# Bradshaw Terminal Renewable Diesel & Bio by Rail

Drainage Analysis
Project No. 12555811

February 2022

Prepared for:
Kinder Morgan
1001 Louisiana Street, Suite 1000
Houston, TX 77002

# Prepared By:


Erik Fanselau 2/28/22

Erik Fanselau, PE Date

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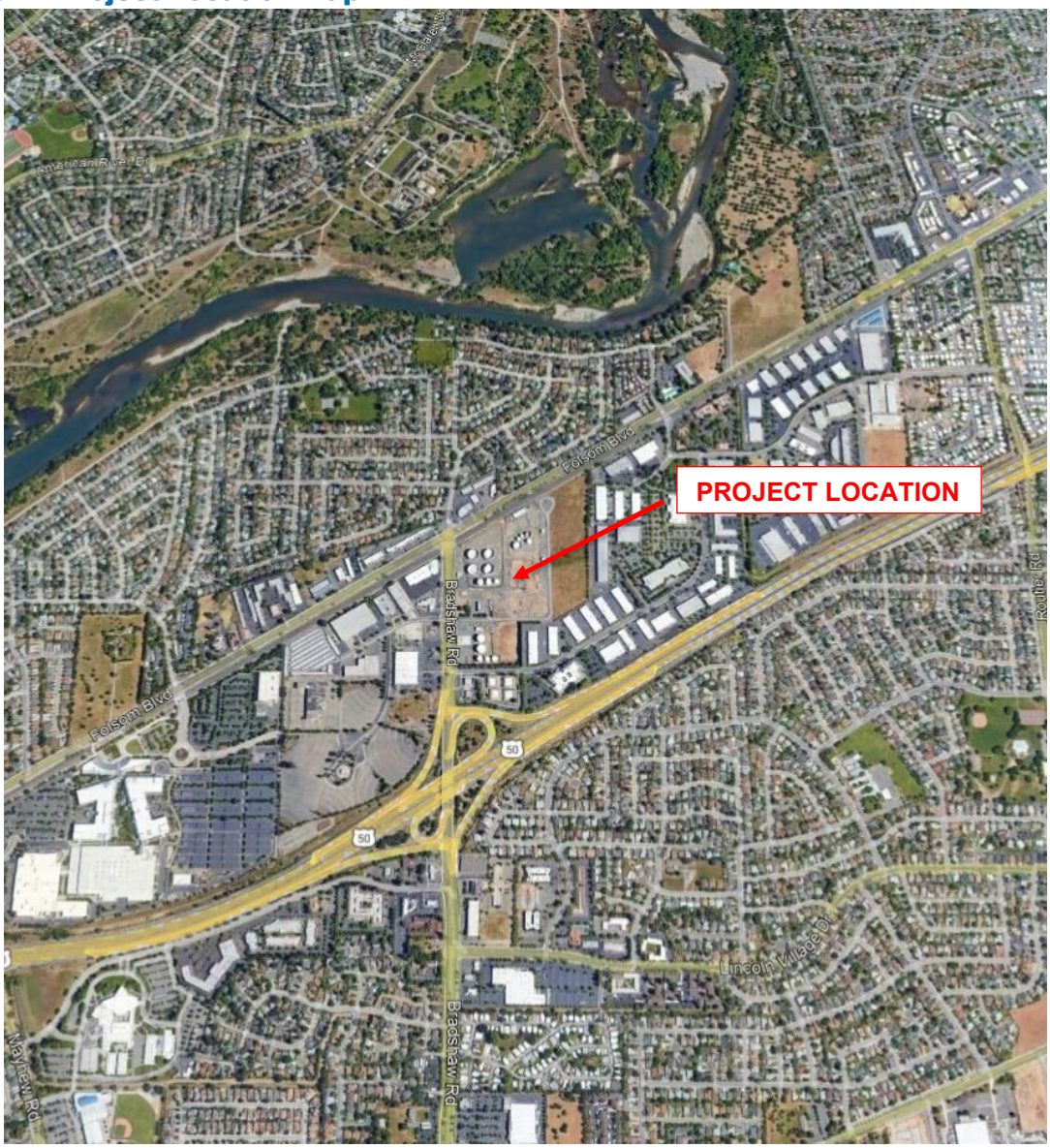
# 1. Introduction

The purpose of this drainage analysis is to assess the hydrologic and hydraulic characteristics of the modifications to the existing Kinder Morgan petroleum facility located at the southeast corner of the intersection of Bradshaw Road and Folsom Boulevard in Rancho Cordova, California. This facility is approximately 31 acres and consists of petroleum storage tanks, fuel truck loading racks, and related support facilities. The purpose of the project is to expand the use of the facility by adding two new storage tanks, additional fuel truck loading facilities, and new rail car unloading tracks. A new track will branch off of the Union Pacific track and run into the facility and split into two separate unloading tracks. Additional street paving will also be added to support the additional truck traffic.

**Figure 1 - Project Location Map**



## 2. Existing Conditions

The existing site is surrounded by developed area and discharges to the City drainage system. For the most part, drainage flows from east to west across the project site. The onsite drainage system consists of a series of ditches, pipes, culverts, and inlets. GHD used existing plans as well as the City website to determine the locations of existing drainage facilities. The onsite system connects to the City system on Bradshaw Road with a 42-inch pipe. This includes the business park to the east that drains to the project site. It is estimated that this offsite shed is approximately 18 acres and discharges to the existing ditch on the project site. Approximately 75% of the site is developed with a combination of tanks, equipment, gravel, and pavement. The remaining portion of the site is undeveloped with an open ditch in the middle of the shed. A SWPPP was previously prepared for other recent site improvements. This SWPPP was created by Arcadis and will be amended for the new project. See Appendix C for a summary of the onsite and offsite culverts.

