REVISED
GROUNDWATER MONITORING WELL INSTALLATION WORK PLAN

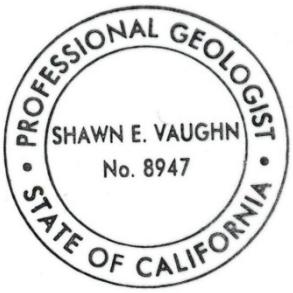
Prepared for

MALAGA COUNTY WATER DISTRICT
WASTEWATER TREATMENT FACILITY (WWTF)

Site Address:
3749 S. Maple Ave
Fresno, CA 93725

Mailing Address:
3580 S. Frank Street
Fresno, CA 93725

August 2016



EST. 1968
PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company

Prepared by
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Date Signed : 8/19/2016

1057-16-001 GMP

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Appendix D - Health and Safety Plan

I. INTRODUCTION

Provost and Pritchard Consulting Group (Provost & Pritchard) has prepared this Revised Groundwater Monitoring Well Installation Work Plan (Revised Work Plan) for the Malaga County Water District – Wastewater Treatment Facility (WWTF or Site) located between Highway 99 to the north, East Central Avenue to the south, BNSFRR to the east, and South Maple Avenue to the west, in the unincorporated community of Malaga, Fresno County, California. The Site is located within the southwest ¼ of Section 25, Township 14 South, Range 20 East, Mount Diablo Base and Meridian. A topographic map showing facility location, roads, and surface water bodies is included in **Appendix A: Figure 1**.

This Revised Work Plan has been prepared under the direct supervision of a Professional Geologist registered in the State of California in accordance with the California Regional Water Quality Control Board – Central Valley Region (RWQCB) Standard Requirements for Monitoring Well Installation Work Plan and Monitoring Well Installation Report. Required elements of this Revised Work Plan are detailed below.

II. GENERAL INFORMATION

A. Purpose

The purpose of the well installation project is to establish an updated monitoring well network at the Site as specified in Task 4 of Cease and Desist Order (CDO) R5-2014-0146 (Order). This Revised Work Plan has been prepared to fulfill the requirements of Task 4a of the Order. As specified in Task 4a, "the groundwater monitoring well network shall include one or more background wells representative of regional groundwater conditions, and a sufficient number of designated monitoring wells to evaluate the extent to which, if any, the Facility has degraded or threatens to degrade groundwater."

In June 2016 a Groundwater Monitoring Well Installation Work Plan was submitted to the RWQCB which proposed a monitoring well network to be comprised of an existing downgradient monitoring well associated with the Orange Avenue Landfill and the installation of two new monitoring wells. In a letter dated July 13, 2016, the RWQCB requested a revised Work Plan stating that the proposed monitoring well network was not acceptable. This Revised Groundwater Monitoring Well Installation Work Plan has been prepared in response to the July 13, 2016 RWQCB letter.

B. Regional Geology

The Site is located within the central portion of the Kings Subbasin of the San Joaquin Valley Groundwater Basin. The San Joaquin Valley is a structural trough, approximately 70 miles in width by 200 miles in length, filled with up to

32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and erosion of the surrounding mountains.

The San Joaquin Valley is bounded by the Coast Ranges to the west, the San Emigio and Tehachipi Mountains to the south, the Sierra Nevada to the east, and the Sacramento-San Joaquin Delta and Sacramento Valley to the north. The northern San Joaquin Valley drains towards the Delta by way of the San Joaquin, Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern San Joaquin Valley drains internally by way of the Kings, Kaweah, Tule, and Kern Rivers into the Tulare drainage basin, which includes the beds of the former Tulare, Buena Vista, and Kern Lakes.

The sediments that comprise the Kings Subbasin aquifer system consist of Tertiary and Quarternary age unconsolidated continental deposits. The Quarternary deposits are generally divided into older alluvium and lucastrine deposits, younger alluvium, and flood-basin deposits. The older alluvium consists of interbedded lenses of clay, silt, silty/sandy clay, clayey/silty sand, sand, gravel, cobbles, and boulders. The younger alluvium consists of fluvial arkosic beds interbedded with flood-basin deposits (DWR, 2006).

Clay beds of the lacustrine and marsh deposits form aquitards that control the vertical and lateral movement of ground water. The most commonly cited regional study is Water Supply Paper 1999-H (Croft, 1972). The paper identifies six primary clay layers which act as horizontal barriers to groundwater flow and separate water occurring above the clay from water below it. The most prominent clay bed is the Corcoran clay, or E-clay, which was formed as a characteristically dark greenish, blue gray silty clay that is stiff and nearly impermeable. The thickness of the Corcoran Clay ranges from about 10 feet near its edge to more than 160 feet beneath the Tulare Lake bed (Page, 1986).

Although the E-clay layer underlies the western one-quarter to one-third of the Kings Subbasin, ranging in depth from approximately 250 to 550 feet below surface grade (bsg) (DWR, 1981), none of the six associated clay layers are mapped as present below the Site.

Soil boring logs for the installation of groundwater monitoring wells MW-1 through MW-4 in 2001 indicate that soils below the Site are comprised of interbedded layers of sandy silts, silty sands, clayey sands, clays, and sands to approximately 72 feet bsg, the maximum depth explored (Twining, 2001).

C. Hydrogeology

Fresno Area-Regional Groundwater Management Group (FARGM) groundwater elevation maps from Spring 2014 and Spring 2015 (**Appendix B**) indicate that groundwater flow below the Site is generally to the northwest. Based on information uploaded to the State Water Resources Control Board's Geotracker

database, the Orange Avenue Landfill, located approximately 0.5 miles to the northwest of the Site, had a new groundwater monitoring well network installed in 2011. Monitoring wells CMT-1 through CMT-7 were installed to depths of approximately 120 feet below surface grade (bsg). During drilling for CMT-1 through CMT-7, no evidence of laterally continuous confining units or distinct multiple water-bearing zones was found (EBA, 2011). Quarterly groundwater monitoring of the network since that time has also indicated that local groundwater flows predominantly in the northwestern direction. Copies of groundwater elevation maps for the Orange Avenue Landfill are included in **Appendix B**.

This groundwater flow direction is in agreement with the localized predominant groundwater flow direction that was determined at the Site by the existing monitoring well network prior to the wells going dry. A copy of a potentiometric surface map for the Site from a 2008 groundwater monitoring event is included in **Appendix B**.

The existing monitoring well network was put in place in November 2001 with wells installed to depths of approximately 70 bsg (Twining, 2001). Since calendar year 2013, all existing groundwater wells have been dry. A hydrograph from historic groundwater monitoring data illustrating the fall of groundwater levels is included in **Appendix B**. Depth to groundwater in Orange Avenue Landfill well CMT-1D was reported as 87.77 feet bsg in September 2015 (EBA, 2016).

As can be seen in the hydrograph included in **Appendix B**, groundwater elevations at the Site, prior to the wells going dry, correlate well with the groundwater elevations shown on the Orange Avenue Landfill maps in **Appendix B**. This indicates that prior to going dry, the existing Site wells, and the deeper Orange Avenue Landfill wells were installed in the same water bearing zone.

Existing site features and existing well locations are shown on **Appendix A: Figure 2**.

D. Proposed Monitoring Well Locations and Rationale

Based on the northwesterly groundwater flow direction that has been determined by: (a) the FARGM Spring 2014 and Spring 2015 groundwater elevations maps, (b) the nearby Orange Avenue Landfill 2011 through 2015 groundwater monitoring data, and (c) the historic groundwater monitoring at the Site, a replacement background monitoring well for MW-1 is proposed to be installed on the west side of the mobile home park. The proposed designation of this well is MW-1R.

Near downgradient groundwater monitoring wells are proposed along the downgradient edges of the property. Proposed monitoring well MW-2R will be located northwest of the southern effluent ponds near existing dry well MW-2.

Proposed monitoring well MW-3R will be located to the northwest of the northwest effluent pond near existing dry well MW-3. An additional downgradient well, MW-4R, is proposed approximately 350 feet north of the western edge of the WWTF, near existing dry well MW-4.

As proposed, the well locations will be in a triangular spatial arrangement to facilitate accurate monitoring of groundwater flow direction and gradient across the Site. Proposed groundwater monitoring well locations are shown on **Appendix A: Figure 2**.

Per the July 13, 2016 RWQCB response letter to the original Workplan, a fourth downgradient well is tentatively proposed as MW-5R to likely be located northwest of the WWTF. As shown on **Appendix A: Figure 2**, construction of the California High-Speed Rail line is slated to occur in this area. Placement of proposed well MW-5R on these properties prior to High-Speed Rail construction is not possible due to the potential for well head destruction during site preparation and construction activities. Presently, it is proposed to monitor the groundwater data collected from proposed wells MW-1R through MW-4R to assess the need for and location of an additional near downgradient groundwater monitoring well MW-5R. After construction of the California High-Speed Rail has been completed and sufficient trend monitoring data from proposed wells MW-1R through MW-4R has been collected, the assessment can determine if an additional groundwater monitoring well is warranted. Note that a proposed location for potential well MW-5R is not shown on **Appendix A: Figure 2**.

E. Drilling details

For proposed monitoring wells, permits will be obtained from Fresno County per the Fresno County Water Well Permitting Program website:

http://www.co.fresno.ca.us/DivisionPage.aspx?id=1630

Copies of signed permits will be on-site during drilling operations and will be available for inspection by appropriate agencies. Site activities will be overseen by a Professional Geologist or Civil Engineer registered in the State of California. Well drilling will be performed in general accordance with California Department of Water Resources California Well Standards Bulletins 74-81 and 74-90 and Fresno County requirements.

Specifically, drilling will be in accordance with the Drilling and Soil Sampling protocol in **Appendix C**. Monitoring well installation and development will be performed in accordance with the Monitoring Well Installation, Development, and Sampling protocols in **Appendix C**.

For the purposes of this work plan, it is anticipated that groundwater will be encountered at approximately 90 feet bsg. It is anticipated that the wells will be

drilled by a hollow stem drilling rig and crew capable of reaching a target depth of approximately 130 feet bsg. During drilling, soil will generally be sampled at a minimum of every 5 feet or major changes in lithology for the entire length of the soil boring. Geo-physical logs may be performed and utilized for stratigraphic interpretation.

A project-specific Health and Safety Plan is included in **Appendix D**.

III. MONITORING WELL CONSTRUCTION

Monitoring wells will be constructed in general accordance with California Well Standards and local regulations. At this time it is not proposed to destroy the existing monitoring wells (MW-1 through MW-4), as they may have future beneficial use should groundwater levels in the project area return to pre-drought levels and "drown" the well screens of the proposed replacement monitoring wells. Due to this potential and if possible based on the groundwater levels at the time of construction, consideration will be made during well construction to have some overlap between the existing well screens and the screens of the replacement wells. Construction details of the existing monitoring wells are summarized in **Table 1**. The existing wellheads will be maintained as required by local and state regulations. The existing access agreements for off-site wells well be maintained.

