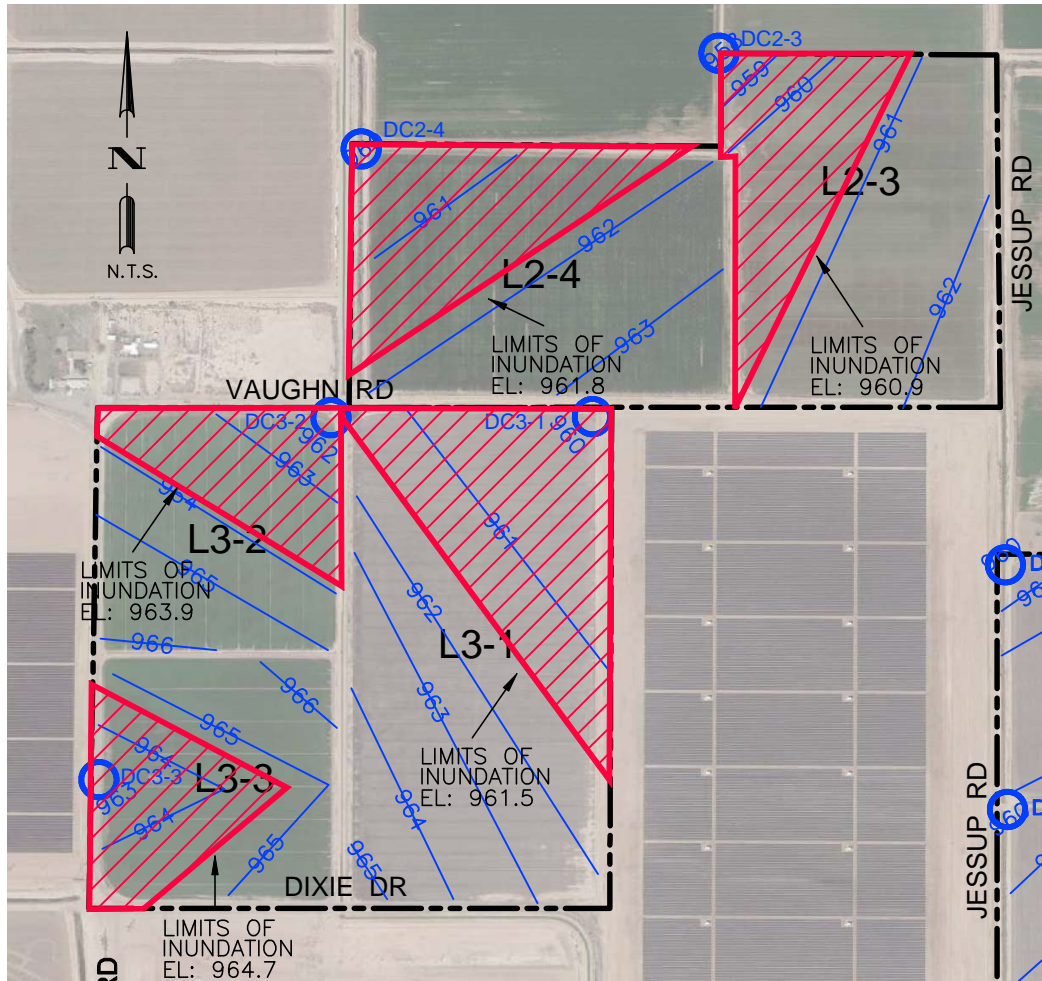A=AREA OF CONTRIBUTION (ACRES)= 23 Ac.
V=250 470 CF

RETENTION PROVIDED AT 966.1 ELEVATION
V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.1FT
AREA OF INUNDATION= 543 290 SF
VOL. PROVIDED= 251 000 CF

AREA: L1-4
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 32 Ac.
V=348 480 CF

RETENTION PROVIDED AT 966.4 ELEVATION
V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.4 FT
AREA OF INUNDATION= 593 537 SF
VOL. PROVIDED= 349 000 CF

AREA: L2-1
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 79 Ac.
V=860 310 CF

RETENTION PROVIDED AT 962.9 ELEVATION
V=0.33(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 2.0 FT
AREA OF INUNDATION= 1 300 000 SF
VOL. PROVIDED= 866 580 CF

AREA: L2-2
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 79 Ac.
V=860 310 CF

RETENTION PROVIDED AT 963.0 ELEVATION
V=0.33(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 2.8 FT
AREA OF INUNDATION= 982 000 SF
VOL. PROVIDED= 907 368 CF

AREA: L2-3
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 59 Ac.
V=642 510 CF

RETENTION PROVIDED AT 960.9 ELEVATION
V=0.33(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 2.2 FT
  AREA OF INUNDATION=   885 000 SF
VOL. PROVIDED= 642 510 CF

AREA: L2-4
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 63 Ac.
V=686 070 CF

RETENTION PROVIDED AT 961.8 ELEVATION
V=0.33(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.8 FT
  AREA OF INUNDATION=   1 155 000 SF
VOL. PROVIDED= 686 070 CF