Based on information provided by Caltrans, the site is located within the Sherman Lake-Sacramento River watershed and Lake Greenhaven subwatershed. The hydrologic area is Morrison Creek. The annual average precipitation is 18.11 inches and the site is also approximately 2000 feet south of the American River. See Appendix E for the Existing Shed Map.

## 3. Proposed Conditions

The proposed project will increase the amount of impervious pavement by approximately 1.6 acres. However, the overall drainage patterns will not change. The track construction will also require the extension of the existing culvert located in the large ditch in the eastern portion of the property. For the purposes of this analysis, the track structure will be evaluated as pervious material as it will consist of a ballasted section.

Two new tanks will be added to the main tank storage area with respective capacities of 15,000 BBL and 80,000 BBL. Both of the tanks will be located within a containment berm area that prevents the release of the stored product in the event of a failure. The Terminal operates under a Spill Prevention, Control, and Countermeasures Plan approved by the State of California. This also effects the drainage runoff in this shed (P4). In peak storm events there is a culvert with a valve that can be manually opened by an employee to release flows into the adjacent site. From discussions with maintenance staff, these valves are opened infrequently. Shed P10 has a similar situation with a containment berm and valve release. Runoff predominantly infiltrates into ground due to the gravel surface cover although in peak storm events.

A concrete pad will be constructed between the two unloading tracks. This will support the equipment installation for the unloading of the product. The shed delineation for the new track construction was centered on the track for the single track section and between the two tracks for the two track section. This is due to the fact that the track is elevated above adjacent ground and crowned so runoff flows away from the track structure. See Appendix F for the Proposed Shed Map.

## 4. Floodplain Impact Analysis

The project area is shown in the FEMA FIRM map 06067C0205H dated August 16, 2012. The project is located in Zone X which is defined as areas of minimal flood hazard. As a result, the FEMA designated floodplain would not be negatively impacted by the proposed project.

## 5. Geotechnical Conditions

A geotechnical analysis for the site was prepared by Ninyo & Moore. Their investigation found the onsite soils consisted of “very dense silty sand, clayey sand, well/poorly graded gravel, and stiff to hard lean clay with sand”. Groundwater was not encountered during the subsurface exploration but was estimated to be around 52 feet from a nearby monitoring well. The seismic considerations for the site include strong ground motion. Additional research was performed by reviewing information provided by NRCS. The predominant hydrologic group classification is C. See Appendix D for the soil information.

## 6. Water Quality

Temporary erosion control measures will be used during construction. As previously mentioned, the site operates under a current SWPPP approved by the State, which will be amended for this project. Due to the total increased impervious area being larger than one acre, permanent water quality treatment will be required. However, hydromodification mitigation will not be required as this area is exempt due to the high level of developed area. The preferred solution for water quality treatment for this project will be a vegetated swale. This swale will be constructed along a portion of the track-side ditch on the east side of the rail car unloading area. This will not capture 100% of the new impervious area but will provide the greatest tributary area for the new pavement. It should also be noted that the discharge from the vegetated swale will be to the existing undeveloped area adjacent to the ditch. This will provide additional treatment and flow dissipation.

The swale was modeled in Hydraflow Express in Civil 3D. The initial design for this swale will be 65 ft long, with a 2-foot bottom width, 3:1 side slopes, 0.5% slope, and 1-ft deep although the depth of flow will only be 2.4 inches. The Water Quality Flow for this area was calculated to be 0.08 cfs based on the design intensity of 0.18 in/hr as provided in the Stormwater Quality Design Manual for the Sacramento Region.

## 7. Calculations

For this analysis it was determined that the Nolte method was appropriate to calculate the peak flows based on the criteria in the Sacramento City/County Drainage Manual. This methodology is appropriate given that the project site is in a heavily developed area. This methodology requires the impervious to be determined and is one of the inputs for the SacCalc calculations. For the proposed project calculations additional sheds were delineated and the imperviousness adjusted to reflect the new project features. The flows were calculated using the SacCalc software and the results are shown in Appendix G and H.

Pipe and ditch calculations were performed using Hydraflow Express within the Civil 3D 2020 software. The software uses Manning’s equation to perform pipe and ditch capacity calculations. Note that the minimum pipe size used for this project was an 18-inch diameter for maintenance purposes. See Appendix I for the swale calculation.

**Table 1 – Existing Conditions Peak Flow**

| Shed | Area (sf) | Area (ac) | % Imperviousness | Nolte Flow (cfs) |
|---|---|---|---|---|
| X1 | 31306 | 0.72 | 50 | 0.12 |
| X2 | 37096 | 0.85 | 90 | 0.44 |
| X3 | 4829 | 0.11 | 50 | 0.02 |
| X4 | 174858 | 4.01 | 50 | 0.68 |
| X5 | 56609 | 1.30 | 50 | 0.22 |
| X6 | 55617 | 1.28 | 90 | 0.67 |
| X7 | 19657 | 0.45 | 50 | 0.08 |
| X8 | 15888 | 0.36 | 50 | 0.06 |
| X9 | 210711 | 4.84 | 50 | 0.82 |
| X10 | 45684 | 1.05 | 50 | 0.18 |
| X11 | 66203 | 1.52 | 50 | 0.26 |
| X12 | 135965 | 3.12 | 50 | 0.53 |
| X13 | 16403 | 0.38 | 90 | 0.20 |
| X14 | 479462 | 11.01 | 20 | 2.00 |
| O-1 | 784080 | 18.00 | 90 | 9.08 |
| **Total** | | **49.00** | | **15.36** |