Table 1: Construction Summary of Existing Monitoring Wells

Well ID	Casing Type	Screen Slots (inch)	Screen Interval (ft)	Sand Pack Interval	Bentonite Seal (ft)
MW-1	Sch. 40 PVC	0.020	70 to 40	71 to 37	37 to 34
MW-2	Sch. 40 PVC	0.020	70 to 40	71 to 37	37 to 34
MW-3	Sch. 40 PVC	0.020	70 to 40	70 to 35	35 to 32
MW-4	Sch. 40 PVC	0.020	70 to 40	70 to 37	37 to 34

Notes: Well construction details are taken from The Twining Laboratories, Inc. December 2001 Report on Monitoring Well Installation

The July 13, 2016 RWQCB response letter to the original Workplan indicated that the City of Fresno intends to increase use of surface water and expects recovery of groundwater levels in the Fresno metropolitan area.

In general terms, the use of surface water tends to be highly variable from year to year depending on precipitation and snow fall during the annual season and there is no way of determining the availability of surface water during future years. Additionally, Malaga is located at the southern-most portion of Fresno where changes in groundwater elevations are likely more reflective of groundwater use for agricultural land in the area than of groundwater use for municipal purposes. Without knowing what future surface water deliveries will be for the growers, or for the City of Fresno, it's not possible to forecast the recovery of groundwater levels.

Based on the declining groundwater elevations that were observed in the existing monitoring well network prior to going dry (**Appendix B**), and the declining groundwater elevations in the Orange Avenue Landfill wells from 2011 to 2015 (**Appendix B**), well screens of approximately 60-foot length are proposed in order to maximize the useful lifespan of the proposed wells should lower than normal rain and/or snow years continue and groundwater levels continue to fall. Final well designs will be based on soil boring lithology and depth to first encountered groundwater at the time of drilling.

The proposed wells will be constructed of 2-inch schedule 40 PVC with 0.020 machine-slotted well screens. For the purposes of this work plan, 60-foot well screens are proposed for each monitoring well. It is anticipated that groundwater will be encountered at approximately 90 feet bsg. Each well screen will extend approximately 20 feet above first encountered groundwater and approximately 40 feet below groundwater.

Filter packs consisting of Lonestar #3 sand, or equivalent, will be put in place from the bottom of the borings to approximately 2 to 3 feet above the top of the screened intervals. A minimum three-foot thick transition seal will then be emplaced above the filter pack. Transition seals will consist of bentonite chips or pellets hydrated with clean water. Annular seals consisting of cement grout mixtures will then be placed above the bentonite transition seals with the use of tremie pipe.

Once installed, the well casings will be cut to the required height and capped with water-tight well caps. Concrete bases will be installed at the well heads with water-tight painted steel standpipes and locking well covers for proposed wells MW-2R and MW-3R as shown in **Appendix A: Figure 3**. As shown in **Appendix A: Figure 4**, proposed wells MW-1R and MW-4R will be installed with flush mounted traffic rated well boxes. Well pads will be constructed so that surface drainage will slope away from the casings.

Monitoring well installations will be performed in accordance with the Monitoring Well Installation protocol in **Appendix C**.

Construction details of the proposed monitoring wells are summarized in **Table 2**. Final well designs will be based on soil boring lithology and depth to first encountered groundwater at the time of drilling.

Table 2: Construction Summary of Proposed Monitoring Well

Proposed Well ID	Casing Type	Screen Slots (inch)	Screen Interval (ft)	Sand Pack Interval (ft)	Bentonite Seal (ft)
MW-1R	Sch. 40 PVC	0.020	70 to130	132 to 67	67 to 64
MW-2R	Sch. 40 PVC	0.020	70 to130	132 to 67	67 to 64
MW-3R	Sch. 40 PVC	0.020	70 to130	132 to 67	67 to 64
MW-4R	Sch. 40 PVC	0.020	70 to130	132 to 67	67 to 64
MW-5R	TBD	TBD	TBD	TBD	TBD

TBD – To be determined

Existing and proposed well locations are illustrated in **Appendix A: Figure 2**. Proposed well locations may change slightly due to site conditions, facility operational concerns, or potential access issues.

IV. WELL DEVELOPMENT

See **Appendix C**: Monitoring Well Installation, Development, and Sampling protocol.

V. WELL SURVEY

A combination of Global Positioning System (GPS) and ground survey methods will be used based on the following datums:

- Horizontal – North American Datum of 1983 (NAD83), California Coordinate System of 1983 (CCS83) state plane coordinates.
- Vertical – North American Vertical Datum of 1988 (NAVD88)

Survey measurements will be reported to +/- 0.01 feet. The survey will be performed by a licensed land surveyor registered in the State of California

VI. SAMPLING AND ANALYSIS PLAN

As specified in the Site Monitoring and Reporting Program (MRP) R5-2014-0145, the proposed monitoring wells would be added to the Site monitoring network.

Additionally, as specified in the MRP, the new groundwater monitoring wells will be sampled monthly for twelve months, after which they shall be sampled on a quarterly basis. The analytical list would be as required in the MRP.

The methods used for groundwater sampling will be consistent with the Groundwater Sampling Protocol in **Appendix C**. The proposed well constructions will allow for sampling by down-hole pumps, such as a Proactive Mega Monsoon Stainless Steel pump or a 2-inch Grundfos Redi-Flo 2.

VII. MONITORING WELL INSTALLATION COMPLETION REPORT

A post construction report will be submitted summarizing the monitoring well installation activities. The report will include as-built monitoring well construction details, boring logs, depth to groundwater data, field notes, a construction summary table, well development procedures and data, well survey data, and an updated site plan.

VIII. SCHEDULE FOR COMPLETION OF WORK

As specified in the Order, implementation of the monitoring well installation work plan and commencement of groundwater monitoring in accordance with the MRP is to be completed within 180 days following written approval of this work plan. The ability for the Malaga County Water District to install a replacement groundwater monitoring well network is dependent on the availability of funds and will likely require a Community Development Block Grant. Due to the depth of the wells, each well will likely take approximately two days to drill and install once on-site work begins. Development would follow once the annular seals have set sufficiently so as not to be damaged by the development.

Additionally, as specified in the Order, within 90 days of completion of well installations, a technical report on the well installations is to be submitted.

Upon completion of the High Speed Rail construction to the northwest of the WWTF and review of groundwater monitoring data to date, an addendum to this Revised Workplan will be submitted to address the potential installation of tentatively proposed well MW-5R.

As specified in the MRP, the new groundwater monitoring wells will be sampled monthly for twelve months, after which they shall be sampled on a quarterly basis. Reports on monthly monitoring are due the first day of the second calendar month following the month of sampling. Reports on quarterly groundwater monitoring are due May 1, August 1, November 1, and February 1 of each calendar year.

In addition to the monthly and quarterly reporting, as described above, Malaga County Water District is also a registered Monitoring Entity for the California

Statewide Groundwater Elevation Monitoring (CASGEM) program and intends to report recorded groundwater data to the CASGEM on an ongoing basis.

IX. LIMITATIONS

This work plan has been prepared for the sole use of the client and involved regulatory agencies. Any other person or entity without the express written consent of Provost & Pritchard Consulting Group may not rely upon this report.

Provost & Pritchard's professional services were performed consistent with generally accepted environmental principles and practices in California at the time the services were performed. No guarantee or warranty, expressed or implied is made.

X. REFERENCES

Croft, 1972. *Subsurface Geology of the Late Tertiary and Quaternary Water-Bearing Deposits of the Southern Part of the San Joaquin Valley, California. Geological Survey Water-Supply Paper 1999-H.* Prepared by M.G. Croft.

DWR, 1981. *Depth to the Top of the Corcoran Clay (Map) – San Joaquin Valley.* Prepared by the California Department of Water Resources.

EBA, 2011. Phase 3 Evaluation Monitoring Program Report for Orange Avenue Landfill, Fresno County, California. EBA Engineering, January 2016.

EBA, 2012a. Annual Monitoring Summary Report for Orange Avenue Landfill, Fresno County, California. EBA Engineering, January 2012.

EBA, 2012b. Semi-Annual 2012 Monitoring Summary Report for Orange Avenue Landfill, Fresno County, California. EBA Engineering, July 2012.

EBA, 2016. Second Semi-Annual and Annual Monitoring Summary Report for Orange Avenue Landfill, Fresno County, California. EBA Engineering, January 2016.

Fresno Area Regional Groundwater Management Group, Elevation of Water in Wells Map (Spring 2014)

Fresno Area Regional Groundwater Management Group, Elevation of Water in Wells Map (Spring 2015)

Page, 1986. *Geology of the Fresh Ground-Water Basin of the Central Valley, California, with Texture Maps and Sections. U.S. Geological Survey Professional Paper 1401-C*. Prepared by R.W. Page.

Twining, 2001. Report on Monitoring Well Installation, Malaga Wastewater Treatment Plant, Malaga, California, December 14, 2001.

Appendix A

Figures

0 400 800 Feet

Legend

Malaga WWTP

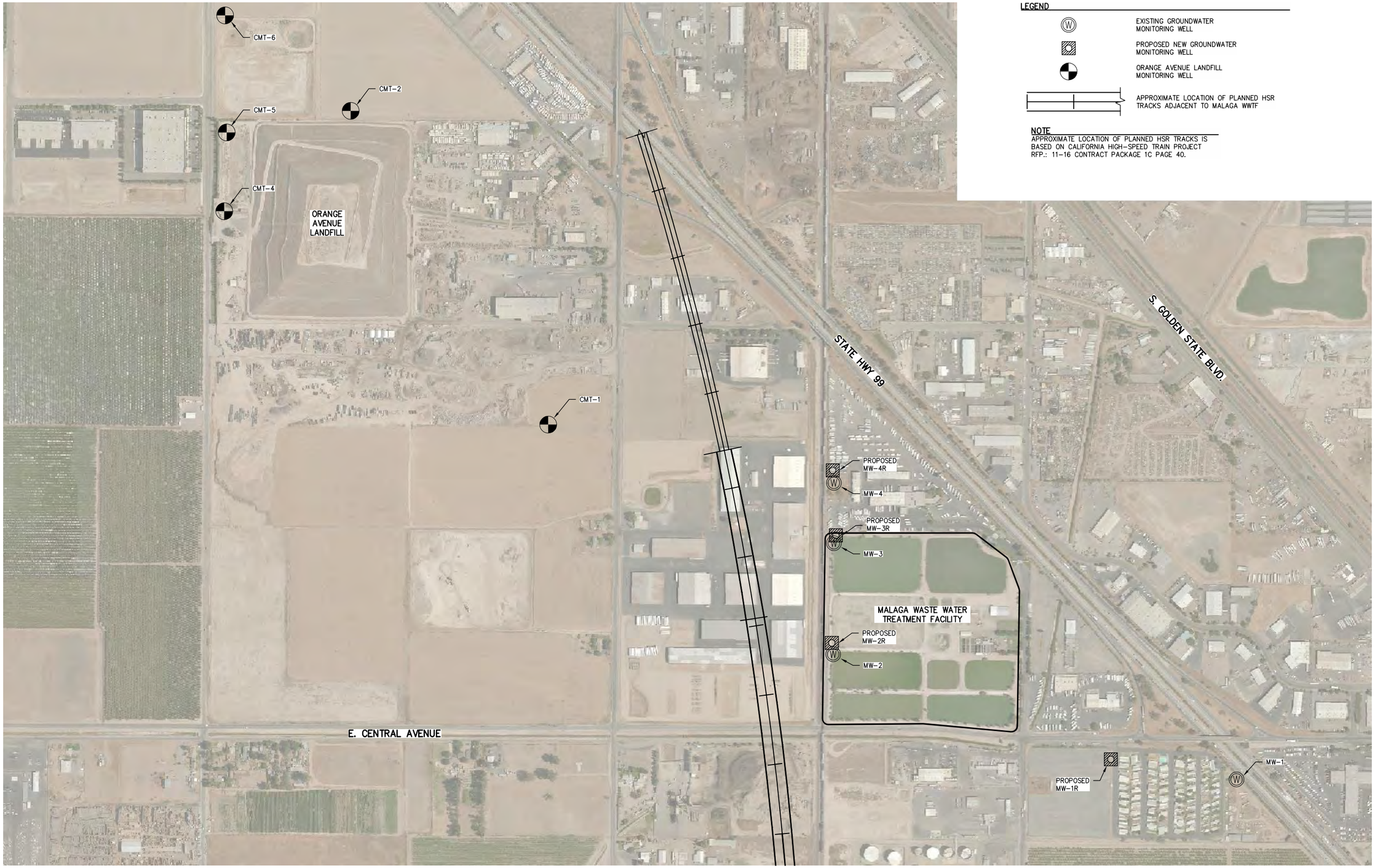
PROVOST & PRITCHARD CONSULTING GROUP
EST. 1962
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Malaga County Water District
Wastewater Treatment Facility