AREA: L3-1
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 84 Ac.
V=914 760 CF

RETENTION PROVIDED AT 961.5 ELEVATION
V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.5FT
  AREA OF INUNDATION= 1 452 400 SF
VOL. PROVIDED= 915 000 CF

AREA: L3-2
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 38 Ac.
V=413 820 CF

RETENTION PROVIDED AT 963.9 ELEVATION
V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.5 FT
  AREA OF INUNDATION= 700 000 SF
VOL. PROVIDED= 441 000 CF
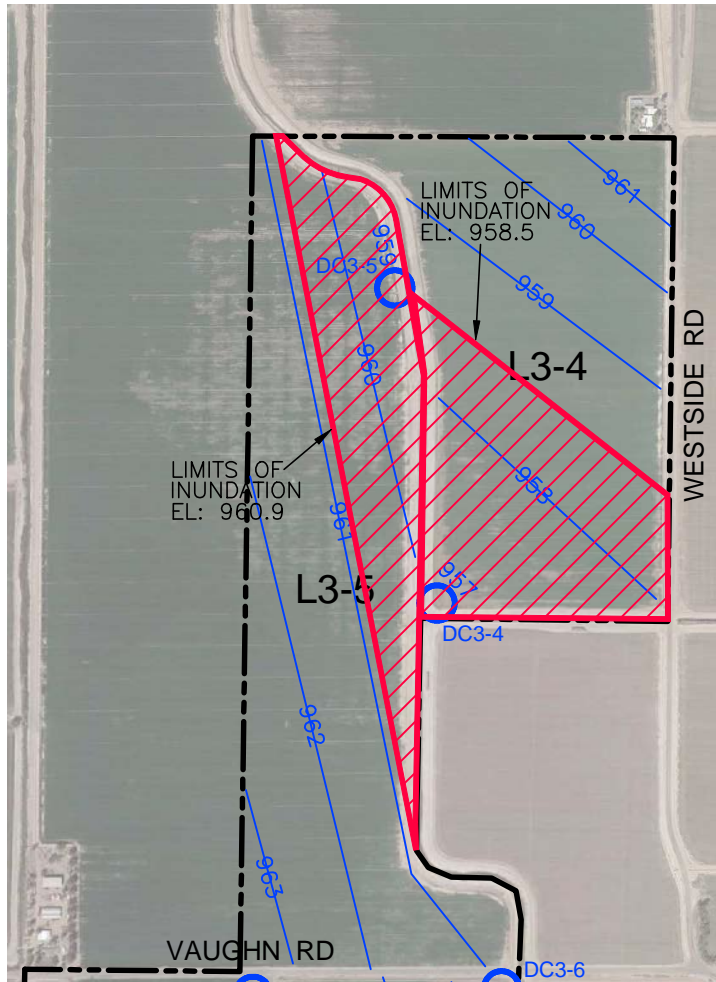
AREA: L3-3
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 38 Ac.
V=413 820 CF

RETENTION PROVIDED AT 964.7 ELEVATION
V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.5 FT
  AREA OF INUNDATION= 700 000 SF
VOL. PROVIDED= 441 000 CF

EXHIBIT E
POR. OF LAUREL 2 AND 3
DRAINAGE MAP
IMPERIAL VALLEY
DATE 9/29/17
BY STAFF
CLIENT 8minutenergy
FILE NAME 17030-02EXHB
JOB NUMBER 17030-02

SHEET
3
5
OF:

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AREA: L3-4
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 79 Ac.
V=860 310 CF

RETENTION PROVIDED AT 958.5 ELEVATION

V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.5 FT
AREA OF INUNDATION= 1 460 000 SF
VOL. PROVIDED= 919 800 CF

AREA: L3-5
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 91 Ac.
V=990 990 CF