**Table 2 – Proposed Conditions Peak Flow**

| Shed | Area (sf) | Area (ac) | % Imperviousness | Nolte Flow (cfs) |
|---|---|---|---|---|
| P1 | 31306 | 0.72 | 50 | 0.12 |
| P2 | 37096 | 0.85 | 90 | 0.44 |
| P3 | 4829 | 0.11 | 50 | 0.02 |
| P4 | 174858 | 4.01 | 60 | 1.03 |
| P5 | 56609 | 1.30 | 50 | 0.22 |
| P6 | 55617 | 1.28 | 90 | 0.67 |
| P7 | 19657 | 0.45 | 50 | 0.08 |
| P8 | 15888 | 0.36 | 50 | 0.06 |
| P9 | 210711 | 4.84 | 50 | 0.82 |
| P10 | 45684 | 1.05 | 50 | 0.18 |
| P11 | 66203 | 1.52 | 50 | 0.26 |
| P12 | 135457 | 3.11 | 50 | 0.53 |
| P13 | 12268 | 0.28 | 90 | 0.15 |
| P14 | 121419 | 2.79 | 30 | 0.47 |
| P15 | 318032 | 7.30 | 30 | 1.29 |
| P16 | 6628 | 0.15 | 90 | 0.08 |
| P17 | 13875 | 0.32 | 90 | 0.17 |
| P18 | 24304 | 0.56 | 90 | 0.29 |
| O-1 | 784080 | 18.00 | 90 | 9.08 |
| **Total** | | **49.00** | | **15.96** |

## 8. Conclusions

In summary, the proposed project is not expected to adversely impact the onsite or offsite conditions. The portion of the site that is proposed to have new impervious pavement only represents about 5% of the total

area. The increase in flow was only 0.6 cfs which is relatively insignificant. Permanent water quality treatment will be incorporated as feasible. A new vegetated swale will be constructed and provide additional treatment.

# 9. References


Caltrans Water Quality Planning Tool (website)

FEMA FIRM Map,06067C0205H, dated August 16, 2012.

“Geotechnical Evaluation – Kinder Morgan Bradshaw Terminal”, Ninyo & Moore, January 28, 2022.

Sacramento City/County Drainage Manual, December 1996.

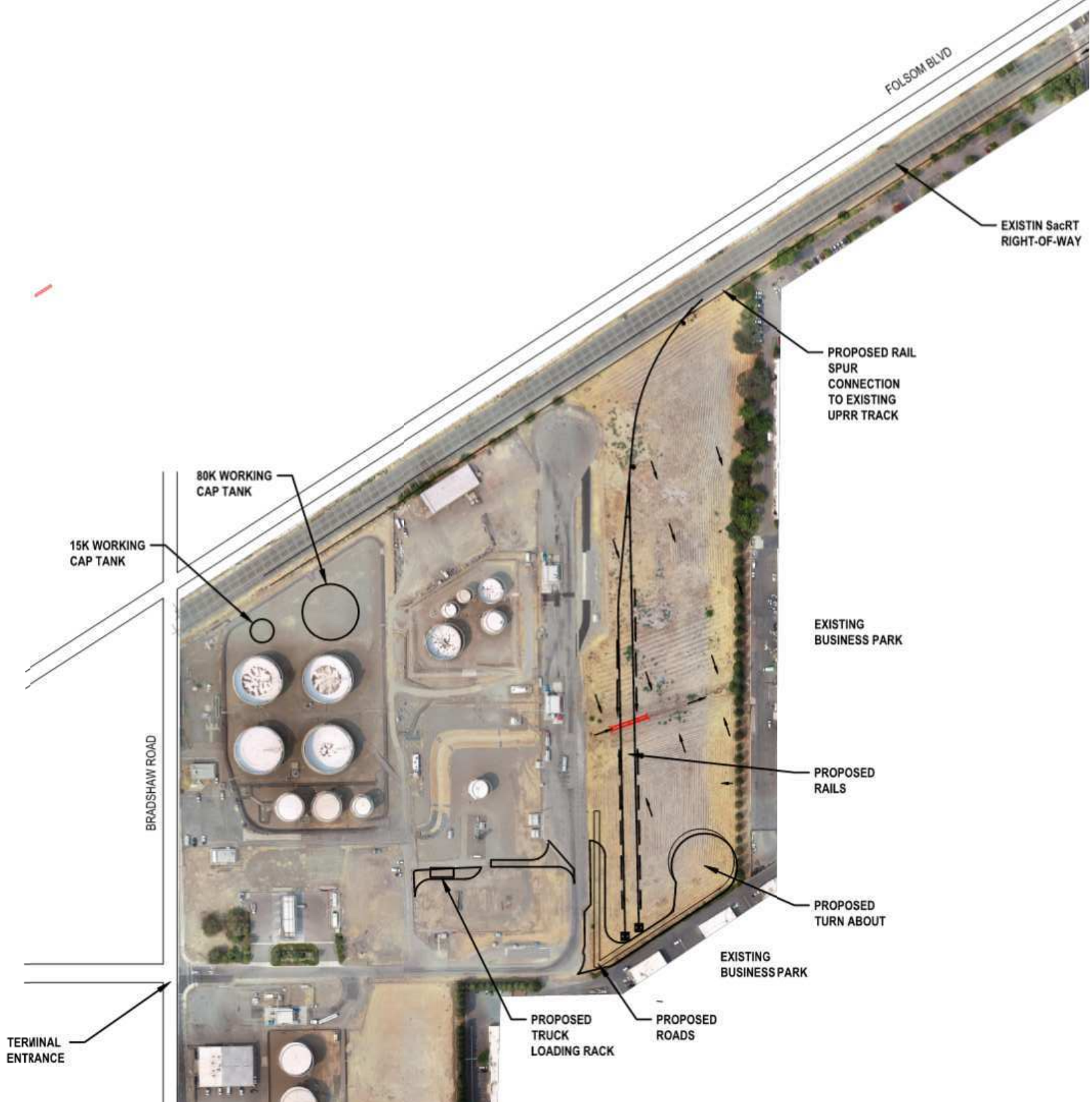
Stormwater Pollution Prevention Plan – Bradshaw Terminal, Arcadis, WDID No. 5 S34I024070, July 26, 2021

Stormwater Quality Design Manual for the Sacramento Region, July 2018.