Figure 1

Vicinity and Topographic Map

3/28/2016 : U:\hunter\Malaga\Fig 1 vicinity and topo map.mxd



LEGEND

- EXISTING GROUNDWATER MONITORING WELL
- PROPOSED NEW GROUNDWATER MONITORING WELL
- ORANGE AVENUE LANDFILL MONITORING WELL
- APPROXIMATE LOCATION OF PLANNED HSR TRACKS ADJACENT TO MALAGA WWTF

NOTE
APPROXIMATE LOCATION OF PLANNED HSR TRACKS IS BASED ON CALIFORNIA HIGH-SPEED TRAIN PROJECT RFP.: 11-16 CONTRACT PACKAGE 1C PAGE 40.

SCALE IN FEET
0 150 300 600

No.	REVISION	BY	DATE

FOR REVIEW ONLY

GROUNDWATER MONITORING PLAN

MALAGA COUNTY WATER DISTRICT
WASTE WATER TREATMENT FACILITY

GENERAL

SITE MAP

PROVOST & PRITCHARD
CONSULTING GROUP
EST. 1968
An Employee Owned Company
286 WEST CROMWELL AVENUE
FRESNO, CALIFORNIA 93711-6162
559/449-2700 FAX 559/449-2715
www.ppeng.com

DESIGN ENGINEER:

LICENSE NO:

DRAFTED BY: MAP | CHECKED BY:

DATE: 8-10-2016

JOB NO: 105716001

PROJECT NO:

PHASE:

0 1"
ORIGINAL SCALE SHOWN IS ONE INCH. ADJUST SCALE FOR REDUCED OR ENLARGED PLANS.

SHEET FIG 2

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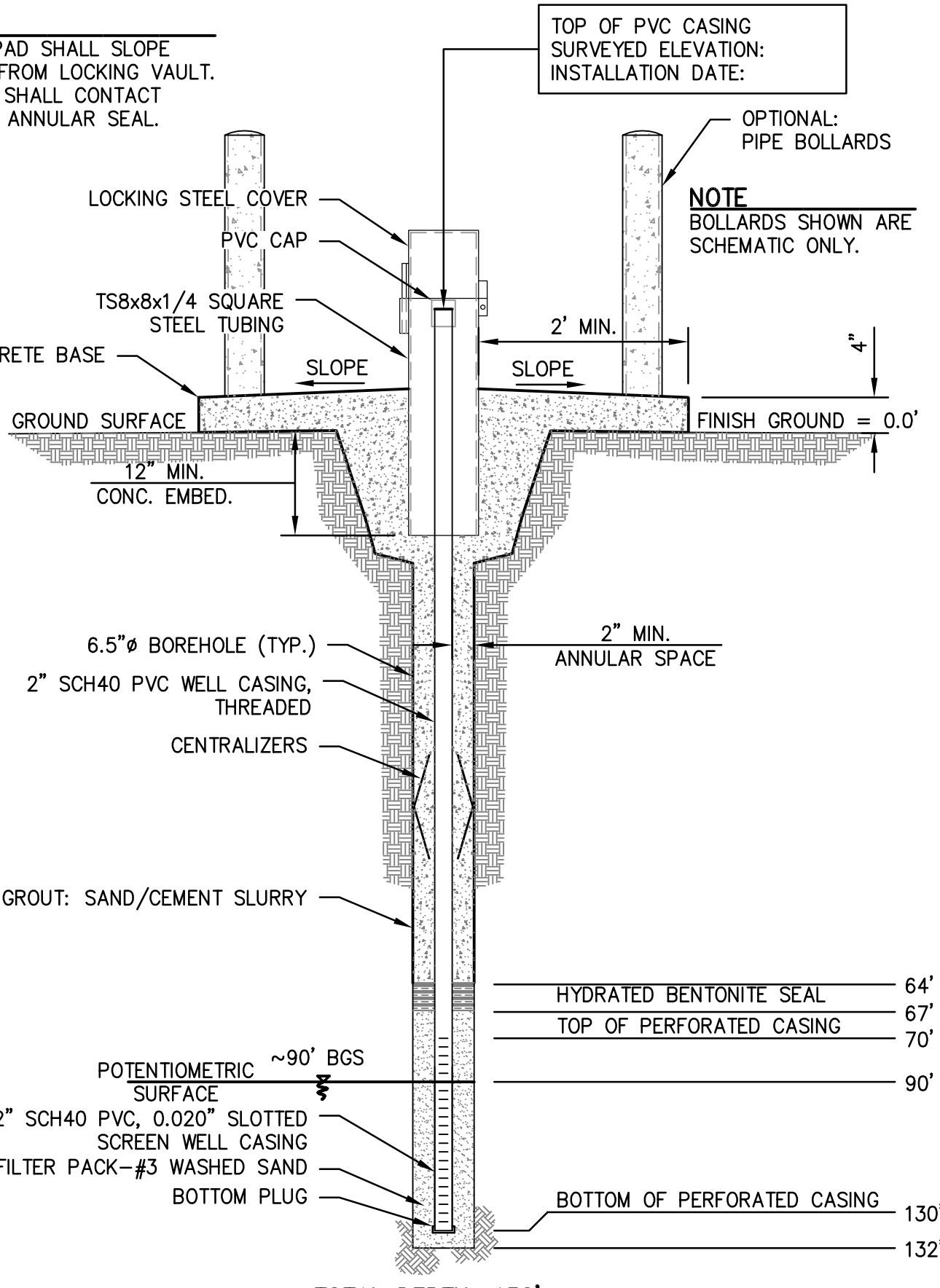
NOTE
WELL PAD SHALL SLOPE AWAY FROM LOCKING VAULT. VAULT SHALL CONTACT UPPER ANNULAR SEAL.



TOTAL DEPTH: 132'

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GROUNDWATER MONITORING PLAN

MALAGA COUNTY WATER DISTRICT
WASTE WATER TREATMENT FACILITY

SCHEMATIC MONITORING WELL DESIGN

MW2R & MW3R

DESIGN ENGINEER:	
DRAFTER:	MAP
SCALE:	N. T. S.
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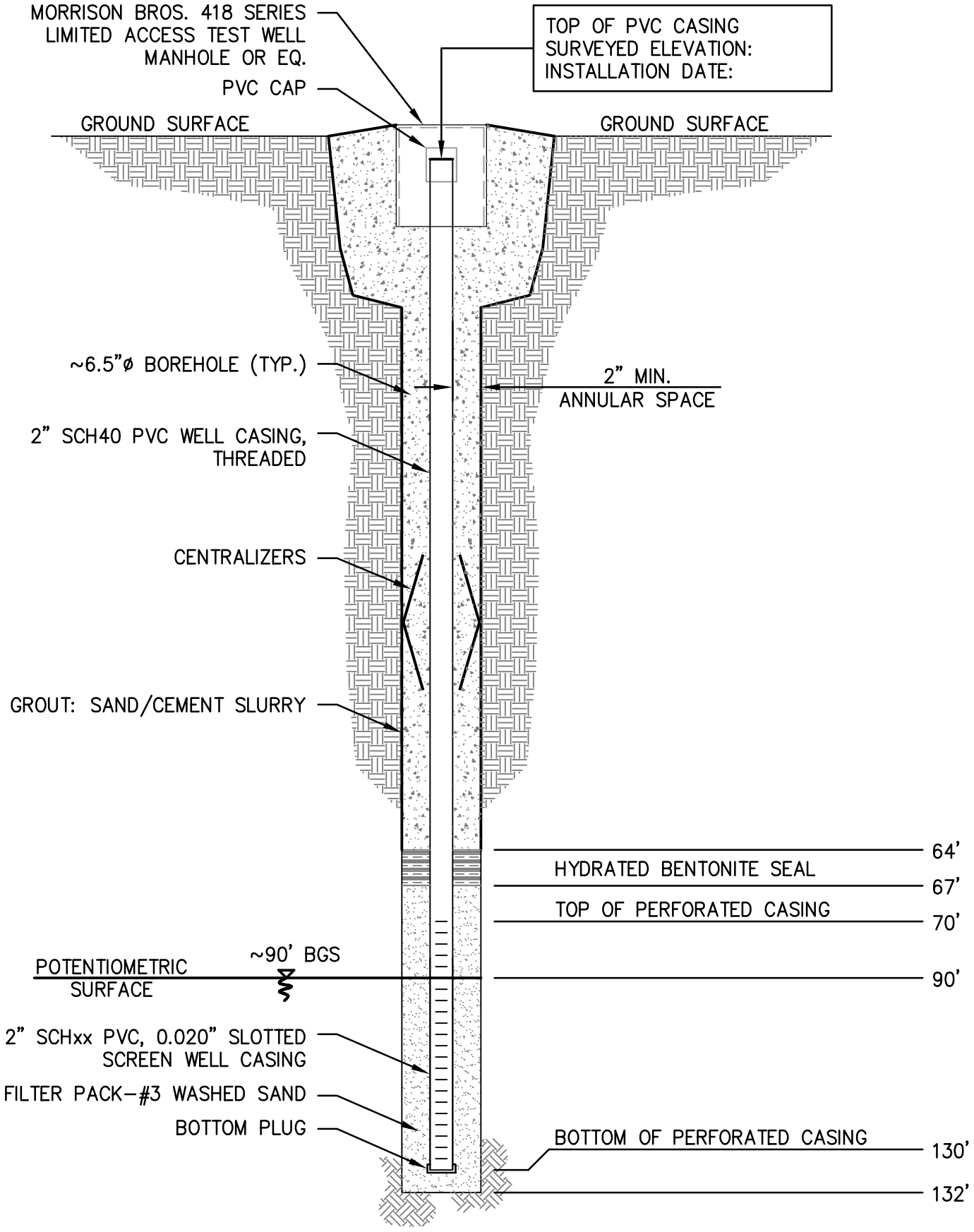
SHEET	FIG 3 OF