RETENTION PROVIDED AT 960.9 ELEVATION

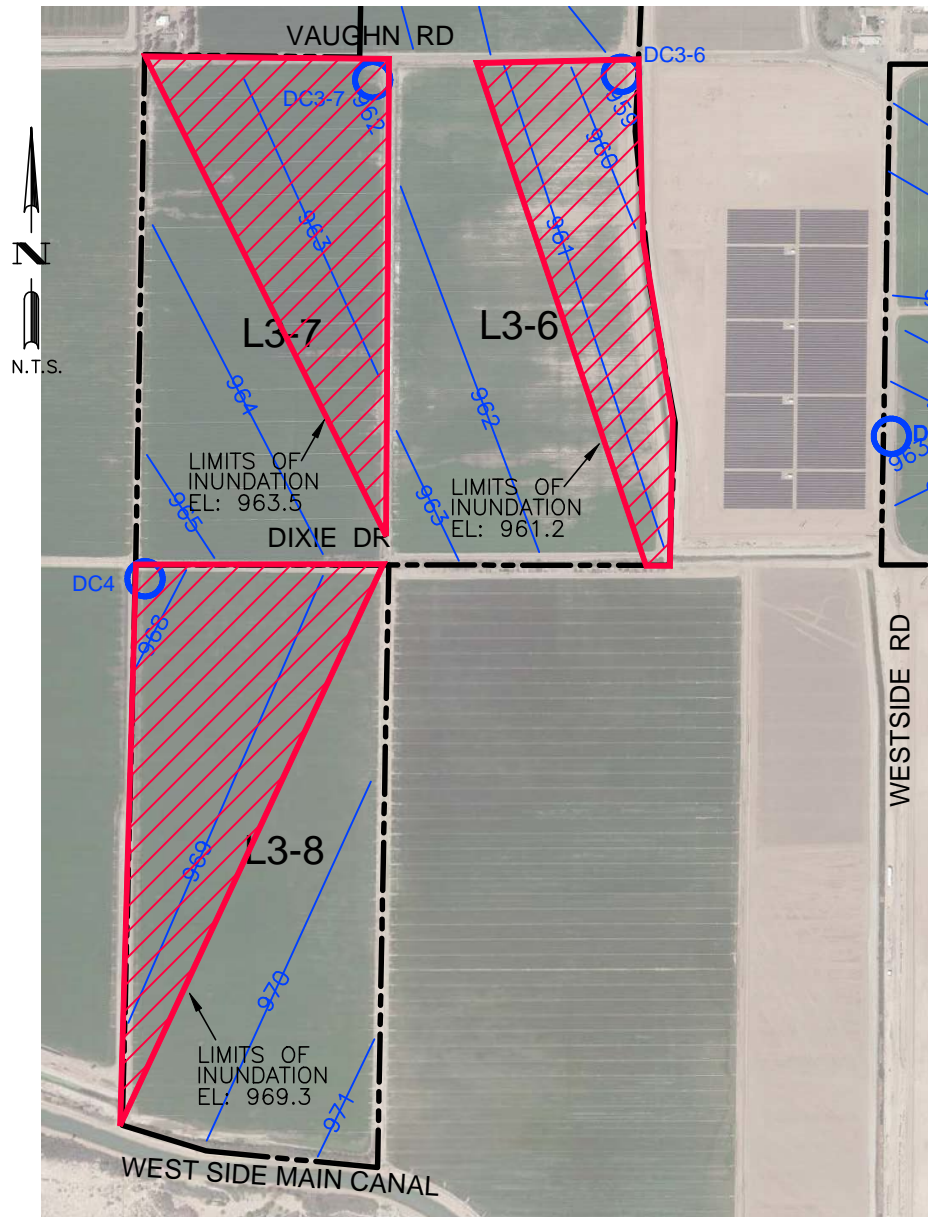V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.9 FT
AREA OF INUNDATION=   1 253 000 SF
VOL. PROVIDED= 999 894 CF

In-map labels:
LIMITS OF INUNDATION EL: 958.5
LIMITS OF INUNDATION EL: 960.9
L3-4
L3-5
WESTSIDE RD
VAUGHN RD
DC3-5
DC3-4
DC3-6
N
N.T.S.

EXHIBIT F
PORTION OF LAUREL 3
DRAINAGE MAP
IMPERIAL VALLEY
CLIENT 8minutenergy
SHEET
4
5
OF:
DATE 9/29/17
BY STAFF
FILE NAME 17030-02EXHB
JOB NUMBER 17030-02

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AREA: L3-6
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 83 Ac.
V=903 870 CF

RETENTION PROVIDED AT 961.2 ELEVATION
V=0.42(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.8 FT
AREA OF INUNDATION= 1 290 000 SF
VOL. PROVIDED= 975 240 CF

AREA: L3-7
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 79 Ac.
V=860 310 CF

RETENTION PROVIDED AT 963.5 ELEVATION
V=0.33(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.7 FT
AREA OF INUNDATION= 1 580 000 SF
VOL. PROVIDED= 886 380 CF

AREA: L3-8
STORM WATER VOLUMES
V=CIA
V=RETENTION VOLUME CAPACITY REQUIRED
C=RUNOFF COEFFICIENT REDUCTION FACTOR=1.0
I=PRECIPITATION DEPTH IN FEET=0.25' (3")
A=AREA OF CONTRIBUTION (ACRES)= 95 Ac.
V=1 034 550 CF

RETENTION PROVIDED AT 969.3 ELEVATION
V=0.33(MAX DEPTH)(POLYGON AREA)
MAX. DEPTH= 1.6FT
AREA OF INUNDATION= 1 960 000 SF
VOL. PROVIDED= 1 034 880 CF

Map labels: VAUGHN RD, DIXIE DR, WESTSIDE RD, WEST SIDE MAIN CANAL
L3-7, L3-6, L3-8
DC3-7, DC3-6, DC4
LIMITS OF INUNDATION EL: 963.5
LIMITS OF INUNDATION EL: 961.2
LIMITS OF INUNDATION EL: 969.3
N.T.S.

EXHIBIT G
POR. OF LAUREL 3 DRAINAGE MAP
IMPERIAL VALLEY
CLIENT: 8minutenergy
DATE: 9/29/17
BY: STAFF
FILE NAME: 17030-02EXHB
JOB NUMBER: 17030-02
SHEET 5 OF: 5

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