USDA – Natural Resources Conservation Service (NRCS), Soil Survey

# Appendices

# **Appendix A** Site Plan


FOLSOM BLVD
EXISTIN SacRT
RIGHT-OF-WAY
PROPOSED RAIL
SPUR
CONNECTION
TO EXISTING
UPRR TRACK
80K WORKING
CAP TANK
15K WORKING
CAP TANK
BRADSHAW ROAD
EXISTING
BUSINESS PARK
PROPOSED
RAILS
PROPOSED
TURN ABOUT
EXISTING
BUSINESS PARK
TERMINAL
ENTRANCE
PROPOSED
TRUCK
LOADING RACK
PROPOSED
ROADS

# **Appendix B** FEMA FIRM Map

## NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was California State Plane Zone II (FIPSZONE 0402). The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

**Base map** information shown on this FIRM was provided in digital format by the County of Sacramento Water Resources Department. This information was derived from digital orthophotos produced with 6-inch pixel resolution and 3.3-foot horizontal accuracy from aerial photography dated March 2001.

This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

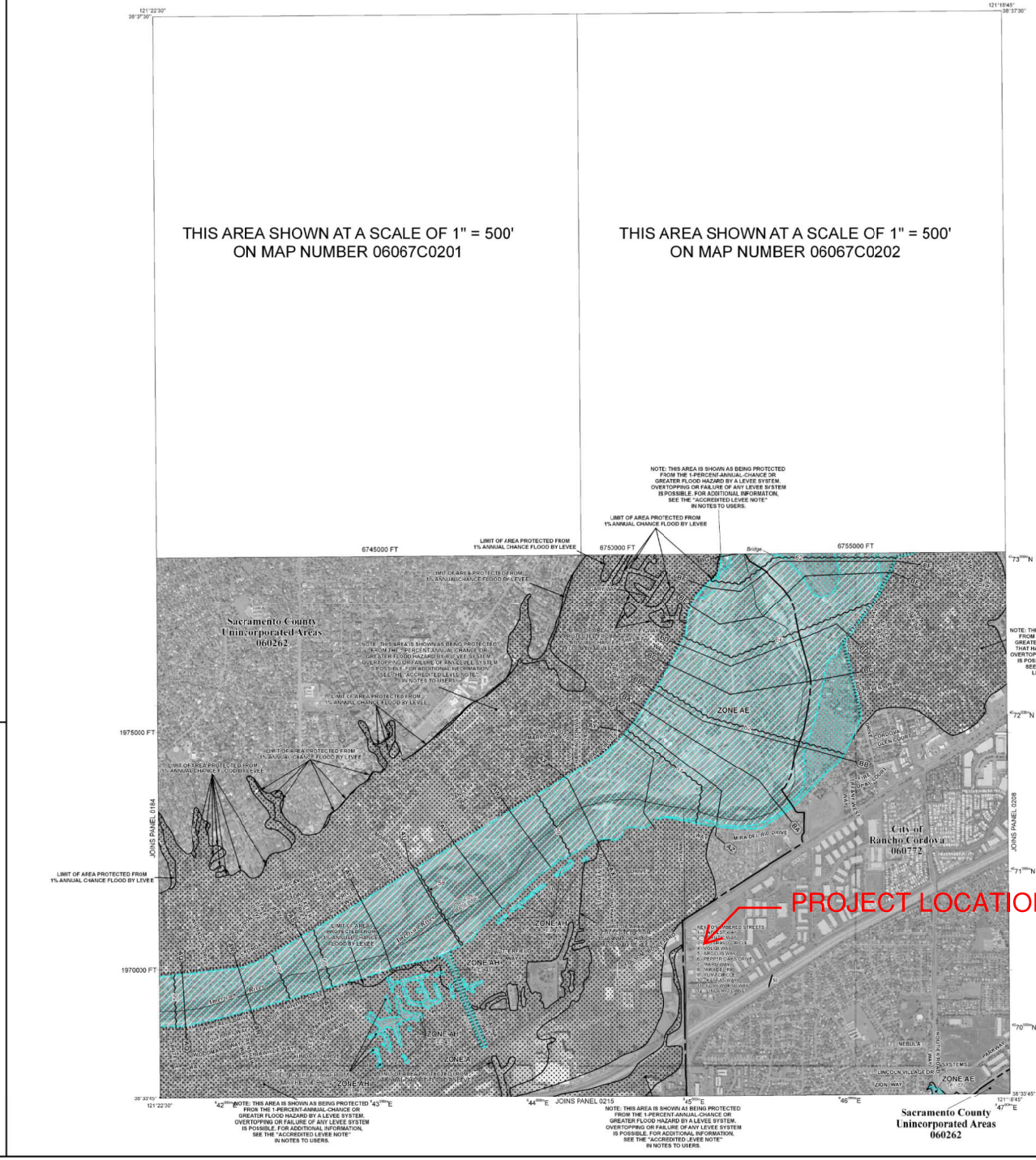
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

**Accredited Levee Notes to Users:** Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/business/nfip/index.shtm.

**Provisionally Accredited Levee Notes to Users:** Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations by January 26, 2011. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA website at http://www.fema.gov/business/nfip/index.shtm.