8/10/2016 2:23 PM G:\malaga cwd - 1057\1057g01_ongoing\400\groundwater monitoring plan\DWG\SHEET\FIG 3 MW2R & MW3R.dwg -Danny Jorge



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####
MALAGA COUNTY WATER DISTRICT
WASTE WATER TREATMENT FACILITY

MW1R & MW4R

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DRAFTER:	MAP
SCALE:	N. T. S.
DATE:	8-10-2016
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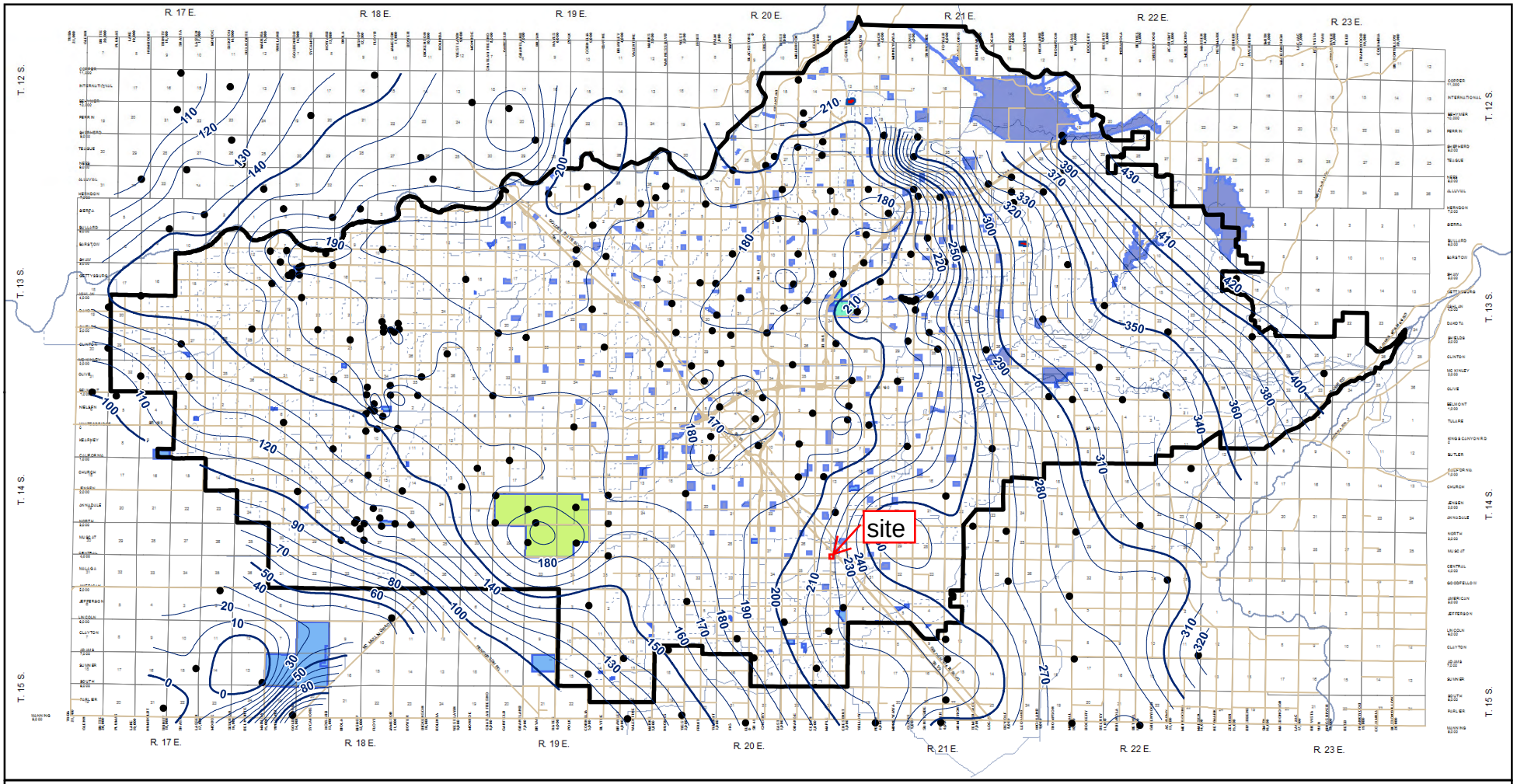
Appendix B

Geologic and Hydrogeologic Information



Legend

- Well Location
- **Lines of Equal Elevation(Feet Above Sea Level, NAVD88)**
  - 10 foot interval
  - 50 foot interval
- GWMP Boundary
- Major Streets
- Sections
- Waste Water Treatment Plant
- Leaky Acres
- FID Pond / Basin
- FMFCD Basin
- Surface Water Treatment Plant
- **Facilities**
  - Canal
  - Creek
  - Culvert
  - Flume
  - Pipeline
  - River

0 1 2 3 4 5 Miles

Approximate Scale

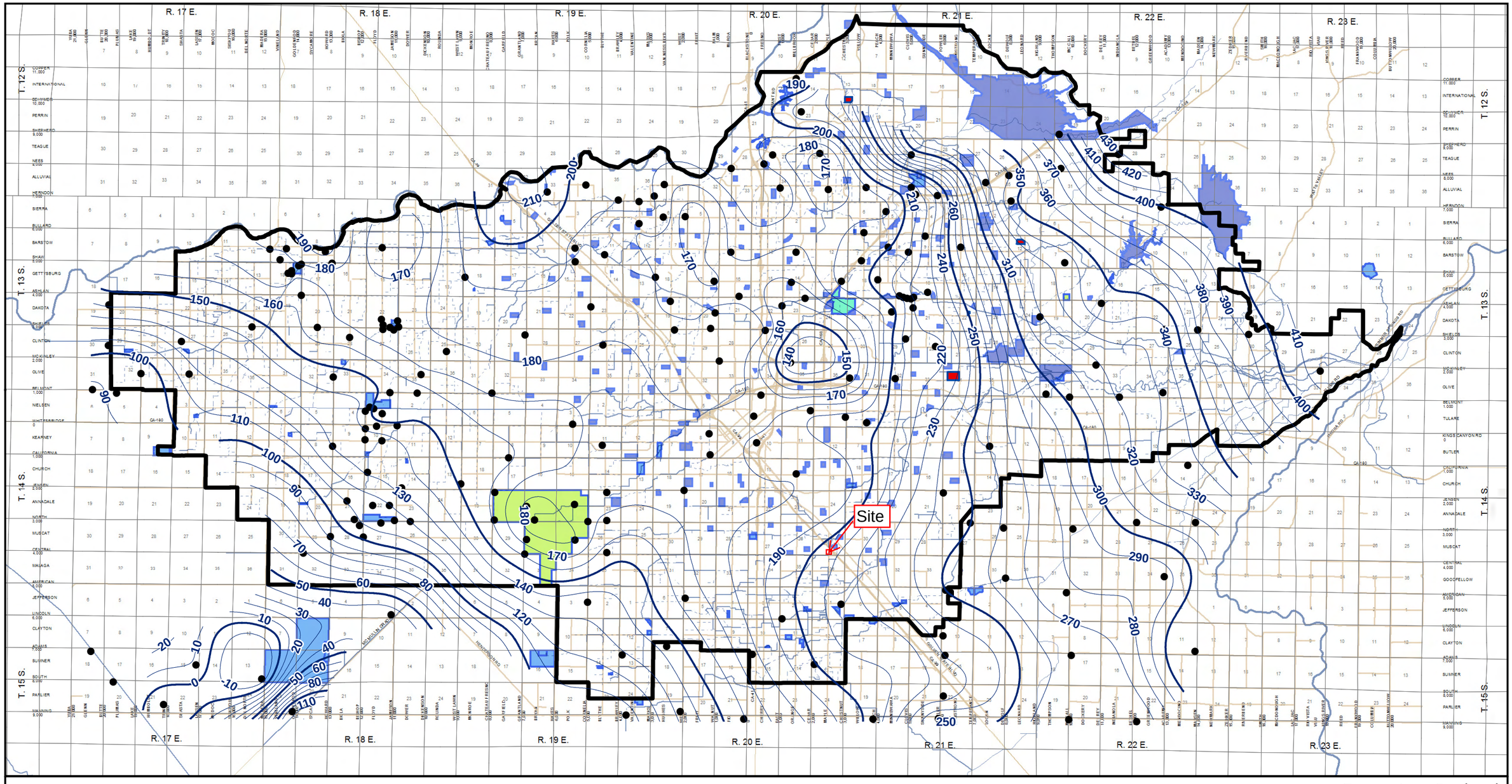
Lines of equal elevation are for general reference puposes only, and are an estimate based on available water level data. No assumprions are made about well construction or geologic conditions. Some well data points have been removed from the analysis if they appeared to be an obious anomoly when compared to other local well water levels.

Fresno Area-Regional Groundwater Management Plan

Annual Report

Elevation of Water In Wells (Spring 2014)

Figure 3



Legend

- Well Location

Lines of Equal Elevation(Feet Above Sea Level, NAVD88)

- 10 foot interval
- 50 foot interval

- GWMP Boundary
- Major Streets
- Sections

- Waste Water Treatment Plant
- Leaky Acres
- FID Pond / Basin
- FMFCD Basin
- Surface Water Treatment Plant

Facilities

- Canal
- Creek
- Culvert
- Flume
- Pipeline
- River

0 1 2 3 4 5 Miles

Approximate Scale

Lines of equal elevation are for general reference puposes only, and are an estimate based on available water level data. No assumprions are made about well construction or geologic conditions. Some well data points have been removed from the analysis if they appeared to be an obious anomoly when compared to other local well water levels.