## LEGEND

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

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

| | |
|---|---|
| ZONE A | No Base Flood Elevations determined. |
| ZONE AE | Base Flood Elevations determined. |
| ZONE AH | Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined. |
| ZONE AO | Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined. |
| ZONE AR | Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood. |
| ZONE A99 | Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined. |
| ZONE V | Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined. |
| ZONE VE | Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined. |

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE U/N/I/U — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Limit of Moderate Wave Action
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- Culvert, Pluma, Penstock or Aqueduct
- Road or Railroad Bridge
- Footbridge
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4376000 N — 1000-meter Universal Transverse Mercator grid values, zone 10
- 600000 FT — 5000-foot grid values: California State Plane coordinate system, zone II (FIPSZONE 0402), Lambert Conformal Conic projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
AUGUST 16, 2012

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0205H

# FIRM

## FLOOD INSURANCE RATE MAP

## SACRAMENTO COUNTY, CALIFORNIA AND INCORPORATED AREAS

## PANEL 205 OF 705

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| RANCHO CORDOVA, CITY OF | 060772 | 0205 | H |
| SACRAMENTO COUNTY | 060262 | 0205 | H |

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 community.

**MAP NUMBER**
**06067C0205H**

**EFFECTIVE DATE**
**AUGUST 16, 2012**

Federal Emergency Management Agency

# **Appendix C** Existing Drainage System


Allegheny Dr
Escobar Way
Bradshaw Rd
Folsom Blvd
JuJiu Korean & BBQ
VCA Sacramento Veterinary Referral
Elmira Cir
Capital City Loan & Jewelry Rancho...
Rudway Ct
Urgent Tires
Pita Q
Botánica Shango
A & G Cash For Gold
Gore Rd
30"
15"
Kinder Morgan
New World Gift
Moulding Base – baseboard
36"
The Rink
12"
42"
Smile Food Market
36"
12"
???
RandMOffice.com
Goodman Distribution Inc
Gas station Hunt and sons
Oates Dr
Sticker Farmer Sacramento
Gap2Gap Softball
Business Park Dr
Green Day Power
Cpm Labs
Google Earth

# **Appendix D** NRCS Soil Information

# Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

*Hydrologic soil group* is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

*Group A.* Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

*Group B.* Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

*Group C.* Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

*Group D.* Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

*Depth* to the upper and lower boundaries of each layer is indicated.

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

*Classification* of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

*Percentage of rock fragments* larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

*Liquid limit* and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

# Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

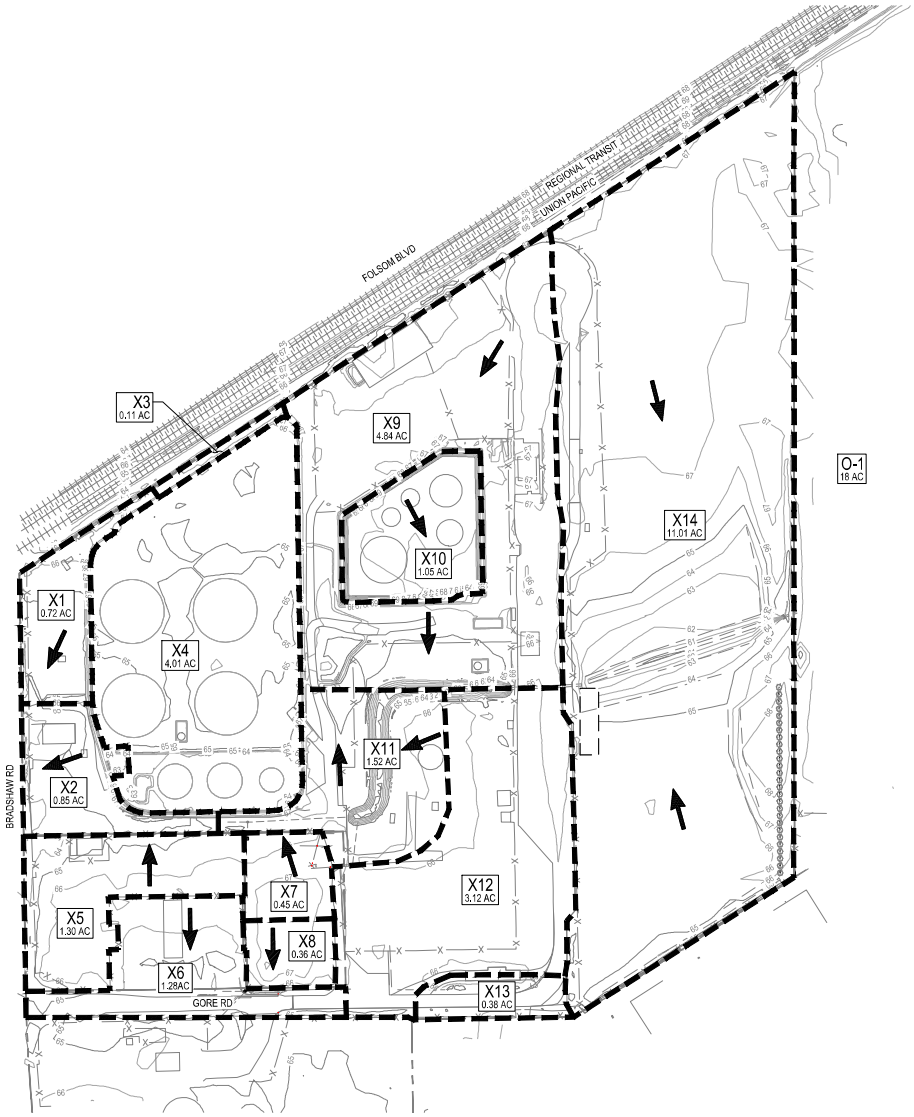
| Engineering Properties–Sacramento County, California | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Map unit symbol and soil name | Pct. of map unit | Hydrologic group | Depth | USDA texture | Classification | | Pct Fragments | | Percentage passing sieve number— | | | | Liquid limit | Plasticity index |
| | | | | | Unified | AASHTO | >10 inches | 3-10 inches | 4 | 10 | 40 | 200 | | |
| | | | *In* | | | | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* |
| 102—Americanos-Urban land complex, 0 to 2 percent slopes | | | | | | | | | | | | | | |
| Americanos | 65 | B | 0-8 | Silt loam | ML | A-4 | 0- 0- 0 | 0- 0- 0 | 100-100-100 | 100-100-100 | 95-98-100 | 75-80-85 | 25-30-35 | NP-5-10 |
| | | | 8-36 | Silt loam, loam | ML | A-4 | 0- 0- 0 | 0- 0- 0 | 100-100-100 | 100-100-100 | 95-98-100 | 85-90-95 | 30-35-40 | 5-8 -10 |
| | | | 36-54 | Silt loam, loam | ML | A-4 | 0- 0- 0 | 0- 0- 0 | 100-100-100 | 100-100-100 | 95-98-100 | 75-80-85 | 25-30-35 | NP-3 -5 |
| | | | 54-62 | Sandy loam | SM | A-2, A-4 | 0- 0- 0 | 0- 0- 0 | 95-98-100 | 85-90-95 | 50-55-60 | 25-35-45 | 0-7 -14 | NP |

| Engineering Properties–Sacramento County, California | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Map unit symbol and soil name | Pct. of map unit | Hydrologic group | Depth | USDA texture | Classification | | Pct Fragments | | Percentage passing sieve number— | | | | Liquid limit | Plasticity index |
| | | | | | Unified | AASHTO | >10 inches | 3-10 inches | 4 | 10 | 40 | 200 | | |
| | | | *In* | | | | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* | *L-R-H* |
| 181—Natomas loam, 0 to 2 percent slopes | | | | | | | | | | | | | | |
| Natomas | 85 | C | 0-17 | Loam | CL-ML, CL | A-4, A-6 | 0- 0- 0 | 0- 0- 0 | 100-100-100 | 95-98-100 | 80-85-90 | 50-58-65 | 25-30-35 | 5-10-15 |
| | | | 17-33 | Loam, clay loam | CL | A-6 | 0- 0- 0 | 0- 0- 0 | 100-100-100 | 95-98-100 | 80-85-90 | 55-65-75 | 25-30-35 | 10-15-20 |
| | | | 33-78 | Clay loam | CL | A-6 | 0- 0- 0 | 0- 0- 0 | 100-100-100 | 95-98-100 | 85-90-95 | 70-75-80 | 30-35-40 | 15-20-25 |
| | | | 78-84 | Stratified gravelly coarse sandy loam to sandy loam | SC-SM | A-2, A-4 | 0- 0- 0 | 0- 3- 5 | 65-83-100 | 60-80-100 | 45-58-70 | 25-38-50 | 25-28-30 | 5-8 -10 |
| 227—Urban land | | | | | | | | | | | | | | |
| Urban land | 100 | | 0-6 | Variable | — | — | — | — | — | — | — | — | 0-7 -14 | — |

# Data Source Information

Soil Survey Area: Sacramento County, California
Survey Area Data: Version 20, Sep 3, 2021

# **Appendix E** Existing Shed Map




**LEGEND**

- X7 X.XX AC — SHED DESIGNATION & ACREAGE
- SHED BOUNDARY
- 67 — EXISTING CONTOUR
- FLOW DIRECTION

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| Author | O. GOODE | Drafting Check | E. FANSELAU | Project Manager R. GIBSON |
| Designer | E. FANSELAU | Design Check | E. FANSELAU | Project Director |

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Bar is one inch on original size sheet
0 1"

N
0 100' 200'