Fresno Area-Regional Groundwater Management Plan

Annual Report

Elevation of Water In Wells (Spring 2015)

Figure 3

EAST NORTH STREET

HIGHWAY 99

SOUTH PARKWAY DRIVE

SOUTH ORANGE AVENUE

CMT-7
214.96

CMT-6
215.37

CMT-5
216.29

CMT-3
217.52

CMT-2
217.84

CMT-4
216.25

CMT-1
224.54

215.00
215.50
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222.50
223.00
223.50
224.00

DISPOSAL SITE
PERMITTED
FACILITY
BOUNDARY

400 0 400
SCALE : 1" = 400'

LEGEND

CMT-1 224.54	CMT MONITORING WELL WITH POTENTIOMETRIC SURFACE ELEVATION (FEET MSL)
215.50	POTENTIOMETRIC SURFACE CONTOUR (FEET MSL)
CMT	CONTINUOUS MULTI-CHANNEL TUBING
MSL	MEAN SEA LEVEL

FIGURE 3

08-1550

POTENTIOMETRIC SURFACE MAP - SHALLOW DEPTH INTERVAL

SEPTEMBER 19, 2011

ORANGE AVENUE LANDFILL

3280 SOUTH ORANGE AVENUE

FRESNO, CALIFORNIA

EBA ENGINEERING

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EAST NORTH STREET

HIGHWAY 99

SOUTH PARKWAY DRIVE

SOUTH ORANGE AVENUE

CMT-7
213.65

CMT-6
214.22

CMT-5
214.76

CMT-3
216.16

CMT-2
217.35

CMT-4
216.29

CMT-1
220.83

214.00
214.50
215.00
215.50
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216.50
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217.50
218.00
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219.50
220.00
220.50

DISPOSAL SITE
PERMITTED
FACILITY
BOUNDARY

400 0 400
SCALE : 1" = 400'

LEGEND

CMT-1 220.83	CMT MONITORING WELL WITH POTENTIOMETRIC SURFACE ELEVATION (FEET MSL)
217.50	POTENTIOMETRIC SURFACE CONTOUR (FEET MSL)
CMT	CONTINUOUS MULTI-CHANNEL TUBING
MSL	MEAN SEA LEVEL

FIGURE 4

08-1550

POTENTIOMETRIC SURFACE MAP - SHALLOW DEPTH INTERVAL

JUNE 19, 2012

ORANGE AVENUE LANDFILL
3280 SOUTH ORANGE AVENUE
FRESNO, CALIFORNIA

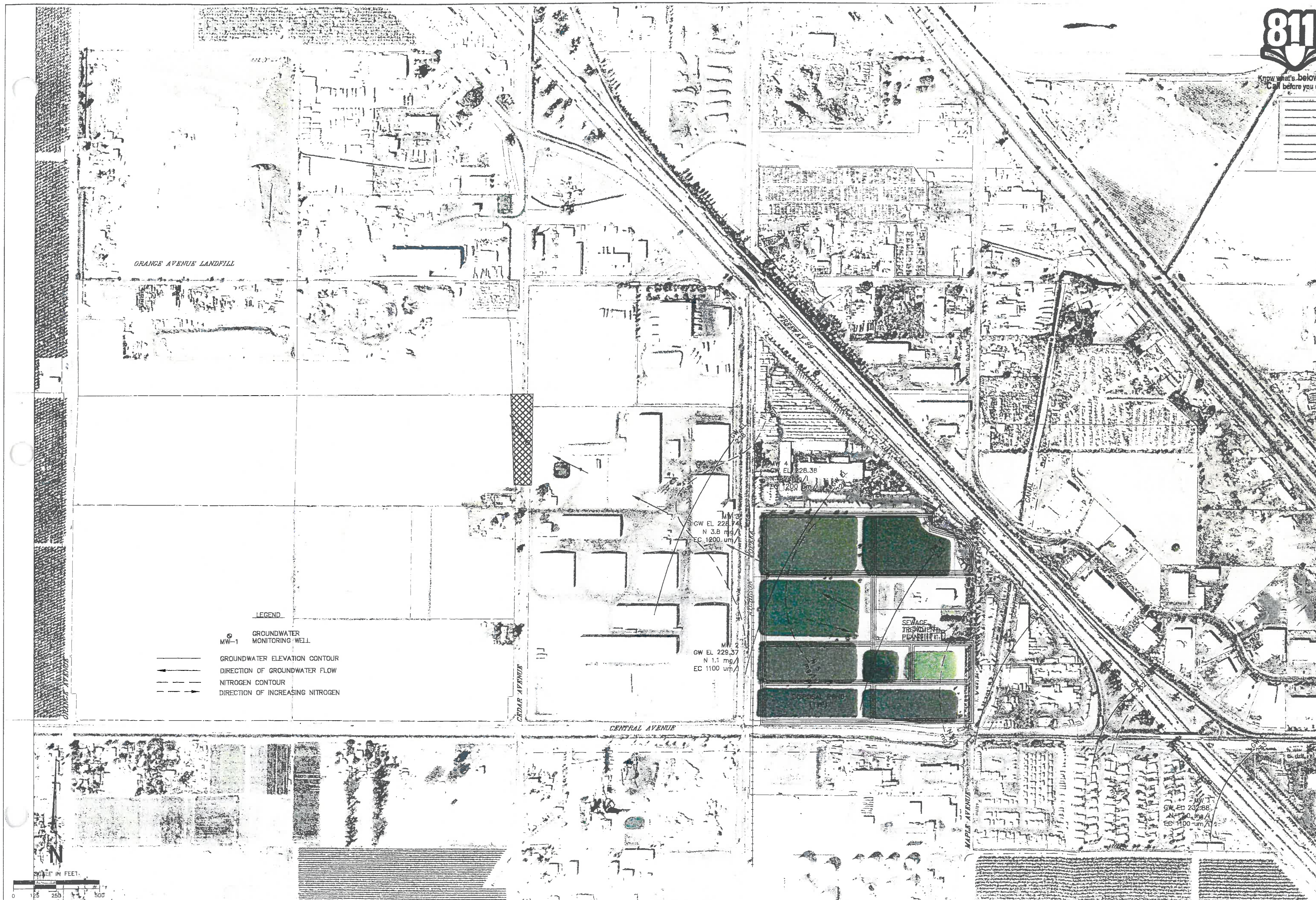
EBA ENGINEERING

Q:\1550\2012 - Monitoring Report\PSM - 2012.dwg, 2012--06-19 - Shallow, 6/27/2012 6:14:53 PM

FIGURE 4 08-1550

POTENTIOMETRIC SURFACE MAP
DECEMBER 11, 2015
ORANGE AVENUE LANDFILL
3280 SOUTH ORANGE AVENUE
FRESNO, CALIFORNIA

EBA ENGINEERING
825 SONOMA AVENUE
SUITE C
SANTA ROSA, CA 95404
TEL: (707) 544-0784



PRELIMINARY
NOT FOR CONSTRUCTION
01/03/2007

No.	REVISION	BY	DATE

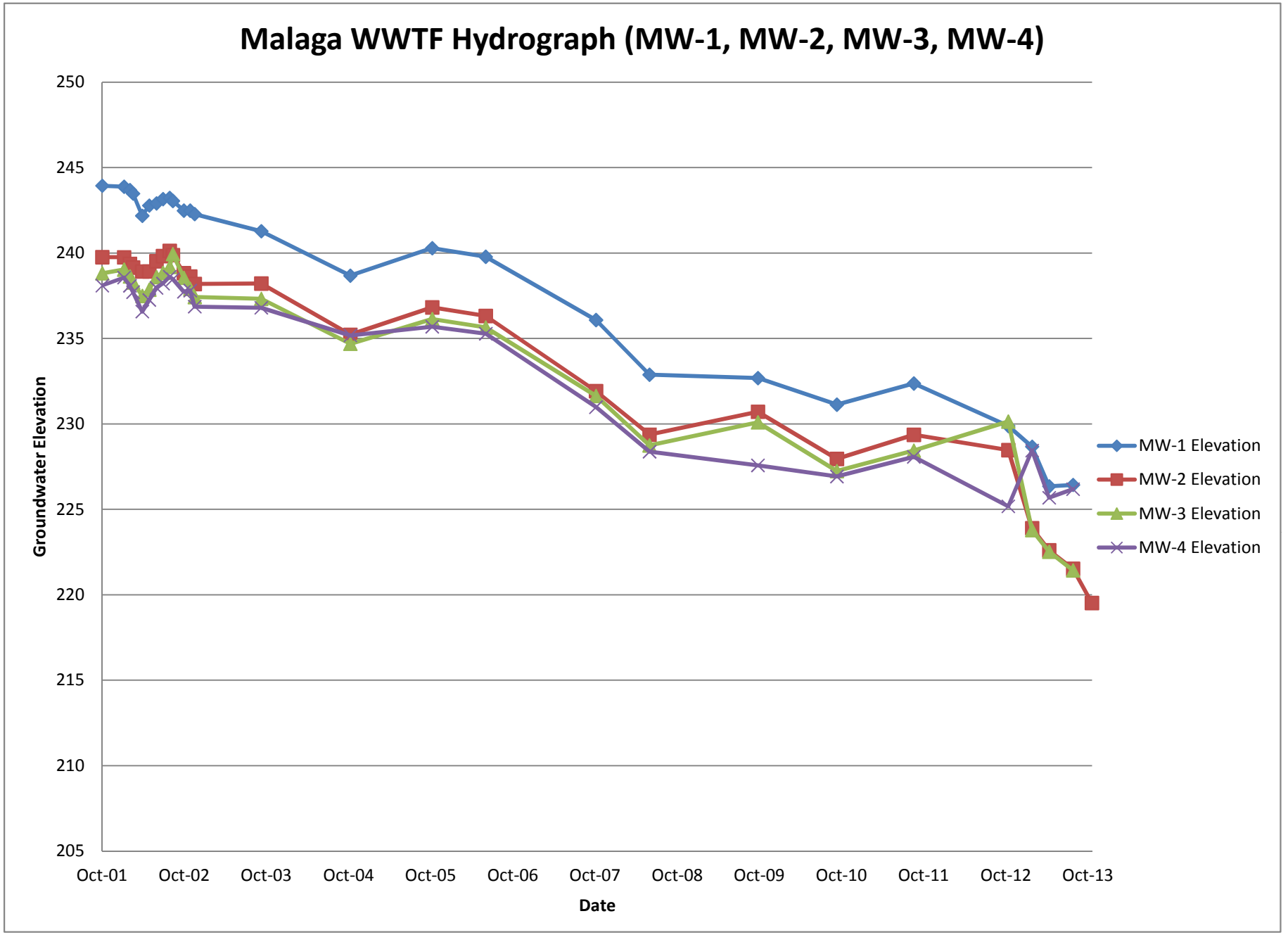
MALAGA COUNTY WATER DISTRICT
FRESNO COUNTY, CA

EXHIBIT C
MONITORING WELLS
GROUNDWATER MONITORING 2008

EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company
286 WEST CROMWELL AVENUE
FRESNO, CALIFORNIA 93711-6162
559/449-2700 FAX 559/449-2715
www.ppeng.com

DESIGN ENGINEER: MGT	
LICENSE NO: CE 39961	
DRAFTED BY: DVS	CHECKED BY:
SCALE: AS SHOWN	
DATE: 01-27-2009	
JOB NO: 10570901	
DWG. NO:	
SHEET 1 OF 1	

10/20/2009 12:05 PM G:\Clients\Malaga CWD - 1057\10570G01_Ongoing\400\Groundwater Monitoring Plan\DWG\EXHIBIT\2009\10570901-GW EXHIBIT SENT TO CITY OF FRESNO 2009-09-30.dwg --Michael Taylor


Malaga WWTF Hydrograph (MW-1, MW-2, MW-3, MW-4)
250
245
240
235
230
225
220
215
210
205
Groundwater Elevation
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Date
MW-1 Elevation
MW-2 Elevation
MW-3 Elevation
MW-4 Elevation

Appendix C

Protocols

PROTOCOL FOR DRILLING AND SOIL SAMPLING

GENERAL SCOPE

The procedures used by Provost and Pritchard Consulting Group (Provost & Pritchard) were developed to obtain representative, consistent, reliable, and reproducible data during the drilling, sampling, and sealing of boreholes. The procedures described herein are intended to be of general use. As work progresses, appropriate revisions may be made and approved in writing by Provost & Pritchard's project manager.

PROCEDURES FOR DRILLING

Provost & Pritchard will prepare a work plan for the oversight agency review. Field work and reporting will be performed under the direction of an appropriately registered or certified professional (Business and Professions Code Sections 6735 and 7835). All field personnel have current Hazwoper certification, as applicable. All field equipment will be calibrated prior to field use, and recalibrated, as needed.