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www.ghd.com



Client: KINDER MORGAN

Project: BRADSHAW TERMINAL
RrenewABLE DIESEL AND BIO BY RAIL

Title: SHED MAP:
PRE CONSTRUCTION

| Project No. | Date | Scale |
|---|---|---|
| 12555811 | 2/10/2022 | AS SHOWN |

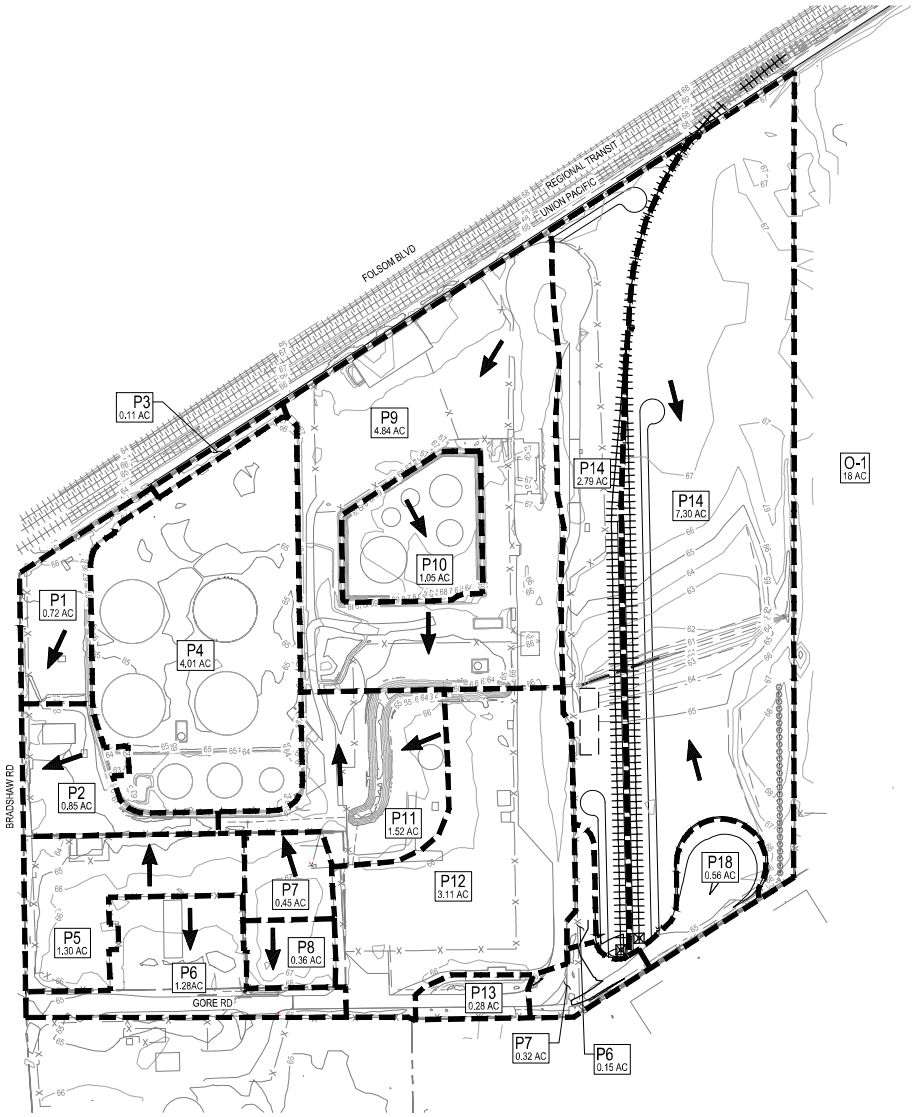
Size: ANSI D

Sheet No.: FIGURE 1

Sheet: 1 of 2

Plot Date: 10 February 2022 - 4:21 PM
Plotted By: Owen Goode
Filename: N:\US\Houston\Projects\582\12555811\Tech\Drainage\12555811 KM_DRAINAGE REPORT FIGURES-PRE.dwg

# **Appendix F** Proposed Shed Map




**LEGEND**

- P7 X.XX AC — SHED DESIGNATION & ACREAGE
- SHED BOUNDARY
- EXISTING CONTOUR
- PROPOSED CONTOUR
- FLOW DIRECTION

**DRAFT**

| No. | Issue | Checked | Approved | Date |
|---|---|---|---|---|
| Author | O. GOODE | Drafting Check | E. FANSELAU | Project Manager R. GIBSON |
| Designer | E. FANSELAU | Design Check | E. FANSELAU | Project Director |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Client KINDER MORGAN

Project BRADSHAW TERMINAL
RENEWABLE DIESEL AND BIO BY RAIL

Title SHED MAP:
POST CONSTRUCTION

Size ANSI D

| Project No. | Date | Scale | Sheet No. | Sheet |
|---|---|---|---|---|
| 12555811 | 2/10/2022 | AS SHOWN | FIGURE 2 | 2 of 2 |

Plot Date: 10 February 2022 - 4:13 PM Plotted By: Owen Goode Filename: N:\US\Houston\Projects\582\12555811\Tech\Drainage\12555811 KM_DRAINAGE REPORT FIGURES-POST.dwg

# **Appendix G** Existing Conditions SacCalc Results

**Nolte method results**
**(Project: Kinder Morgan Existing Conditions)**
**(Hydrologic zone 3)**

| ID | Drainage area (acres) | Impervious area (%) | Design Q (cfs) |
|---|---|---|---|
| X2 | 0.85 | 90.00 | 0.44 |
| X1 | 0.72 | 50.00 | 0.12 |
| X4 | 4.01 | 50.00 | 0.68 |
| X7 | 0.45 | 50.00 | 0.08 |
| X5 | 1.30 | 50.00 | 0.22 |
| X6 | 1.28 | 90.00 | 0.67 |
| X8 | 0.36 | 50.00 | 0.06 |
| X9 | 4.84 | 50.00 | 0.82 |
| X10 | 1.05 | 50.00 | 0.18 |
| X11 | 1.52 | 50.00 | 0.26 |
| X12 | 3.12 | 50.00 | 0.53 |
| X13 | 0.38 | 90.00 | 0.20 |
| X14 | 11.01 | 20.00 | 2.00 |
| O-1 | 18.00 | 90.00 | 9.08 |
| X3 | 0.11 | 50.00 | 0.02 |