Procedures for boreholes intended for conversion into monitoring wells will additionally follow the Provost & Pritchard Monitoring Well Installation, Development, and Sampling Protocol.

1. PERMITTING

Provost & Pritchard will prepare applications for appropriate permits, unless otherwise instructed by the owner. Copies of signed permits will be on site during drilling operations, and will be available for inspection by appropriate agencies. The Contractor shall obtain well drilling permits and USA clearance as needed.

2. EQUIPMENT CLEANING

Drilling equipment will be thoroughly steam-cleaned prior to arriving on site to prevent the introduction of contamination from off site. Clean equipment will be stored in a clean location when not in use. Hydrocarbon based lubricants will not be used on drilling equipment. Provost & Pritchard recommends that food grade-solid, vegetable shortening, or a Teflon™ based lubricant be used. Equipment will be steam-cleaned on site, and will be cleaned only in designated areas, prior to reuse.

3. SAMPLER CLEANING

Soil samplers will be disassembled, washed with a solution containing Simple Green or non-phosphate detergent, or steam-cleaned, rinsed with steam distilled water, and air-dried immediately prior to use. Samples will be lined with similarly cleaned and dried brass or stainless steel tubes, and reassembled for use.

4. DRILLING

The drilling method used will be determined based upon the material to be drilled, depth and diameter of the boring, sampling requirements, site access, and other site-specific conditions. Most wells installed up to approximately 150 feet deep will utilize a hollow-stem auger truck-

mounted drilling rig; most deeper wells will require using a mud rotary drilling rig or similar. Each boring will initially be hand-augered to a minimum of five feet below surface to assure clearance of subsurface structures or other impediments. Additional efforts to widen the clearance area may be utilized as needed.

The subsurface stratigraphy will be interpreted by observing the materials recovered during drilling, and by sampling undisturbed soils. For hollow-stem drilling, discrete soil samples will generally be collected at a minimum of each 5 feet drilled, or at noticeable changes in lithology, until groundwater is encountered. Soils may be sampled using a California-modified sampler or a standard penetration sampler containing cleaned brass liners. For mud rotary-type drilling, soil cuttings will generally be composited at a minimum of each 10 feet drilled to the total depth explored. Geo-physical logs may be performed and utilized for stratigraphic interpretation. Sampling intervals may vary depending upon project requirements. Boring depths will be based upon the nature and extent of the materials encountered, and upon project requirements.

5. PREPARATION OF BORING LOGS

The Provost & Pritchard field technician will lithologically log the borings during drilling. The technician and the drilling operator will discuss changes in material penetrated by the drill, changes in drilling conditions, hydraulic pressure, drilling action, and drilling fluid circulation rate, and the technician will record such changes by time and depth. The technician will evaluate the relative moisture content of the samples and note zones that produce water.

6. SEALING OF BORING

Boreholes will be destroyed by methods as approved by the local oversight agency.

PROCEDURES FOR SOIL SAMPLING

1. EQUIPMENT LIST

The geologist or soil technician will require the following equipment for hollow-stem drilling and soil sampling. Mud rotary samples are generally collected by the drilling subcontractor. In this case, protective equipment and site documents would generally be sufficient.

Decontamination Equipment

- 2 – 5-gallon buckets (or suitable wash tub)
- Simple Green or non-phosphate detergent
- small head long handled scrub brush
- 1 ½" or 2" bottle brush

Drilling Equipment

- chain vise (provided by driller)
- 2 – 5-gallon buckets
- pipe wrench
- rock hammer
- large flathead screwdriver and/or small putty knife

- quart self-sealing plastic bags
- photoionization detector (with a lamp of 11.7 eV), as appropriate
- leather gloves
- eye and ear protection
- clipboard or forms box with the following:
  - client contact information
  - site map with boring locations
  - field boring logs and daily field records
  - waterproof fine point marker and ball point pens
  - sample labels and chain-of-custody forms
  - Site Health and Safety Plan

Sampling Equipment

- 1 ½" or 2" stainless steel or brass liners, caps and Teflon tape
- gallon self-sealing plastic bags
- ice chest with ice
- latex or similar gloves
- soil sample collection log (or note on boring log)

2. SAMPLING INTERVAL IN BORINGS

Soil samples may be collected at discrete intervals or by continuous core, based upon project-specific requirements. For hollow-stem drilling with discrete sampling intervals, soils will be sampled utilizing a standard split spoon (SPT), modified California, or California sampler. The sampler will be driven either 18 or 24 inches, as appropriate, ahead of the bottom auger using a slide hammer and rods or other comparable method. The number of blows necessary to drive the sampler each 6 inches will be recorded to help evaluate soil consistency. For continuous core sampling, soils will be sampled by utilizing a continuous split spoon sampler typically either 5 or 10 feet in length. The auger string, with the sampler inside, will be advanced into the soil column a distance equal to the length of the sampler being used.

For both discrete and continuous sampling, once the split spoon has been driven into the soil the appropriate distance, the sampler is retrieved to the surface where it is opened for sample acquisition. Each style of split spoon sampler is designed to contain a set of brass or stainless steel liners appropriate to the length of the sampler. If liners are utilized, soils collected in the bottom liner may be labeled, sealed, and preserved in an ice-cooled container for potential laboratory analyses. Selected soil samples may be delivered under a chain-of-custody record to a State-certified laboratory for chemical or soil property analyses. Soils which are collected in the upper and middle liners may be extruded in the field, and examined by Provost & Pritchard's geologist to help provide detailed lithologic information.

For mud rotary soil sampling, the drilling subcontractor will collect soil samples for lithologic purposes from the cuttings utilizing a screened scoop or other comparable method. The retained soil will be placed into a self-sealing plastic bag labeled with the drilling depth interval in which the sample was collected.

3. QUALITATIVE FIELD SCREENING

A photoionization detector (PID) may be used to provide a qualitative screening of each soil sample collected during drilling. The field screening procedure typically consists of sealing a soil sample in a self-sealing plastic bag or clean glass jar, allowing the sample to equilibrate for 5 to 15 minutes, and scanning the headspace in the bag or jar for vapors. The screening readings will be noted on the boring log and/or on the daily field log.

4. SAMPLE PRESERVATION

The sample(s) selected for chemical or physical testing will be sealed in the liner in the field. Teflon™ sheeting covers will be placed on the ends of the liner directly on the exposed soils, and held in place by clean plastic caps. Sealed soil samples will be labeled and placed in a covered ice-cooled container.

5. SAMPLE PACKAGING AND TRANSPORT

Sample Handling

Sample containers will not be opened except by laboratory personnel who will perform the chemical analyses. Soil samples will be analyzed by a laboratory certified by the State of California. Requests for sample analyses will be made in writing and will be included as part of the chain-of-custody record.

Custody Seal

If it is necessary for samples or sample chests to leave the immediate control of the sampler prior to being delivered to the laboratory, a custody seal will be placed on each sample container and/or sample chest to discourage tampering during transportation. The custody seal will contain the sampler's signature, and the date and time seal was emplaced.

Chain of Custody Procedures

In order to document and trace sample possession from time of collection to time of analysis, a chain-of-custody record will be filled out by the sampler, and will accompany the sample through the laboratory analyses. The completed chain-of-custody record will accompany the final laboratory analytical report.

Information contained on the duplicate, carbonless chain-of-custody form will include:

- date and time the sample was collected;
- sample number and the number of sample containers;
- analyses required;
- remarks, including preservatives added and any special conditions; and
- container number in which sample has been packaged.

Blank space on the chain-of-custody record between last sample number listed and signatures at the bottom of the sheet will be lined out.

PROTOCOL FOR MONITORING WELL INSTALLATION, DEVELOPMENT, AND SAMPLING

GENERAL SCOPE

The procedures used by Provost and Pritchard Consulting Group (Provost & Pritchard) for drilling, construction, development, and sampling of groundwater monitoring wells were developed to obtain representative, consistent, reliable, and reproducible data. The wells will generally be drilled by the hollow stem auger method to approximately 150 feet below ground surface, and by mud rotary or similar for deeper wells; other drilling methods may be pre-approved by the Geologist or Engineer. The exact depth and screening interval of each monitoring well will be based on the field conditions encountered and the review and evaluation of past data collected from wells in the vicinity of the investigation.

Upon construction completion, each monitoring well shall be developed and sampled as described in this protocol. The procedures described herein are intended to be of general use. As work progresses, appropriate revisions may be made and approved in writing by Provost & Pritchard's project manager.

PROCEDURES

Field work and reporting will be performed under the direction of an appropriately registered or certified professional (Business and Professions Code Sections 6735 and 7835). All field personnel have current Hazwoper certification, as applicable. All field equipment will be calibrated prior to field use, and recalibrated, as needed.

Provost & Pritchard will prepare a work plan for the oversight agency review, and obtain appropriate permits, unless otherwise instructed by the owner. Subsurface site assessment permits will be completed sufficiently early in the course of the project to allow time for review and authorization at least 48 hours before field activities begin. Copies of signed permits will be on site during sampling activities, and will be available for inspection by appropriate agencies, if applicable.

Complete drilling and sampling procedures are detailed in the Provost & Pritchard Drilling and Soil Sampling Protocol.

1. EQUIPMENT LIST

The geologist or soil technician will require equipment as listed in the Provost & Pritchard Drilling and Soil Sampling Protocol. The water technician will require equipment as listed in the Provost & Pritchard Groundwater Sampling Protocol.

2. QUALIFICATIONS OF CONTRACTORS

The wells shall be drilled by qualified well drillers with experience in construction of monitoring wells. The well driller must possess a current C-57 Well Drillers License, valid in the State of California.

3. STANDARDS AND PERMITS

The wells shall be constructed in accordance with the local County ordinance, and the California Water Well Standards (DWR Bulletins 74-90 and 74-81). The Contractor shall obtain well drilling permits and USA clearance as needed, and shall report the results of the drilling to the California Department of Water Resources.

4. EQUIPMENT REQUIREMENTS

Drilling equipment and soil samplers will be thoroughly washed with a solution containing a non-phosphate detergent, or steam-cleaned, rinsed with steam distilled water, and air-dried immediately prior to use on site to prevent the introduction of contamination from another source. If equipment needs to be steam-cleaned on site, it will be cleaned in a designated area prior to reuse. Soil samplers will be lined with similarly cleaned and dried brass or stainless steel tubes as needed, and reassembled for use.

5. WELL DRILLING

During the groundwater monitoring well drilling process the following information will be recorded and logged:

A. A detailed log of unique soil horizons and hydrogeological conditions encountered, from the surface to the total depth, as interpreted from soil samples. Physical descriptions of soils excavated will be noted as per the Unified Soils Classification System (USCS).

B. Discrete soil samples will be collected at five foot intervals from the surface to the total depth, as per standard geological practice, placed in separate bags for each interval, and plainly marked with the well name and depth. Additional discrete or continuous samples may be collected at significant changes in subsurface conditions. Selected soil samples may be delivered under a proper chain-of-custody record to a State-certified laboratory for chemical analyses.

C. For mud rotary borings, geo-physical logs may be performed to better clarify the soil lithology and determine depth to groundwater.

D. The final drillers log shall show diameter, wall thickness, depth, and length of casing installed; perforated intervals; details of cemented sections; and other pertinent details.