# **Appendix H** Proposed Conditions SacCalc Results

**Nolte method results**
**(Project: Kinder Morgan Proposed Conditions)**
**(Hydrologic zone 3)**

| ID | Drainage area (acres) | Impervious area (%) | Design Q (cfs) |
|---|---|---|---|
| P2 | 0.85 | 90.00 | 0.44 |
| P1 | 0.72 | 50.00 | 0.12 |
| P4 | 4.01 | 60.00 | 1.03 |
| P7 | 0.45 | 50.00 | 0.08 |
| P5 | 1.30 | 50.00 | 0.22 |
| P6 | 1.28 | 90.00 | 0.67 |
| P8 | 0.36 | 50.00 | 0.06 |
| P9 | 4.84 | 50.00 | 0.82 |
| P10 | 1.05 | 50.00 | 0.18 |
| P11 | 1.52 | 50.00 | 0.26 |
| P12 | 3.11 | 50.00 | 0.53 |
| P13 | 0.28 | 90.00 | 0.15 |
| P14 | 2.79 | 30.00 | 0.47 |
| O-1 | 18.00 | 90.00 | 9.08 |
| P3 | 0.11 | 50.00 | 0.02 |
| P15 | 7.30 | 30.00 | 1.29 |
| P16 | 0.15 | 90.00 | 0.08 |
| P17 | 0.32 | 90.00 | 0.17 |
| P18 | 0.56 | 90.00 | 0.29 |

# **Appendix I** Water Quality Swale Results

# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Feb 11 2022

## Kinder Morgan Swale

**Trapezoidal**

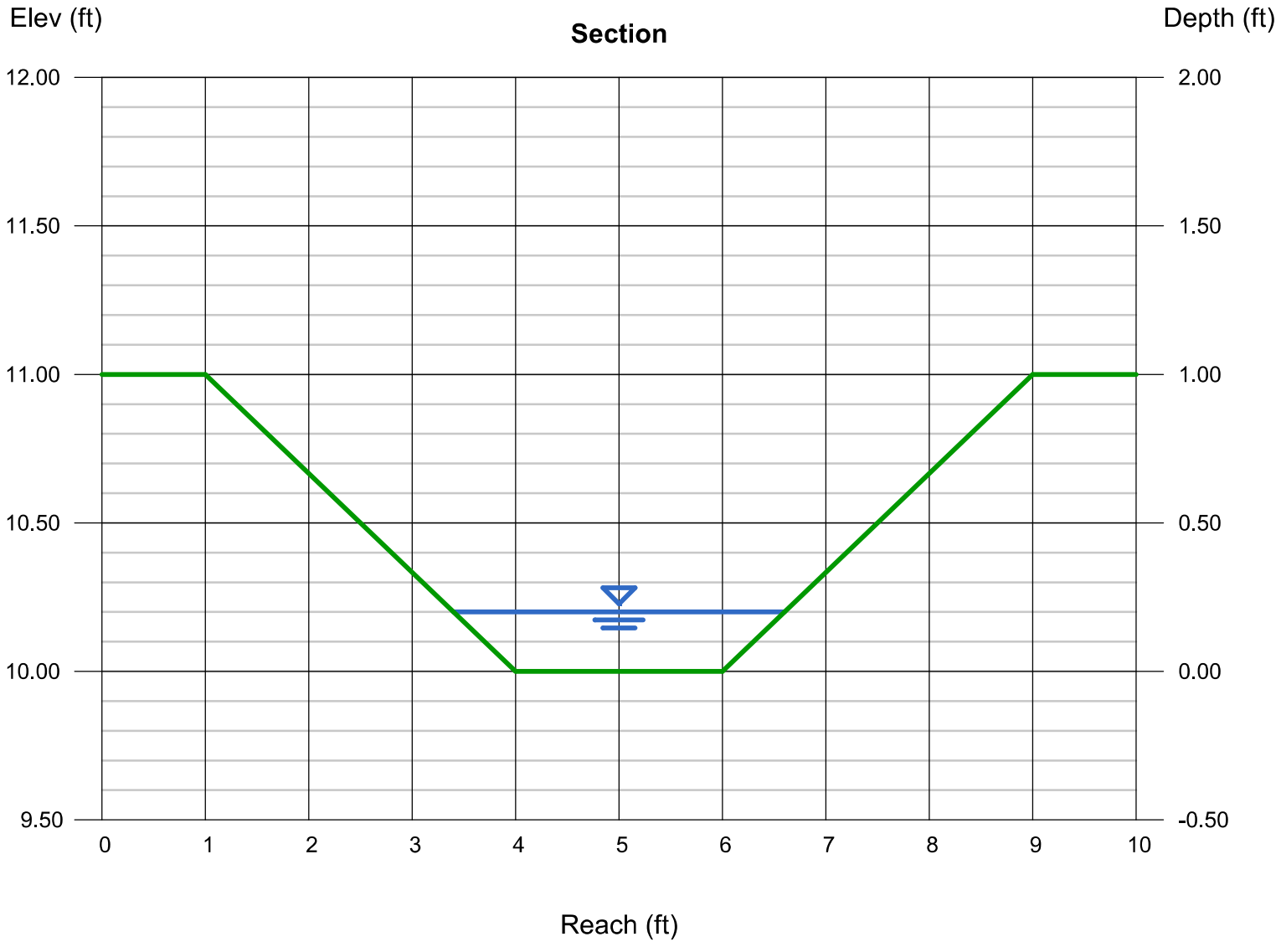
| | |
|---|---|
| Bottom Width (ft) | = 2.00 |
| Side Slopes (z:1) | = 3.00, 3.00 |
| Total Depth (ft) | = 1.00 |
| Invert Elev (ft) | = 10.00 |
| Slope (%) | = 0.50 |
| N-Value | = 0.200 |

**Calculations**

| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cfs) | = 0.08 |

**Highlighted**

| | |
|---|---|
| Depth (ft) | = 0.20 |
| Q (cfs) | = 0.080 |
| Area (sqft) | = 0.52 |
| Velocity (ft/s) | = 0.15 |
| Wetted Perim (ft) | = 3.26 |
| Crit Depth, Yc (ft) | = 0.04 |
| Top Width (ft) | = 3.20 |
| EGL (ft) | = 0.20 |



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