E. Permanent records of drilling shall be made by the Contractor in accordance with the laws of the State of California governing the drilling of monitoring wells.

6. WELL CONSTRUCTION MATERIALS

Blank and Perforated Well Casing

The blank casing is typically 2-inch diameter schedule 40 PVC pipe, with perforated casing of 2-inch diameter, schedule 40 PVC pipe of with machined slots of 0.020-inch width. The Geologist or Engineer may propose wells of smaller or larger diameter and schedule based on specific site conditions.

Filter Pack

Filter pack grain size will be appropriate to the selected screen slot width. Filter pack will consist of Lonestar #3 sand or equivalent with less than 2 percent, by weight, passing through a No. 200 sieve for the 0.020-inch width screen. The filter pack will be selected to retain a high percentage of the saturated zone (native materials) to be monitored and will be graded similarly. The filter pack will extend from the bottom of the borehole, along the length of the perforated section, to approximately two feet above the top of the screened interval. The Geologist or Engineer may propose filter pack of smaller or larger grain size based on specific site conditions.

Transition Seal

The transition seal will be a minimum of three feet thick of bentonite chips or pellets. The Geologist or Engineer may propose a different transition seal thickness based on specific site conditions.

Cement Grout

Cement grout will be a mixture of not more than six gallons of clean water per cubic foot of Type II Portland cement, with up to 5% bentonite, to be approved by the Geologist or Engineer.

7. WELL INSTALLATION

Well Casing

The exact monitoring well construction will be determined by the Geologist or Engineer contingent upon the field conditions encountered. The casing shall be installed in such a manner as to avoid damage to the casing and to allow the proper placement of the filter pack and annular seal.

Filter Pack

The filter pack shall be installed opposite the perforated interval by using a tremie pipe or equivalent method. The tremie pipe will initially be lowered to near the bottom of the interval to be filter packed and then slowly pulled up as sand packing proceeds to the desired depth above the perforated interval. The filter pack for the well screen will be surged and additional filter pack material added as needed.

Transition Seal

The transition seal will be installed above the filter pack. Bentonite installed above standing water will be hydrated by the addition of clean water.

Annular Seal

The cement grout mixture will be placed above the bentonite seal. The annular seal from the top of the transition seal to the land surface shall be installed by pumping the cement under pressure through a tremie pipe. During the operation, the tremie pipe will be raised as the annular space is filled with cement. An upper interval may be emplaced by free-fall method as

approved by the local oversight agency. Once the cement has been installed, the well will not be disturbed for at least 48 hours.

Well Head and Pad

The well casing will be cut to the required height and capped with a water resistant well cap. A concrete base will be installed at the well head with a water-tight painted steel standpipe and locking well cover as shown on the monitoring well schematic. A well pad will be constructed so that surface drainage will slope away from the casing.

8. WELL DEVELOPMENT

The monitoring well will be purged and developed with a surge block and/or pump after at least 48 hours and after the annular seal has cured sufficiently to prevent damage during well development. The monitoring well will be purged of at least 10 well volumes. Development purging should continue until the measured depth of the well essentially agrees with the constructed depth, and the parameters of temperature, pH, and electrical conductivity (EC) stabilize, and the water is visually clear of suspended solids. Disposal of development water will be on site or in accordance with local regulations.

9. WELL SAMPLING

Groundwater samples will be collected from each monitoring well at least 48 hours following well development and purging. Depth to water measurements will be taken prior to sampling each well to establish the direction of the hydraulic gradient. Disposable or dedicated sampling equipment may be used to sample the wells. If non-dedicated equipment is used, proper decontamination procedures shall be followed both prior to sampling and between sampling of each well.

After collecting water level measurements, the monitoring wells will be purged of at least three well volumes and sampled. Temperature, pH, and EC will be measured until the parameters stabilize during the purging process. Once the water parameters have stabilized, water samples will be collected in appropriate containers supplied by the laboratory. The water samples may be filtered in the field or by the contracting laboratory. Monitoring well purging and sampling will be conducted in accordance with USEPA SW-846.

10. WELL SURVEY

The monitoring wells will be surveyed for future water gradient determination under the direction of a State registered civil engineer or land surveyor. The well elevations will be measured to the nearest 0.01 foot and referenced to state plane coordinates, or an assumed datum. The survey will be performed in accordance with Geotracker requirements, as applicable.

PROTOCOL FOR GROUNDWATER SAMPLING FOR GENERAL PHYSICAL/GENERAL MINERAL

GENERAL SCOPE

The procedures used by Provost and Pritchard Consulting Group (Provost & Pritchard) for purging, sampling and analyses of groundwater samples were developed to obtain representative, consistent, reliable, and reproducible data. The procedures described herein are intended to be of general use. As work progresses, appropriate revisions may be made and approved in writing by Provost & Pritchard's project manager.

Protocols for collecting grab samples from temporary sampling points are similar to protocols from installed monitoring wells. Exceptions are noted in Section 6 below.

PROCEDURES FOR GROUNDWATER SAMPLING

Field work and reporting will be performed under the direction of an appropriately registered or certified professional (Business and Professions Code Sections 6735 and 7835). All field personnel have current Hazwoper certification, as applicable. All field equipment will be calibrated prior to field use, and recalibrated, as needed.

Provost & Pritchard will prepare a work plan for the over sight agency review, and obtain appropriate permits, unless otherwise instructed by the owner.

1. EQUIPMENT LIST

The water technician will require the following equipment for purging and sampling:

Decontamination Equipment

- 2 – 5-gallon buckets
- Simple Green or non-phosphate detergent
- small head long handled scrub brush
- 1 ½" or 2" bottle brush

Purging Equipment

- Waterra Powerlift II actuator, Grundfos pump, or disposable bailers
- Horiba multimeter with calibration solutions
- Solinst water level indicator
- DO meter or other as needed
- extra Waterra tubing, footer valves, and surge block if using the Waterra system
- 2 – 5-gallon buckets
- generator with gas
- extension cord
- tie down strap or bungie
- tool bucket (wrenches, pliers, all thread, zip ties)

- latex gloves

Sampling Equipment

- sample bottles
- gallon self-sealing plastic bags
- ice chest with ice
- eye and ear protection
- field camera
- clipboard or forms box with the following:
  - client contact information
  - site map with well locations
  - field purge records
  - daily field records
  - waterproof fine point marker and ball point pens
  - sample labels
  - chain-of-custody forms

2. EQUIPMENT CLEANING

When dedicated purging and sampling equipment is not used, equipment that may come in contact with the sample will be thoroughly cleaned prior to arrival to the project site. Non-disposable bailers and positive gas-displacement bladder pumps will be disassembled, steam-cleaned, rinsed with (steam-distilled) water, and then reassembled. Wires, hoses and connectors will be cleaned in a similar manner.

3. WATER LEVEL MEASUREMENT

Prior to each sampling event, the static depth to water and depth to the bottom of the well will be measured in each monitoring well. These data will be used to calculate the elevation of the water surface and the required purge volume. The well depth measurement will also be used to monitor siltation.

Generally, a weighted water level meter will be used to measure the depth to groundwater and bottom-of-well measurements. All measurements will be recorded to the nearest 0.01 foot.

Monitoring wells completed in areas where groundwater is suspected or known to contain hydrocarbons will be measured using an oil/water interface meter. Any detected thickness of free product will be measured and recorded to the nearest 0.01 foot. Unless specifically instructed otherwise, Provost & Pritchard will not collect groundwater samples through a free product layer.

4. WELL PURGING

In order to obtain a representative sample of the groundwater contained within the saturated zone, stagnant water within the well casing and filter material must be removed, and fresh formation water allowed to replace it. Removal of the stagnant water is accomplished by

pumping or bailing the water contained within the well. Purged water may be dispersed on site or stored in holding tanks or drums for future disposal as applicable.

Where dedicated purging and sampling devices have not been installed, one or more of the following temporary purging devices may be used:

- a positive gas-displacement, Teflon™ and/or stainless steel-housed Teflon™ bladder pump;
- a Teflon™ or stainless steel bailer with bottom discharge unit;
- a stainless steel submersible pump with galvanized piping;
- a peristaltic pump;
- a centrifugal pump;
- a two-stage air-lift pump (Teflon™ or stainless steel); or
- disposable polyethylene bailers with polypropylene check ball.

The purging rate used at a particular monitoring well will depend on the expected or known hydraulic yield.

When purging a low-yield well (one that yields less than three casing volumes prior to being purged to dryness), the well will be purged to dryness twice. When the well recovers the third time, and when it contains a sufficient volume of water for the required analyses, samples will be collected. At no time will a well be purged to dryness if the rate of recharge is such that formation water will cascade down the sides of the casing, or if a purge rate of greater than one-quarter gallon per minute can be maintained.

Groundwater samples will be removed from a monitoring well of moderate- to high-yield only after a minimum of three casing volumes have been purged from the well casing, and purging has been of sufficient duration to result in stabilization of pH, temperature, and electrical conductivity (EC) measurements.

In moderate- to high-yield formations, the purging devices will be placed near the top of the screened interval to ensure that fresh formation water will move upward in the screen. When purging low-yield formations, water will be removed from the bottom of the screened portion. If a Waterra dedicated sampling system is in place, the purging device will be placed in the lower half of the screened portion.

A field sampling log will be maintained for each sampling event and will include the following:

- sampler's identification;
- monitoring well identification;
- climatic conditions;
- depth to water prior to purging;
- type of purging and sampling device;
- purging rate and volume;
- relative well yield volume;

- field parameter measurements (pH, temperature, EC);
- type and number of samples collected; and
- date and time collected.

The pH, temperature, and EC parameters will be monitored and recorded during the purge operations for each casing volume purged. Stabilization of pH, temperature, and EC parameters will be indicated by values within 10% of one another for a minimum of three consecutive readings. Field parameters will be measured using a pH meter calibrated to standard buffers, and an electrical conductivity meter equipped with a thermometer. Field equipment will be standardized at the beginning of each use, according to the manufacturers' specifications and consistent with SW-846.

5. SAMPLE COLLECTION

Samples of fresh formation water will be collected only after the appropriate volume of water has been purged from the casing, and field parameters have stabilized.

To increase the likelihood that groundwater samples are representative of the groundwater contained within the formation, it is important to minimize physical or chemical alteration of the sample during the collection process. If dedicated sampling devices are not used, the following procedures will be strictly adhered to:

- Sampling equipment will be thoroughly cleaned in accordance with Section 2 (Equipment Cleaning) of this protocol.
- Blank samples, if required, will be collected during the final rinse of the sampling equipment cleaning process.

A general order of collection for some common groundwater analyses follows:

- total organic carbon
- extractable organic compounds
- total metals
- dissolved metals
- phenols
- sulfate and chloride
- turbidity
- nitrate and ammonia

Samples will be collected in such a manner as to minimize the volatilization of a sample due to agitation and/or transference from pump or bailer to sample container. When a bladder pump is used to sample for volatile compounds, the flow rate will be adjusted to provide a constant flow stream of approximately 100 milliliters/minute. After samples for volatile compounds have been collected, higher flow rates may be used, particularly if large sample volumes are required. The sampling flow rates will not exceed the purging process flow rate. When a bailer is used to retrieve a sample, a bottom discharge unit will be used to minimize volatilization during transference between bailer and sample container.

6. TEMPORARY SAMPLING POINT EXCEPTIONS

Once the borehole is terminated, a temporary well screen will be placed at the borehole bottom. Sand will be emplaced in the annular space surrounding the temporary screen. Groundwater will be purged by disposable bailer following standard protocol, as possible. Grab sampling will be performed by disposable bailer. Sample handling will follow standard protocol. Unless otherwise specified in the workplan, the temporary sampling point will be removed and the borehole filled in accordance with appropriate local guidelines and our protocols for soil borings.

7. SAMPLE PACKAGING AND TRANSPORT

Sample Preservation

Many chemical analytes and physical parameters monitored in groundwater are not chemically stable, and therefore require chemical preservation. Sample preservation will be in accordance with current standards. Sample containers and preservatives will be supplied by the contract laboratory. Samples will be held in ice in a covered, secured ice chest specifically designated for the purpose of sample storage and transport.

Sample Filtration

For some analyses, samples may require filtration to remove suspended particles. As needed, Provost & Pritchard will filter samples in the field. Unless otherwise specified, 45-micron cellulose acetate filters will be used. One of two filter types will be used: an in-line filter which is used in conjunction with a sample pump, or a pressure or vacuum cylinder filter which will be used in conjunction with a bailer.

Sample Labeling

Sample containers will be labeled in the field. Labels will contain the following information:

- consultant's identification;
- project number or identification;
- sampler's identification;
- date and time of collection; and
- sample identification.

Sample Transport

All samples will be delivered to the laboratory within a time frame to allow for analyses within the appropriate holding time. Sealed sample containers will not be opened by other than the laboratory personnel who will perform the requested analyses.

Custody Seal

If it is necessary for samples or sample chests to leave Provost & Pritchard's control prior to delivery to the laboratory, such as for shipment by a common carrier, a custody seal will be placed on each sample container and/or sample chest to discourage tampering during

transportation. The custody seal will contain the sampler's signature, and the date and time the seal was emplaced.

Chain of Custody

In order to document and trace sample possession, a positive signature chain-of-custody record will accompany the sample through the laboratory analyses. The completed chain-of-custody record will be included in the laboratory's final report.

8. SAMPLE ANALYSES

Groundwater samples will be analyzed by a California Certified Environmental Laboratory Accreditation Program (ELAP) laboratory.

Requests for sample analyses will be made in writing and will be included as part of the chain-of-custody record.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

Travel, equipment, and field blanks will be collected as appropriate and handled and transported in the same manner as the groundwater samples. Equipment blanks will be collected at a rate of one per sampling episode by circulating steam-distilled water through cleaned sampling equipment during the final rinse stage. Field blanks will be prepared by the sampler at a rate of one per sampling event.

LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Duplicate samples may be collected at a rate of one duplicate per ten samples, or one duplicate per sampling episode, if fewer than ten samples are collected. Duplicate samples will be delivered to the primary laboratory to evaluate the laboratory's reliability.

Depending on the project sampling and analyses plan or at the discretion of the project manager, split samples may be collected. The split sample will be handled the same as the primary sample, but will be delivered to a second laboratory. A comparison of the split sample results will be made to further evaluate the primary laboratory's performance.

Duplicate and/or split samples collected from a single well will be collected from a single casing volume when possible. When a single casing volume is insufficient, samples will be collected in as rapid a succession as possible.

Quality assurance/quality control sample analytical data will be used to monitor the laboratory performance, sampling technique, and as indicators of potential sample analyses or sample collection anomaly.

For general minerals analyses, a cation/anion balance will be calculated by the laboratory as an error check.

Appendix D

Health and Safety Plan

HEALTH AND SAFETY PLAN

Malaga County Water District Waste Water Treatment Facility, Fresno County, California – Monitoring Well Installation Work Plan

INTRODUCTION

This Health and Safety Plan (**HSP**) was prepared by Provost & Pritchard Consulting Group (**Provost & Pritchard**) for the subject site. This plan complies with, but does not replace, Federal Health and Safety regulations as set forth in 29 CFR 1910 and 1926, CA Health and Safety Regulations as set forth in Title 8, CA Code of Regulations, and guidance established by the CA Department of Health Services. On-site personnel are to use this plan as a supplement to such rules, regulations, and guidelines.

If the Groundwater Monitoring Well Construction activities are contracted through Provost and Pritchard or conducted under the direction of Provost and Pritchard, this Health and Safety Plan will be applicable.

RESPONSIBILITIES

Provost & Pritchard will have site health and safety oversight and coordinate responsibilities for Provost & Pritchard employees. A copy of this HSP will be kept on-site. All on-site Provost & Pritchard employees must read and sign the Provost & Pritchard Health and Safety Compliance Form.

Project Manager: Shawn Vaughn, phone 559 636-1166
The Project Manager (**PM**) directs on-site sampling, investigations and operational efforts of Provost & Pritchard personnel. The PM may delegate all or part of these duties to an appointed Site Safety Officer (**SSO**).

Site Safety Officer: Shawn Vaughn, phone 559 636-1166
The Site Safety Officer (SSO)'s duty is to protect the health and safety of Provost & Pritchard personnel and may be carried out by the PM or other site manager.

Regional Health and Safety Manager: Kim Hansen 559-449-2700
The Regional Health and Safety Manager (**RHSM**) periodically audits operations for compliance with this plan, and provides health and safety support as requested by the SSO and PM.

SCOPE OF WORK

Borings to a maximum depth of approximately 130 feet will be drilled by qualified contractors to collect soil samples and install up to four monitoring wells. Equipment is listed in Table 1.

Table 1. Protective and Safety Equipment List

R	Hard hat	R	Safety glasses with side shields
R	Chemical resistant steel toed boots	AN	Ear plugs or muffs
R	Work gloves	AN	Traffic control (cones, caution tape, etc.)
NR	Nitrile® gloves	NR	Wash tubs, scrub brushes, and detergent
R	Long pants	R	First aid kit
AN	Shirt with sleeves	AN	Drinking water
NR	PID/FID		

R – Required AN – As needed NR – Not required

IDENTIFIED HAZARDS

Physical hazards that may be encountered on site include those from drilling and sampling operations, heat stress, underground and overhead utilities, on-site traffic, and equipment failures. These are discussed below.

Heat Stress Recognition and Control

Evidence for heat stress includes flush skin, rash, irritability, faintness, and dry, cool skin. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, work load, and individual worker characteristics. Rest periods, adequate drinking water intake, and regular monitoring for signs and symptoms of distress are vital.

To help prevent heat stress, site personnel should drink a sufficient quantity of water to maintain body fluids at normal levels. The normal thirst mechanism is not sensitive enough to provide for sufficient consumption of water to replace lost fluids. When heavy perspiration occurs 1) maintain drinking water temperature at 50°F to 60°F, 2) drink 16 ounces of fluid (preferably water or electrolyte replenishing fluid, such as Gatorade) before beginning work, and 3) drink a cup or more of water or equivalent fluid every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons of fluid per day is recommended, but more may be necessary to maintain body weight.

Underground Utilities

The driller will attempt to locate underground utility locations prior to commencement of drilling and sampling activities. Resources may include site plans, utility companies, Underground Service Alert (**USA**) (800-642-2444), and hand auguring methods.

Traffic Hazards

Orange traffic cones and/or barricades may be used to delineate an exclusion zone around the work site. Barriers should be set at a 10-foot radius (as practical) around the work area. Unauthorized visitors will not be allowed in the work/exclusion zone.

SAFE WORK PRACTICES

Eating, drinking, chewing gum or tobacco, and smoking are prohibited in areas that are contaminated or potentially contaminated, or where the possibility for the transfer of contamination exists. Avoid personal contact with potentially contaminated substances and wet areas. Avoid kneeling, leaning, or sitting on equipment or ground.

EMERGENCY RESPONSE PLAN

Emergency telephone numbers are presented at the end of this HSP. A cellular telephone is required on site. A first aid kit is kept available at the site for use in case of minor injuries. If direct contact with contaminants occurs, affected skin areas are immediately washed with soap and water.

Incident Report

In the event of an injury or illness, work is to be stopped until the SSO and the RHSM have determined the cause and have taken appropriate action. Any injury or illness is to be reported on the Provost & Pritchard Accident, Injury and Illness Investigation form.

Operations Shutdown

Under extreme hazardous situations, the PM, SSO, or subcontractor's Safety Representative will request that sampling procedures be temporarily suspended while the underlying hazard is corrected or controlled. The SSO has ultimate authority for shutdown and restart of operations.

EMERGENCY TELEPHONE NUMBERS

SITE CONTACT: James Anderson

TABLE 1: Telephone Numbers for Fire Department, Police, and Ambulance.

Fire Department/Emergency Response/Police/Ambulance	Telephone
Fire Station	911
Sheriff's Department/Highway Patrol	911
Ambulance	911

TABLE 2: Nearest Hospital or Care Facility

City	Hospital or Facility	Address	Telephone
Fresno	Community Regional Medical Center	2823 Fresno Street, Fresno, CA 93721	(559) 459-6000

Directions to Hospital from Site:

1. **Drive south on S Maple Ave toward E Central Ave** **62 feet**
2. **Turn left at the 1st cross street onto E Central Ave** **0.3 miles**
3. **Turn left onto State Route 99 N Ramp** **0.2 miles**
4. **Continue on CA-99 N. Take CA-41 N to Tulare Street in Fresno Take exit 127 from CA-41 N** **5.3 miles**
5. **Use the right 2 lanes to take exit 131 to merge onto CA-41 N toward Yosemite** **1.9 miles**
6. **Take exit 127 for Tulare St** **0.2 miles**
7. **Turn left onto Tulare St** **0.3 miles**
8. **Turn right onto S St** **0.2 miles**
9. **Turn left at the 2nd cross street onto Fresno St** **394 feet**

   Hospital is on the right.

HEALTH AND SAFETY COMPLIANCE

I, the undersigned, have received a copy of the Health and Safety Plan for the project identified below. I have read the plan, understand it, and agree to comply with all of the health and safety requirements therein. I understand that I may be prohibited from continuing work on the project for failing to comply.

I have been briefed by a project safety authority on the health and safety requirements of the project.

PROJECT NUMBER_____Date of Plan_____

PROJECT TITLE_____

FIRM_____

Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date

ACCIDENT INVESTIGATION REPORT

Accident investigated by: _____Date:_____ Time: _____

Injured Person's Name: _____

Date of Accident:_____ Time of Accident:_____ Date Accident Reported:_____

Where did accident occur? _____

Injured Person's Statement on Details of Accident _____

_____

_____

_____

Names of witness(es):_____

Witness Statement: _____

_____

_____

_____

Investigators comments/description of accident: _____

_____

_____

_____

Photographs attached _____yes _____no (If no, explain) _____

Reason for Accident:

- ☐ Lack of knowledge/Experience
- ☐ Not paying attention
- ☐ Playing around
- ☐ Improper Attire
- ☐ Repair needed
- ☐ Other _____

Recommendations to avoid similar accidents: _____

_____

_____

Investigator's Signature: _____ Date _____

HAZARD ASSESSMENT AND CORRECTION RECORD

Person Conducting Inspection:

Unsafe Condition or Work Practice:

Corrective Action Taken: