CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER No. R2-2014-0025

SITE CLEANUP REQUIREMENTS for:

SHELL OIL PRODUCTS US
SHELL MARTINEZ REFINERY

3485 PACHECO BOULEVARD
MARTINEZ, CONTRA COSTA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter the Regional Water Board), finds that:

OWNERSHIP AND SITE LOCATION

1. Shell Oil Products US and Equilon Enterprises LLC (hereinafter called Shell or the Discharger), owns and operates the Shell Martinez Refinery (hereinafter called the refinery or site) in Contra Costa County, as shown in figure 1. This refinery occupies approximately 1000 acres on the south side of Carquinez Strait. The refinery was established in 1913 as a petroleum products terminal, and refining operations commenced in 1916.

PURPOSE OF ORDER

2. Pursuant to California Water Code (CWC) section 13304, this Order requires the Discharger to perform site investigations and to continue monitoring corrective action measures implemented at specified areas of the refinery. This Order accomplishes the following objectives:

   - Establishes Site Cleanup Requirements (SCRs) for portions of the site (spills/releases from tanks, pipelines, or process areas) that are not covered under Waste Discharge Requirements (WDRs) (i.e., releases that are not associated with designated waste management units (WMUs)).
   - Requires the Discharger to ensure that its remediation systems and respective monitoring programs are operated, evaluated, and modified as necessary to ensure (1) that offsite migration of contaminants does not occur; and (2) cleanup of source areas consistent with this Order.

REGULATORY HISTORY

3. On October 9, 2013, the Regional Water Board adopted WDR Order No. R2-2013-0034, which specified requirements for the Discharger's continued maintenance and monitoring of designated WMUs. That Order rescinded and superseded WDR Order No. 95-234, which had previously covered the refinery's WMUs as well as groundwater contaminant source areas not associated with the refinery's WMUs.

4. Earlier Regional Water Board orders adopted for the refinery included WDR Order No. 88-146 and SCR Order No. 87-070. These orders were rescinded in 1995.

5. The Regional Water Board regulates the discharge of effluent from the Discharger's wastewater treatment plant (WWTP), and the discharges of all stormwater associated with industrial activity from the refinery to Peyton Creek, Peyton Slough, and Carquinez Strait, under a separate NPDES permit (Order No. R2-2012-0052; NPDES No. CA0005789) that was adopted on June 13, 2012.

SITE DESCRIPTION

6. The refinery produces petroleum hydrocarbon products, by-products, and intermediates and is classified as a cracking refinery as defined by the U.S. Environmental Protection Agency (U.S. EPA) in Title 40, Code of Federal Regulations, section 419.20. The refinery is permitted to process 163,000 barrels of oil per day. The refinery currently manufactures various hydrocarbon products including gasoline, diesel, jet, and industrial fuels.

Geology

7. Geologically, the refinery is located along the east side of the Briones Hills and partially on the southern alluvial plain/tidal flats of Carquinez Strait. The upland areas of the refinery consist of three northwest trending ridges (Crude, Middle, and Vine Hill), which are composed of the Martinez, Meganos, and Domengine formations. The Martinez Formation is a light colored, thinly bedded sequence of siltstones and fine-grained sandstones. The Meganos Formation has been described as fissile, dark grey shale, with minor siltstone, and sandy claystone. Numerous fractures and slickensides were noted in unweathered samples. The Domengine Formation has been described as a light-colored, very fine to fine-grained, thickly bedded sandstone, with thin claystone interbeds. All of these formations dip approximately 50 degrees to the southwest. Fractures, joints, and faults have been mapped in these units at the site.

   Younger geologic units at the site include a unit of Older Alluvium that ranges from 30 to 900 feet thick across the site. This unit consists of interbedded clay, silt, and fine to coarse sand with pebbles. The channel deposits within this unit range from a few to tens of feet across. The youngest units at the site consist of Quaternary sediments. Alluvial material, deposited during the Quaternary Period at low stands of the sea, is found at the site, as well as bay mud, sand, peat, and clay, deposited by the present day bay/estuary system.

Hydrogeology

8. The refinery is located in the Arroyo del Hambre regional groundwater basin as shown in figure 2A. The refinery is further divided into five groundwater basins as shown in figure 2B. These basins have been defined by the site topography and refinery groundwater elevation measurements. The basins are designated, from west to east, as the Crude Hill Groundwater Basin, the West Valley Groundwater Basin, the Central Valley Groundwater Basin, the Reservoir Lakes Groundwater Basin, and the East Valley Groundwater Basin.

   a. The Crude Hill Groundwater Basin is located in the southwest corner of the site and borders the City of Martinez. Groundwater occurs within the fill and the Domengine Formation in the Crude Hill Area. Groundwater discharges to the southwest, towards the City of Martinez, and dischargers into the Arroyo del Hambre groundwater basin. The average

groundwater flow rate for the basin has been estimated to be 0.74 feet per year (ft/yr), with an estimated basin wide groundwater flux of 3.8 gallons per minute (gpm).

b. The West Valley Groundwater Basin is located between Middle and Crude hills. The basin includes the Effluent Treatment Area. The basin is composed of fill, bay deposits (sand, mud and peat), Younger Alluvium, Older Alluvium, and the Domengine Formation. The groundwater in this basin discharges in the lower Clayton/Ygnacio Valley groundwater basin and flows generally to the north, towards the Effluent Treatment Area, and into Carquinez Strait. The average groundwater flow rate for the basin has been estimated to be 1.2 ft/yr, with an estimated basin wide groundwater flux of 2.4 gpm.

c. The Central Valley Groundwater Basin is located east of Middle Hill and west of the Reservoir Lakes Groundwater Basin. Groundwater in this basin discharges into the lower Clayton/Ygnacio Valley groundwater basin and flows to the north, towards the northeastern portion of the Effluent Treatment Area, and into Carquinez Strait. The basin is comprised of fill, bay deposits, Older Alluvium, and the Domengine and Meganos formations. The average groundwater flow rate for the basin has been estimated to be 4.9 ft/yr, with an estimated basin wide groundwater flux of 1.9 gpm.

d. The Reservoir Lakes Groundwater Basin is located in the central part of the refinery. Groundwater in this basin discharges into the lower Clayton/Ygnacio Valley groundwater basin and generally flows to the north, towards and likely into Carquinez Strait. This basin is composed principally of the Meganos Formation with minor occurrences of Domengine Formation along the southwest and Martinez Formation along the northeast edges. Older Alluvium and bay deposits are also found in the northern portion of the basin. The average groundwater flow rate for the basin has been estimated to be 0.26 ft/yr, with an estimated basin wide groundwater flux of 0.065 gpm.

e. The East Valley Groundwater Basin is located along the eastern side of the refinery. This basin is composed of fill, bay deposits, Younger Alluvium, and the Martinez Formation. Groundwater in this basin discharges into the lower Clayton/Ygnacio Valley groundwater basin and generally flows north towards Peyton Slough and Carquinez Strait. The average groundwater flow rate for the basin has been estimated to be 5.3 ft/yr, with an estimated groundwater flux of 3.3 gpm.

Seismicity

9. Earthquakes posing a threat to the refinery could occur along the Hayward, San Andreas and Calaveras faults. In an effort to prepare for such an incident, refinery staff routinely and systematically review all process facilities for potential hazards, including a seismic review of appropriate structures. In accordance with federal, State, and local requirements, the Discharger also maintains an emergency response plan for the refinery.

HISTORICAL SPILLS, RELEASES, AND CLEANUP ACTIONS

10. All groundwater basins within the refinery contain soil and/or groundwater that have been impacted by historical releases, and a variety of corrective action steps have been implemented

to address these releases. Releases associated with WMUs that are in the Title 27 Detection Monitoring Program are regulated under Order No. R2-2013-0034 and are not covered by this Order.

This Order addresses releases and corrective actions that are not directly associated with WMUs. These include releases at the following areas as shown in figure 3:

- Crude Hill area (see also figure 5);
- East Valley Control 3 (EVC-3) area (see also figure 6);
- East Valley Control 2 (EVC-2) area (see also figure 6);
- Reservoir Lakes (RLC-1) area (see also figure 7); and
- QA Lab Sump (see also figure 8).

Corrective Actions for Groundwater

11. Shell has implemented corrective actions to intercept contaminated groundwater at various locations and thus to prevent offsite migration to Carquinez Strait. In some places, this contamination consists of separate-phase petroleum hydrocarbons (SPH). Each of the five groundwater basins has its own corrective action area groundwater protection system as shown in figure 4.

    Two extraction trench systems (Vine Hill Trench and RLC-1 Trench) and over 33 groundwater extraction wells have been installed for areas covered by this Order. Groundwater extracted from these systems is routed to the refinery's WWTP for treatment and discharged in accordance with NPDES permit requirements.

12. Crude Hill: During initial refinery groundwater investigations in the 1980s, certain monitoring wells in the Crude Hill area (figure 5) were found to have detectable levels of jet fuel. Further work suggested that the likely source was bottom leakage from Tank 4, which was subsequently repaired and tested. As a result, a groundwater extraction system was installed to collect contaminated groundwater and to prevent further migration. Initially, the recovery system was comprised of three separate eductor systems. However, these systems were prone to mineral scaling and corrosion and were replaced with six wells equipped with pneumatic down-well pumps. These wells are screened to approximately 125 to 130 feet deep. Water extracted by this system is routed to the refinery’s WWTP for treatment and disposal.

13. EVC-3: Initial refinery groundwater investigations in the 1990s showed that wells in the Vine Hill area north of tanks 610, 1133, and 1134 contained detectable levels of dissolved hydrocarbons. The likely source was determined to be upgradient petroleum storage tanks that were subsequently repaired and tested. As a result, a groundwater extraction system was installed to collect contaminated groundwater and to prevent further migration. Currently this system consists of 21 individual extraction wells. Water extracted from these wells is pumped to the WWTP for treatment and disposal.

    In 2008, additional SPH contamination was found in the Vine Hill area and traced to Tank 1134 (figure 6). This tank was subsequently repaired and tested and additional recovery systems were

installed. Five shallow SPH recovery wells were installed in late 2008 at 1.3 to 2.5 feet below grade. These wells were removed in 2013 and replaced with a French drain system to provide enhanced SPH recovery. Water extracted by this system is routed to the refinery's WWTP for treatment and disposal.

14. EVC-2: Initial refinery groundwater investigations in the 1990s showed that wells in the Vine Hill area just west of T-Head Road contained detectable levels of dissolved hydrocarbons (figure 6). The likely source of this contamination was determined to be upgradient tankage, which contained the gasoline component alkylate, that was subsequently repaired and tested. As a result, a groundwater extraction system was installed to collect contaminated groundwater and to prevent further migration. Currently this system consists of three 36-inch culverts oriented vertically with a double diaphragm pump. The system also contains three other wells with pumps operated with level-control systems. Water extracted by this system is routed to the WWTP for treatment and disposal.

15. RLC-1: During initial refinery groundwater investigations in the 1990s wells in the Reservoir Lakes groundwater basin were found to have detectable levels of dissolved hydrocarbon contamination. No specific source was found and it has been attributed to historical operations in the area. Sampling results at monitoring well 279, which is just upgradient of the RLC-1 trench, have been non-detect for BTEX and TPH-G for over 10 years based on data reported under previous Order No. 95-234, confirming the conclusion of the historic contamination. An interceptor trench was installed to collect contaminated groundwater and to prevent further migration. This system is a French drain approximately 130 feet long and 15 feet below ground surface (figure 7). The French drain is evacuated with one pump. Water from this system is routed to the WWTP for treatment and disposal.

16. QA Lab Sump: The main Quality Assurance (QA) Laboratory is located on the eastern side of Crude Hill (Figure 8). In late 2008, groundwater and oil seepage began to appear from the corner of the QA Lab's basement floor and wall in an area between an unused elevator shaft and the northwest corner of the basement. An investigation for a source was conducted but no specific current source was determined, and, therefore, it was attributed to historic contamination. This investigation reviewed and found no SPH in any of the available upgradient wells. In addition, the investigation reviewed potential upgradient sources including piping, tanks, and Unit K, and no potential present day source was identified. To collect this material, the elevator shaft was modified to function as a groundwater recovery well. Material extracted by this system is routed to the refinery's WWTP for treatment and disposal.

MONITORING PROGRAMS

17. Shell monitors and reports groundwater elevations, flow direction and gradient, SPH thicknesses and recovery, maximum allowable concentration limits (MACLs) compliance, data quality assurance and quality control, and inspection and maintenance activities as part of its Self-Monitoring Program. There are 27 groundwater monitoring wells in areas covered by this Order that are gauged either semi-annually or annually, with sampling and analysis of 18 representative wells. Monitoring and sampling locations are shown in figure 9.

18. Water quality monitoring required by this Order consists of the Self-Monitoring and Reporting Program (SMP) approved in accordance with Order No. R2-2013-0034.

19. In accordance with the SMP, Shell shall perform a statistical evaluation and trend analysis of groundwater analytical results obtained from points of compliance to assess the effectiveness of the corrective and remedial actions at the refinery.

BASIN PLAN

20. The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) is the Regional Water Board's master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. It also includes programs of implementation to achieve water quality objectives. The Basin Plan was duly adopted by the Regional Water Board and approved by the State Water Resources Control Board (State Water Board), the Office of Administrative Law, and U.S. EPA, where required.

BENEFICIAL USES AND SOURCES OF DRINKING WATER

21. Antidegradation Policy: The State Water Board established California's antidegradation policy through State Water Board Resolution No. 68-16, which requires that existing water quality be maintained unless degradation is justified based on specific findings. State Water Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," applies to the Discharger and requires attainment of background levels of water quality or the highest level of water quality that is reasonable if background levels of water quality cannot be restored. Cleanup levels other than background shall be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, and not result in exceedance of applicable water quality objectives.

22. State Water Board Resolution No. 88-63: The Basin Plan provides that all groundwater in the Region is considered suitable, or potentially suitable, for municipal or domestic water supply and that, in making any exceptions, the Regional Water Board will consider the criteria referenced in State Water Board Resolution No. 88-63, "Sources of Drinking Water", where:

    i) The total dissolved solids exceed 3,000 mg/l (5,000 µS/cm, electrical conductivity), and it is not reasonably expected by the Regional Water Board that the groundwater could supply a public water system, or
    ii) There is contamination, either by natural processes or human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using best management practices or best economically achievable treatment practices, or
    iii) The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day (gpd).

23. Most of the flat portion of the site, bounded by Carquinez Strait to the north and Highway 680 along the east, overlies the Ygnacio Valley groundwater sub-basin (Sub-basin 2-6 in the Basin Plan). This water is not presently used for water supply. The Basin Plan identifies potential

beneficial uses for groundwater in the Ygnacio Valley sub-basin, including industrial process supply, industrial water supply, agricultural water supply, and municipal and domestic supply. There is no historical, existing, or planned use of groundwater as a source of drinking water in either of the aquifer zones beneath this part of the refinery due to elevated total dissolved solids (TDS) levels. Due to the proximity of Carquinez Strait, shallow groundwater beneath portions of this sub-basin near Carquinez Strait and Peyton Marsh contains TDS concentrations significantly higher than 3000 mg/l (5000 µS/cm electrical conductivity), meeting an exception to Regional Water Board Resolution No. 89-39.

Groundwater in the Crude Hill Basin on the southwest margin of the site occurs primarily in fractured bedrock. Hydraulic conductivity of this bedrock is low, and it is unlikely that a single well could produce an average sustained yield of 200 gallons per day for drinking water supply purposes, thus meeting an exception to State Water Board Resolution No. 88-63. There is no historical, existing or planned use of unconfined groundwater as a source of drinking water in this part of the refinery.

24. The existing and potential beneficial uses of surface water in Carquinez Strait are:

    a. Commercial and sport fishing
    b. Estuarine habitat
    c. Fish migration
    d. Preservation of rare and endangered species
    e. Fish spawning
    f. Wildlife habitat
    g. Water contact recreation
    h. Non-contact water recreation
    i. Industrial service supply
    j. Navigation

CLEANUP AUTHORITY

25. Basis for 13267 and 13304 Order: CWC section 13304 authorizes the Regional Water Board to issue orders requiring a discharger to cleanup and abate waste where the discharger has caused or permitted waste to be discharged or deposited where it is or probably will be discharged into waters of the State and creates or threatens to create a condition of pollution or nuisance. As discussed above, the Discharger has caused or permitted waste to be discharged or deposited, causing contamination of groundwater. Contamination of groundwater creates and threatens to create conditions of pollution and nuisance. CWC section 13267 authorizes the Regional Water Board to require a person who has discharged, discharges, or is suspected of having discharged or discharging, to furnish technical or monitoring program reports. The burden of the reports required by this Order bears a reasonable relationship to the need for the report and the benefits to be obtained (to characterize the extent of contamination, the associated risks to human health and the environment, and document success of remediation efforts).

26. State Water Board Resolution No. 92-49: State Water Board Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under California

Water Code Section 13304," establishes policies and procedures to be used by the Regional Water Board when:

- Determining when a person is required to investigate, cleanup, or abate a discharge;
- Concurring with a discharger's selection of cost-effective investigation and remedial measures;
- Overseeing implementation of investigation and remedial measures; and
- Determining schedules for investigation and remedial measures.

This Order implements and is consistent with Resolution No. 92-49.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

27. This Order requires continued monitoring, groundwater extraction, and preparation of work plans and reports that do not have the potential for significant impacts on the environment. As such, the general rule that the California Environmental Quality Act (CEQA) only applies to projects that have the potential for causing a significant effect on the environment (the "common sense" exemption) applies, and no environmental document needs to be prepared in connection with the adoption of this Order [Cal. Code Regs., title 14, §15061(b)(3)]. When a specific cleanup proposal is submitted to the Executive Officer for approval, such proposal must and will be evaluated under CEQA prior to approval.

NOTICE AND MEETING

28. The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to issue this Order and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

29. The Regional Water Board, at a public meeting, heard and considered all comments pertaining to this issuance of SCRs.

IT IS HEREBY ORDERED, pursuant to CWC section 13304 and 13267, that the Discharger (or its agents, successors, or assignees) shall cleanup and abate the effects described in the above findings as follows:

A. PROHIBITIONS

1. The discharge of wastes or hazardous substances in a manner that will degrade water quality or adversely affect beneficial uses of waters of the State is prohibited.
2. Migration of pollutants through subsurface transport to waters of the State beyond the groundwater extraction trenches is prohibited**.**
3. There shall be no discharge of wastes or hazardous substances to surface waters except as permitted under the refinery's current NPDES permits.
4. Activities associated with the subsurface investigation and cleanup that will cause significant adverse migration of wastes or hazardous substances are prohibited.
5. The storage, handling, treatment, or disposal of polluted soil or groundwater shall not create a nuisance as defined in CWC section 13050(m).

6. The Discharger shall not cause the following conditions to exist in waters of the State at any place beyond the influence of the groundwater extraction trenches or other approved treatment systems:

   a. Surface Waters
      i. Floating, suspended, or deposited macroscopic particulate matter or foam;
      ii. Bottom deposits or aquatic growth;
      iii. Adversely altered temperature, turbidity, or apparent color beyond natural background levels;
      iv. Visible, floating, suspended or deposited oil or other products of petroleum origin; or
      v. Toxic or other deleterious substances to be present in concentrations or quantities that may cause deleterious effects on aquatic biota, wildlife, or waterfowl, or which render any of these unfit for human consumption either at levels created in the receiving waters or as a result of biological concentrations.

   b. Groundwater
      i. Further degradation of groundwater quality and/or substantial worsening of existing groundwater impacts; and
      ii. Subsurface migration of pollutants from beyond the existing perimeter control groundwater extraction/containment systems at Shell's operations.

B. TASKS

ALL REQUIRED SUBMITTALS MUST BE ACCEPTABLE TO THE EXECUTIVE OFFICER (SEE PROVISION C.1 - *COMPLIANCE*)

Groundwater Extraction and Hydraulic Containment

1. Shell shall continue to extract water from the groundwater interceptor trenches and extraction systems at a rate which eliminates the contamination or reverses the migration of contaminants toward Carquinez Strait, the Arroyo del Hambre and Clayton/Ygnacio Valley groundwater basins, and Peyton Slough.

   COMPLIANCE DATE: Ongoing

2. **Crude Hill Area:** Shell shall submit a report describing the components and operation of the Crude Hill Remediation System. The report shall include an evaluation of the effectiveness of the remediation system in maintaining hydraulic capture of petroleum hydrocarbons. Shell shall propose additional measures if the system does not demonstrate effective capture.

   COMPLIANCE DATE: **September 30, 2014**

3. **EVC-3:** Shell shall continue to perform recovery activities in the EVC-3 area to provide enhanced SPH recovery. The system shall be updated as necessary to optimize performance. Shell shall propose additional measures if the system does not demonstrate effective capture.

   COMPLIANCE DATE: Ongoing

4. **EVC-2:** Shell shall continue to operate a groundwater extraction system to collect contaminated groundwater and to prevent further migration. The system shall be updated as necessary to optimize performance. Shell shall propose additional measures if the system does not demonstrate effective capture.

   COMPLIANCE DATE: Ongoing

5. **RLC-1**: Shell shall continue to operate the French drain system to collect contaminated groundwater and to prevent further migration. The system shall be updated as necessary to optimize performance. Shell shall propose additional measures if the system does not demonstrate effective capture.

   COMPLIANCE DATE: Ongoing

6. **QA Lab Sump**: Shell shall continue to operate the QA Lab Sump to collect contaminated groundwater and to prevent further migration. The system shall be updated as necessary to optimize performance. Shell shall propose additional measures if the system does not meet its performance criteria of preventing seepage into the QA Lab basement.

   COMPLIANCE DATE: Ongoing

7. If the Executive Officer determines, on the basis of groundwater monitoring information, that water quality downgradient of any of the extraction systems is impaired, or continues to degrade, Shell will be required to submit additional proposals for corrective actions to address the issue.

   COMPLIANCE DATE: To be determined, as needed for future corrective actions**.**

Spill Reporting and Documentation of Cleanup

8. The Discharger shall notify the Regional Water Board of any reportable quantity (42 gallons or more) of petroleum that is either spilled or leaked to any unlined ground surface (any surface not protected by a barrier that is impermeable to petroleum products or other constituents that may cause adverse water quality impacts). Verbal notification shall be provided within one working day of discovery of the spill and shall be followed by a written description to include the nature, location, and volume of the spill and the total area and/or soil volume affected. In addition, the written report shall include a map that identifies the location of the spill and photographic documentation of the spill area before and after cleanup.

   COMPLIANCE DATE: Verbal notification within one working day after discovery followed by written notification within fourteen working days after discovery. (The Discharger shall also report releases consistent with the requirements of Provision C.11.a. i & ii).

Update Groundwater SMP

9. The Discharger shall review the SMP required by Order No. R2-2013-0034 (Attachments A & B) and submit a proposal for any necessary updates to incorporate new groundwater monitoring

wells, extraction systems, and/or sampling parameters/frequency. The SMP shall include the corrective action areas perimeter control points to establish and maintain perimeter capture zones that are intended to prevent the offsite migration of potentially contaminated groundwater. The SMP shall also identify Points of Compliance and all Monitoring Points.

All sampling protocols and reporting requirements shall be consistent with those described in Attachment A. As part of the update, all historical monitoring well data (from at least the most recent five-year period) shall be evaluated, a determination made about adequacy of the number of point of compliance wells, and compliance timelines added for any future corrective action that may be needed.

COMPLIANCE DATE: November 30, 2014

Update Maximum Allowable Concentration Limits (MACLs)

10. The Discharger shall submit a proposal to update existing MACLs in accordance with either federal or State regulations or guidelines or with technically-justified site-specific standards, acceptable to the Executive Officer. The MACLs shall consist of the list of constituents of concern, along with their concentration limits.

COMPLIANCE DATE: **November 30, 2014**

C. PROVISIONS

1. Compliance: The Discharger shall comply immediately, or as prescribed by the time schedule contained herein, with all Prohibitions, Tasks, and Provisions of this Order. All required submittals must be acceptable to the Executive Officer. The Discharger must also comply with all conditions of this Order. Violations may result in enforcement actions, including Regional Water Board orders or court orders requiring corrective action or imposing civil monetary liability, or in modification or revocation of this Order by the Regional Water Board.

2. Authority to Request Technical Reports: All technical and monitoring reports required by this Order are requested pursuant to CWC § 13267. Failure to submit reports in accordance with schedules established by this Order or failure to submit a report of sufficient technical quality to be acceptable to the Executive Officer may subject the Discharger to enforcement action pursuant to CWC § 13268.

3. All technical reports submitted pursuant to this Order shall be prepared under the supervision of and signed by a California registered civil engineer or a California professional geologist.

4. At any time, the Discharger may file a written request (including supporting documentation) with the Executive Officer proposing modifications to the related SMP. If the proposed modifications are acceptable, the Executive Officer may issue a letter of approval that incorporates the proposed revisions into the SMP.

5. Modifications to Remedial Action Plan: The Discharger shall notify and get approval from the Executive Officer at least 60 days prior to implementing any proposed major modifications to

any approved Remedial Action Plan, Implementation Schedule, or remediation system. The notification shall include the rationale for any proposed modification.

6. Delayed Compliance: If the Discharger is delayed, interrupted, or prevented from meeting one or more of the completion dates specified for the tasks, the Discharger shall promptly notify the Executive Officer of the delay and reason for the delay, and the Regional Water Board may consider revisions to this Order.

7. Operation and Maintenance (O&M): The Discharger shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the Discharger to achieve compliance with conditions of this Order. Proper O&M includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Order.

8. Availability: A copy of this Order shall be maintained by the Discharger and shall be made available by the Discharger to all employees or contractors performing work necessary to comply with the tasks set forth in this Order.

9. Change in Ownership: In the event of any change in control or ownership of the facility presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to the Regional Water Board upon a final change in ownership. Notification of the new owner or operator does not transfer the Discharger's responsibility for compliance with this Order.

   COMPLIANCE DATE: 30 days after a change in site control or ownership

10. Stormwater: The Discharger shall comply with the provisions of the refinery's current NPDES permits for the management, monitoring, and discharge of stormwater and wastewater effluent.

11. Long-Term Flood Protection Report: The Discharger shall submit a report, acceptable to the Executive Officer, for long-term flood and/or sea level rise protection of the Corrective Action Areas vulnerable to sea level rise. The report shall include a consideration of feasible options for achieving protection from the 100-year flood to account for rising sea levels and increased flood frequency and intensity. The report shall consider the methods developed by the San Francisco Bay Conservation and Development Commission to predict and protect against future flooding. The report shall be updated every five years throughout the operational life of the site with the most recently available and credible information at the time of the update.

    COMPLIANCE DATE: November 30, 2014, and every 5 years thereafter

12. Reporting of Hazardous Substance Release: If any hazardous substance is discharged in or on any waters of the State, or discharged or deposited where it probably will be discharged in or on any waters of the State, the Discharger shall:

a. Report such discharge to the following:

   i. The Water Board by calling (510) 622-2369 during regular office hours (Monday through Friday, 8 a.m. – 5 p.m.); and to
   ii. The California Office of Emergency Services at (800) 852-7550.

b. A written report shall be filed with the Regional Water Board within five working days. The report shall describe:

   i. The nature of the waste or pollutant.
   ii. The estimated quantity involved.
   iii. The duration of the incident.
   iv. The cause of the release.
   v. The estimated size of the affected area, and nature of the effect.
   vi. The corrective actions taken or planned and a schedule for completion of those measures.
   vii. The persons/agencies notified.

This reporting is in addition to any reporting to the California Office of Emergency Services that is required pursuant to the Health and Safety Code.

13. Contractor/Consultant Qualifications: All technical documents shall be signed by and stamped with the seal of a California professional geologist, or a California registered civil engineer.

14. Lab Qualifications: All samples shall be analyzed by State-certified laboratories or laboratories accepted by the Regional Water Board using approved U.S. EPA methods for the type of analysis to be performed. All laboratories shall maintain quality assurance/quality control (QA/QC) records for Regional Water Board review. This provision does not apply to analyses that can only reasonably be performed onsite (e.g., temperature).

15. Document Distribution: Copies of all correspondence, technical reports, and other documents submitted in compliance with this Order shall be provided to the Regional Water Board.

16. Submittal Revisions: Where the Discharger becomes aware of a material error in fact or omission in any report previously submitted to the Regional Water Board, it shall promptly submit such facts or information.

17. Severability: Provisions of this Order are severable. If any provisions of this Order are found invalid, the remainder of the Order shall not be affected.

18. GeoTracker Requirements: The State Water Board has adopted regulations requiring electronic report and data-submittal to GeoTracker. The text of the regulations can be found at the following URL:
http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal/index.shtml

    Parties responsible for cleanup of pollution at sites overseen by the Regional Water Board are required to submit the following information electronically to GeoTracker:

a. Groundwater analytical data;
b. Surveyed locations of monitoring wells;
c. Boring logs describing monitoring well construction; and
d. Portable data format (PDF) copies of all reports (the document in its entirety [signature pages, text, figures, tables, etc.] must be saved as a single PDF file).

Note that the Discharger is still responsible for submitting one hard copy of all reports pursuant to this Order, unless otherwise agreed upon. The Regional Water Board may require direct submittal of electronic reports and correspondence in addition to the State Water Board's GeoTracker requirements.

19. Entry and Inspection: The Discharger shall allow the Regional Water Board or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Order;
b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order;
c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and
d. Sample or monitor at reasonable times, for the purposes of assuring compliance with this Order or as otherwise authorized by the CWC, any substances or parameters at any location.

20. Maintenance of Records: The Discharger shall retain records of all monitoring information including all calibration and maintenance records, all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order. Records shall be maintained for a minimum of five years from the date of the sample, measurement, report, or application. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Executive Officer. Records of monitoring information shall include QA/QC data:

a. The date, exact place, and time of sampling or measurements;
b. The individuals who performed the sampling or measurements;
c. The date(s) analyses were performed;
d. The individuals who performed the analyses;
e. The analytical techniques or method used; and
f. The results of such analyses.

21. Cost Recovery: The Discharger (as applicable) shall be liable, pursuant to CWC section 13304 and Health and Safety Code section 25270.9, to the Regional Water Board for all reasonable costs actually incurred by the Regional Water Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this Order. If the site addressed by this Order is enrolled in a State Water Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to the procedures established in that program. Any disputes raised by the

Discharger (as applicable) over reimbursement amounts or methods used in that program shall be consistent with the dispute resolution procedures for that program**.**

22. Periodic SCR Order Review: The Regional Water Board will review this Order periodically and may revise it when necessary. The Discharger (as applicable) may request revisions and upon review the Executive Officer may recommend that the Regional Water Board revise these requirements.

I, Bruce H. Wolfe, Executive Officer, do hereby certify that the foregoing is a full, complete, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on June 11, 2014.

Digitally signed by Bruce H. Wolfe
DN: cn=Bruce H. Wolfe, o=SWRCB, ou=Region 2, email=bwolfe@waterboards.ca.gov, c=US
Date: 2014.06.12 17:23:19 -07'00'

Bruce H. Wolfe
Executive Officer

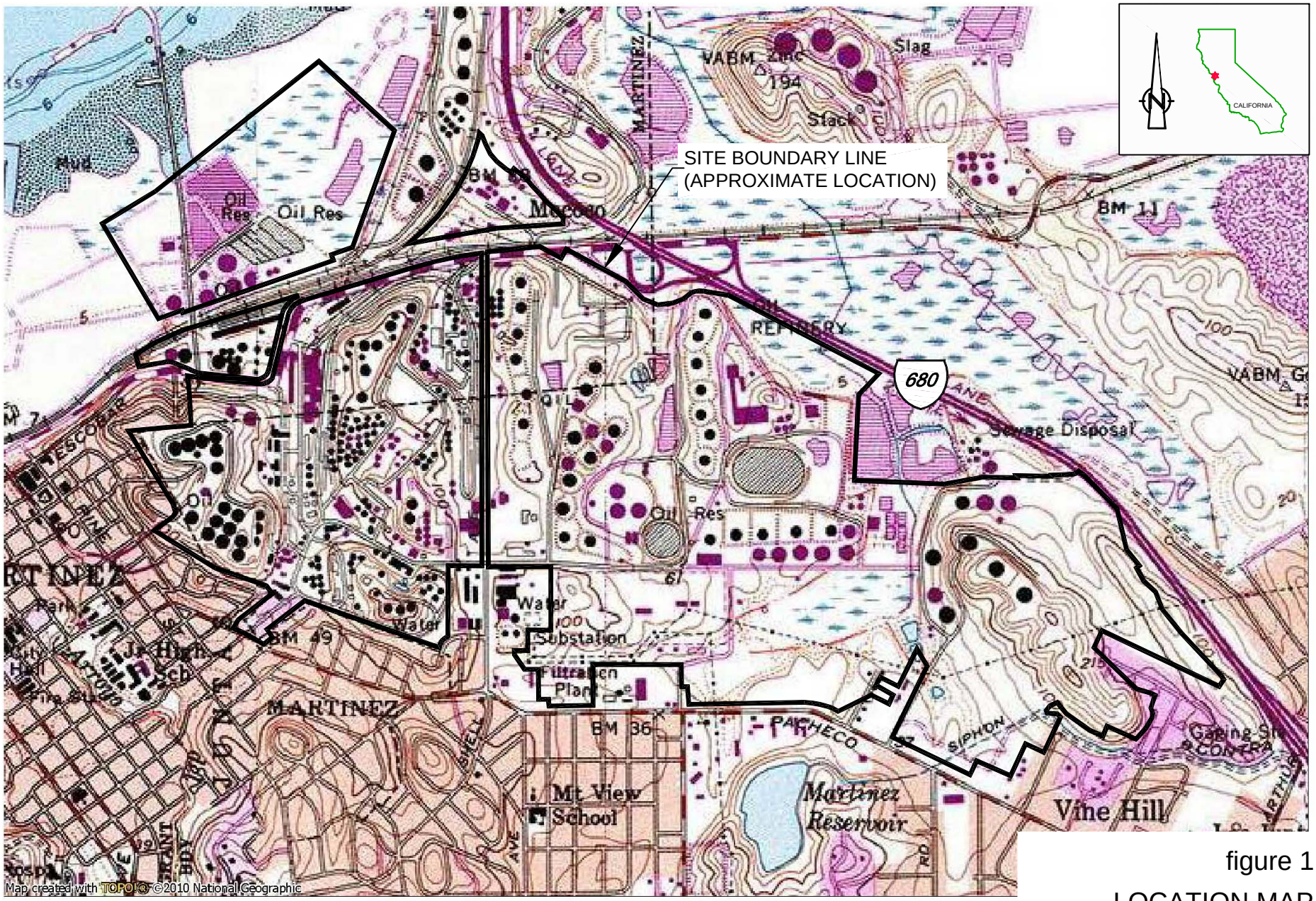
==========

FAILURE TO COMPLY WITH THE REQUIREMENTS OF THIS ORDER MAY SUBJECT YOU TO ENFORCEMENT ACTION, INCLUDING BUT NOT LIMITED TO: IMPOSITION OF ADMINISTRATIVE CIVIL LIABILITY UNDER WATER CODE SECTIONS 13268 OR 13350, OR REFERRAL TO THE ATTORNEY GENERAL FOR INJUNCTIVE RELIEF OR CIVIL OR CRIMINAL LIABILITY

Figures:

Figure 1 - Location Map
Figure 2A – Groundwater Basins: Regional Groundwater Basins
Figure 2B – Groundwater Basins
Figure 3 – Corrective Action Areas
Figure 4 – Corrective Action Area Groundwater Protection System
Figure 5 – Crude Hill Area
Figure 6 – EVC-2 and EVC-3 Area
Figure 7 - RLC-1 Area
Figure 8 – QA Lab Sump Area
Figure 9 – Groundwater Monitoring and Sampling Locations

Attachment: Self-Monitoring and Reporting Program, Order No. R2-2013-0034



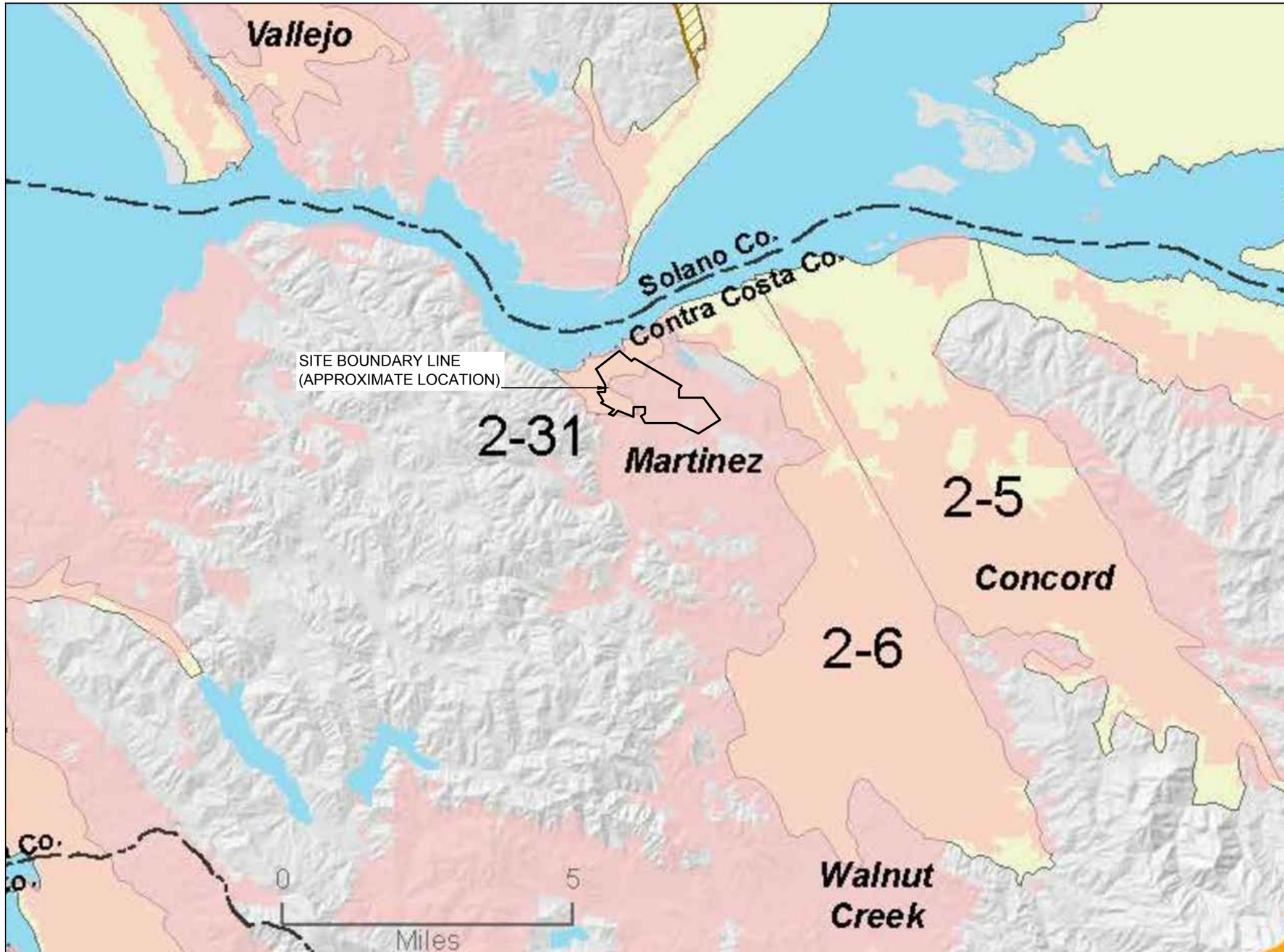
0.0 0.1 0.2 0.3 0.4 0.5 miles

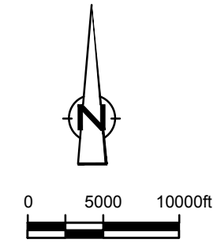
0.0 0.5 km

figure 1

LOCATION MAP
SHELL MARTINEZ REFINERY
Martinez, CA

060197-2014(PRES002)GN-SO001 MAR 24/2014





LEGEND

- GROUNDWATER BASINS
- GROUNDWATER-BEARING VOLCANIC AREAS
- URBAN AREA

GROUNDWATER BASINS

BASIN ID	*BASIN: SUB-BASIN*
2-5	CLAYTON VALLEY
2-6	YGNACIO VALLEY
2-31	ARROYO DEL HAMBRE VALLEY

figure 2A

REGIONAL GROUNDWATER BASINS
SHELL MARTINEZ REFINERY
Martinez, California

SOURCE: REGIONAL GROUNDWATER BASINS: NAPA/SOLANO FIGURE 2-10B.

060197-2014(PRES002)GN-SO010 APR 11/2014

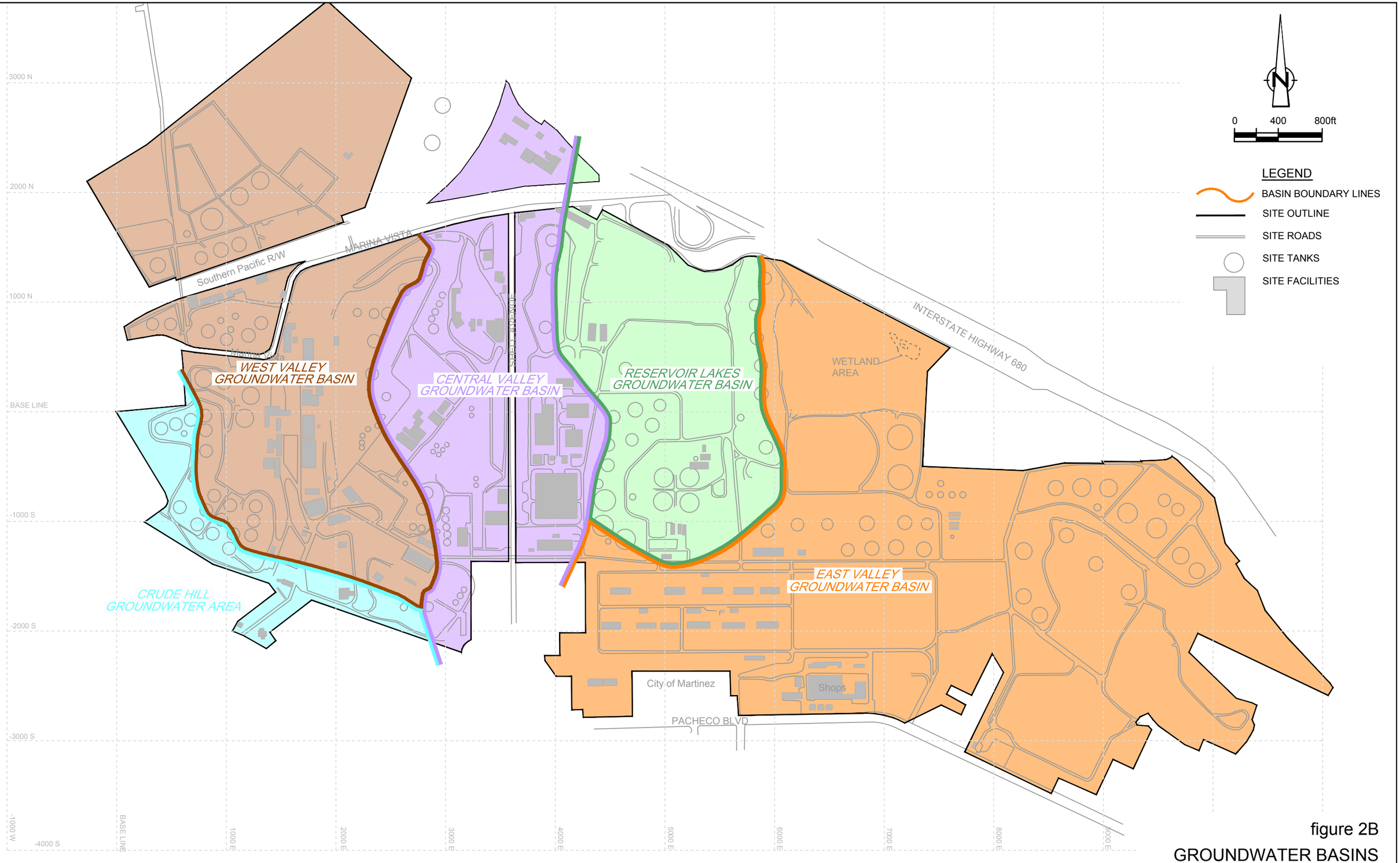


figure 2B

GROUNDWATER BASINS
SHELL MARTINEZ REFINERY
Martinez, California

SOURCE: BASE MAP FROM WESTHOLLOW TECHNOLOGY CENTER
GROUNDWATER CONTOUR MAP FOURTH QUARTER 2010.

060197-2014(PRES002)GN-SO002 APR 11/2014

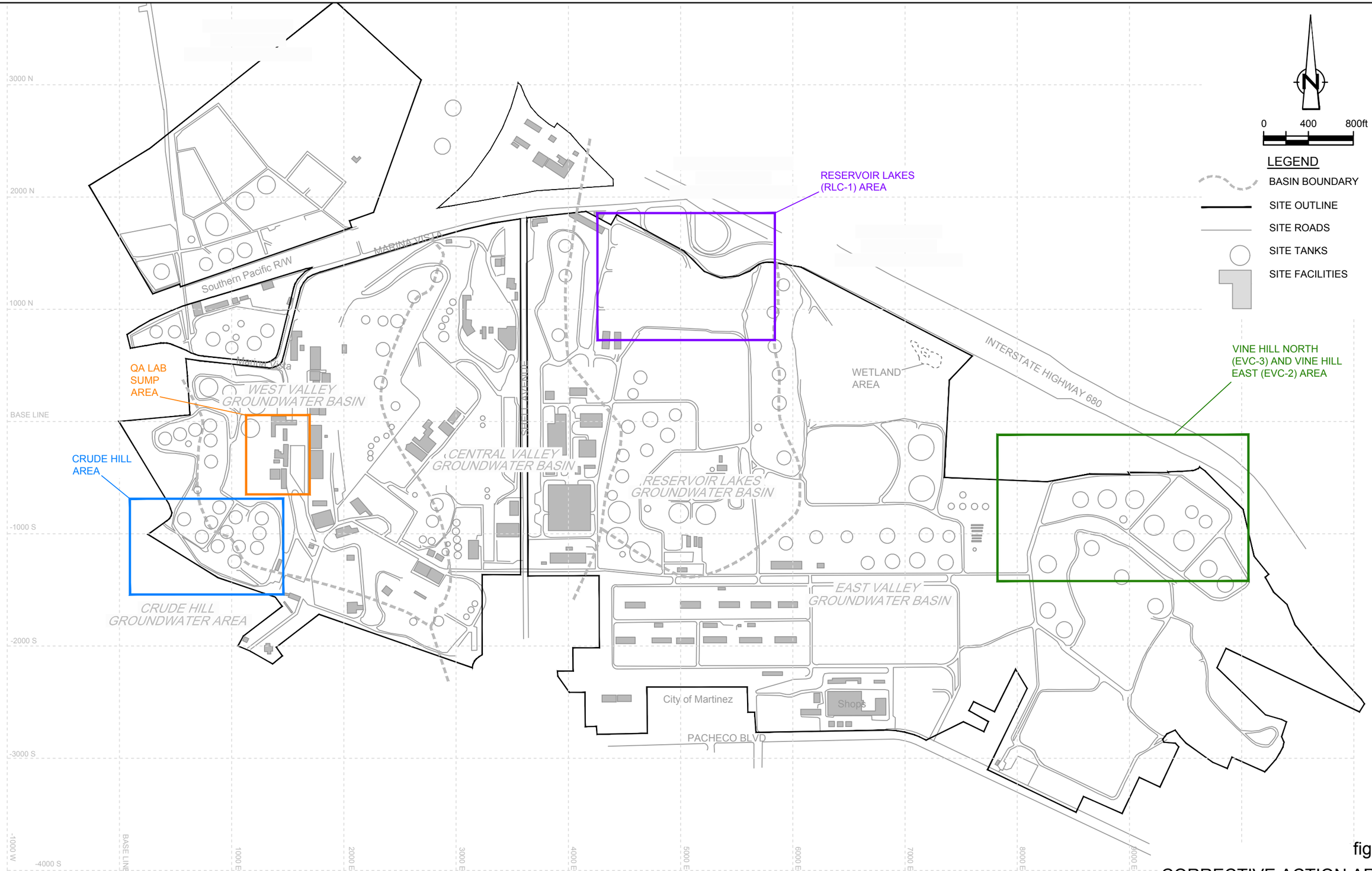


figure 3

CORRECTIVE ACTION AREAS
SHELL MARTINEZ REFINERY
Martinez, California

SOURCE: BASE MAP FROM WESTHOLLOW TECHNOLOGY CENTER
GROUNDWATER CONTOUR MAP FOURTH QUARTER 2010.

060197-2014(PRES002)GN-SO003 APR 2/2014

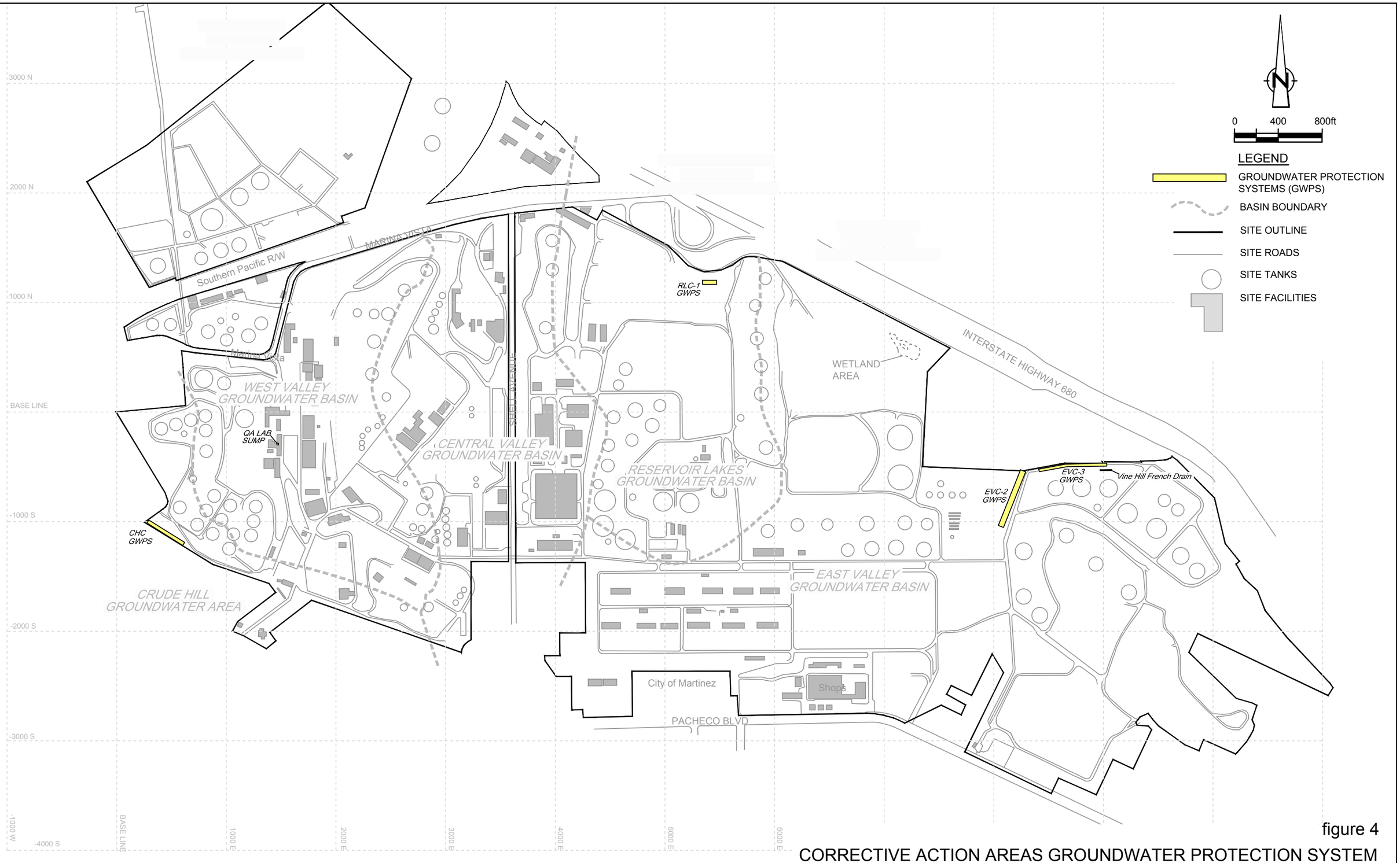


figure 4

CORRECTIVE ACTION AREAS GROUNDWATER PROTECTION SYSTEM
SHELL MARTINEZ REFINERY
Martinez, California

SOURCE: BASE MAP FROM WESTHOLLOW TECHNOLOGY CENTER
GROUNDWATER CONTOUR MAP FOURTH QUARTER 2010.

060197-2014(PRES002)GN-SO004 APR 10/2014

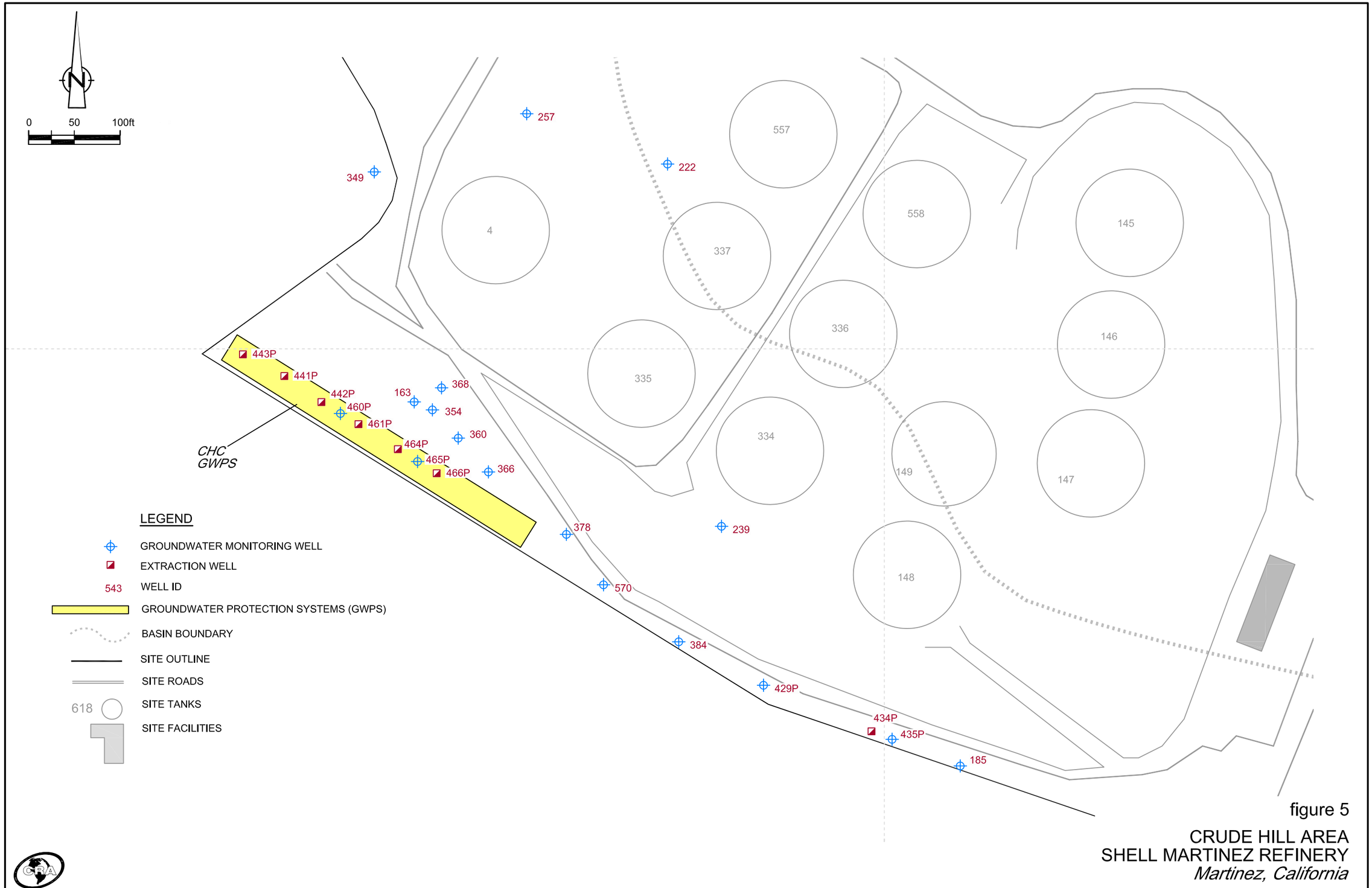


figure 5

CRUDE HILL AREA
SHELL MARTINEZ REFINERY
Martinez, California

060197-2014(PRES002)GN-SO005 APR 2/2014

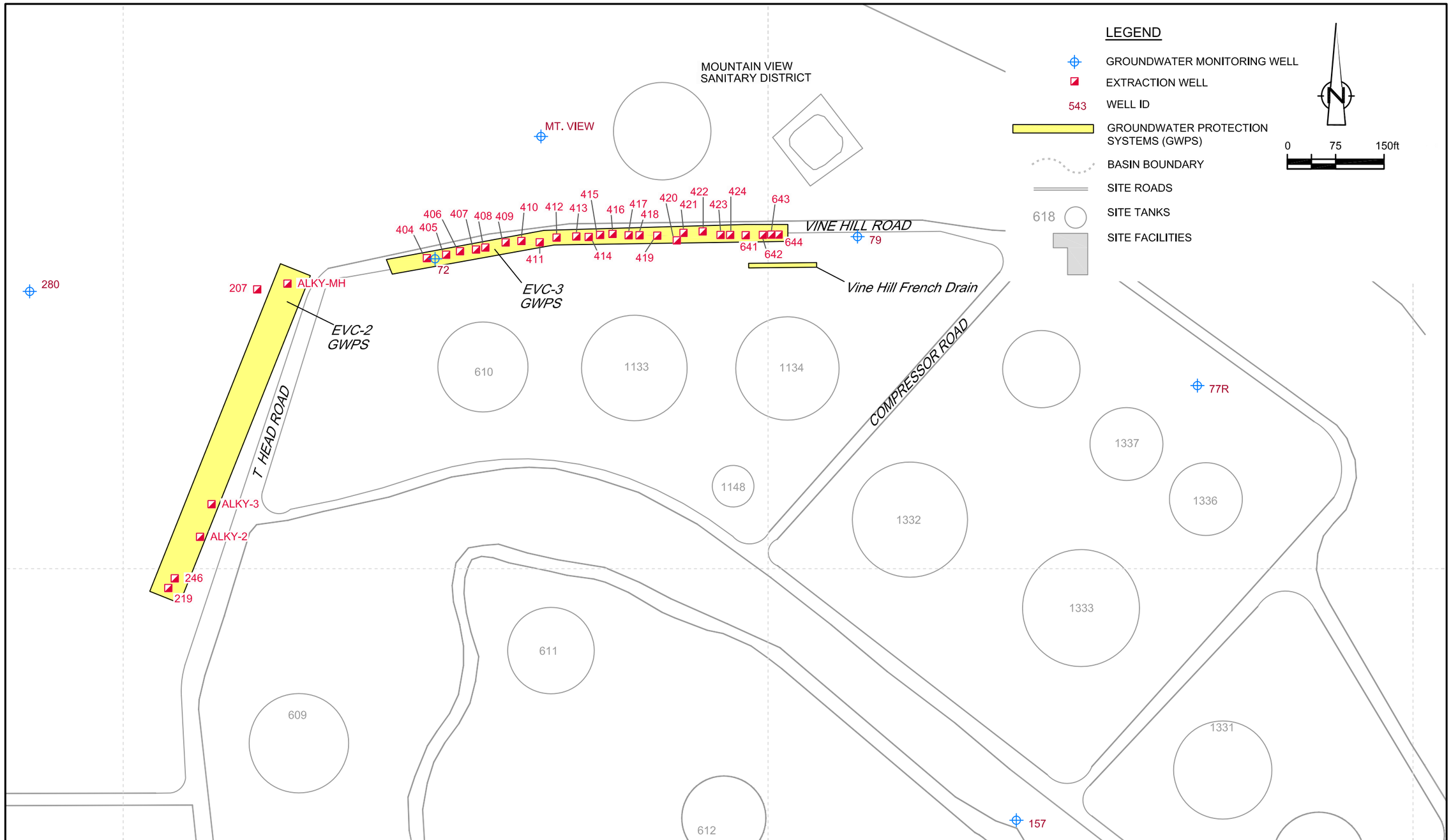


figure 6

EVC-2 AND EVC-3 AREA
SHELL MARTINEZ REFINERY
Martinez, California

060197-2014(PRES002)GN-SO006 APR 11/2014

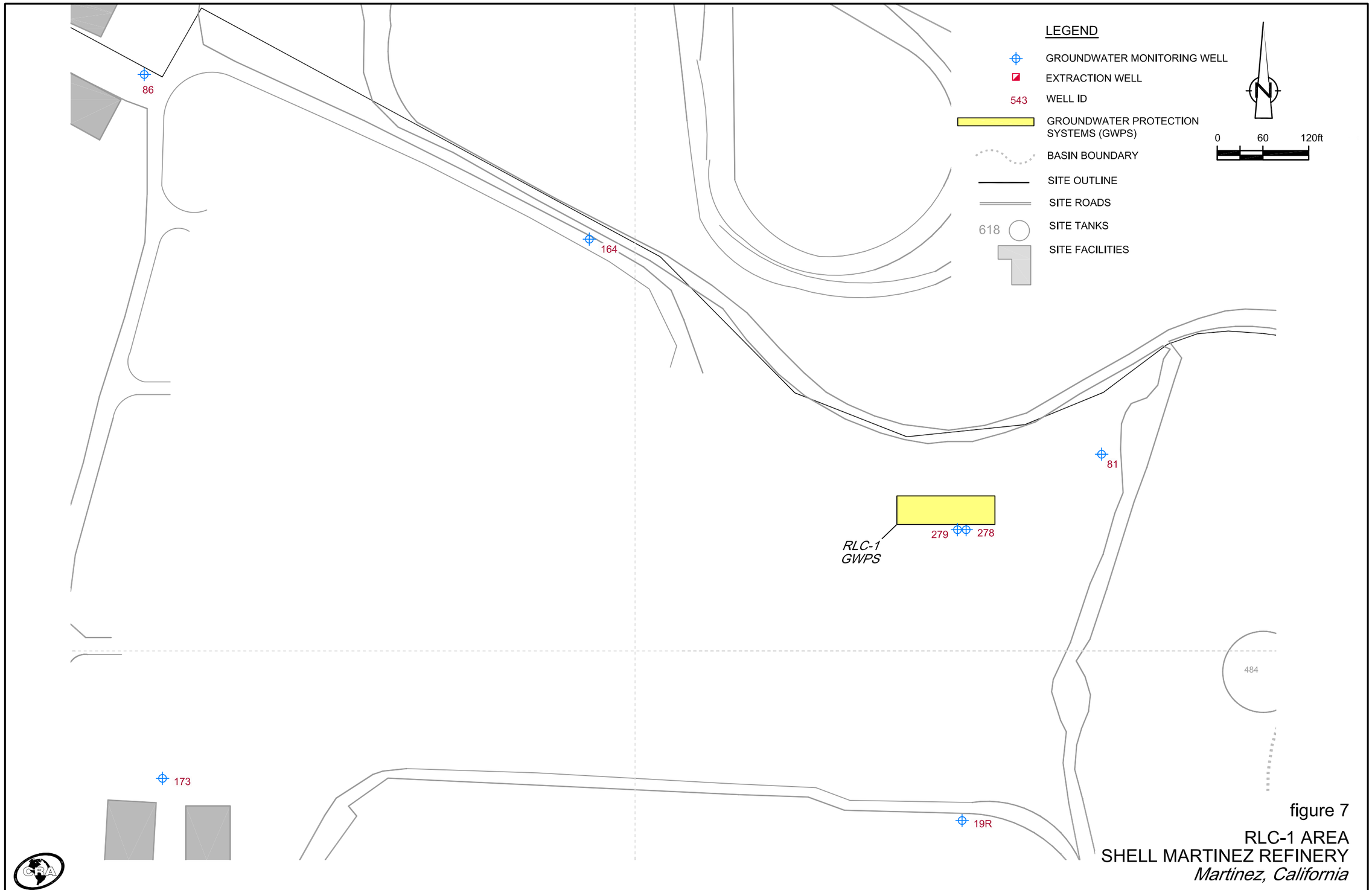


figure 7

RLC-1 AREA
SHELL MARTINEZ REFINERY
Martinez, California

060197-2014(PRES002)GN-SO007 APR 2/2014

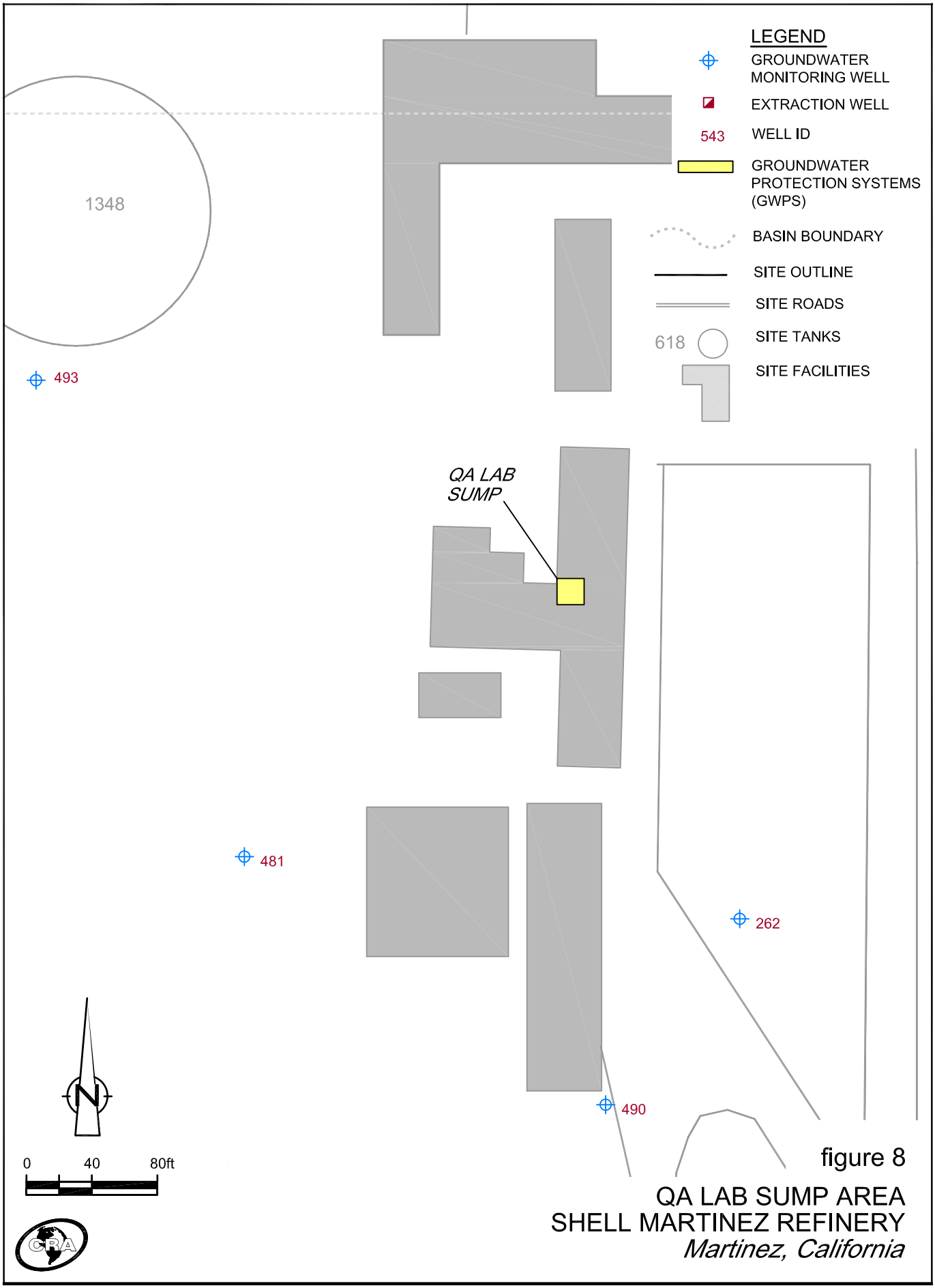


figure 8

QA LAB SUMP AREA
SHELL MARTINEZ REFINERY
Martinez, California

060197-2014(PRES002)GN-SO009 APR 2/2014

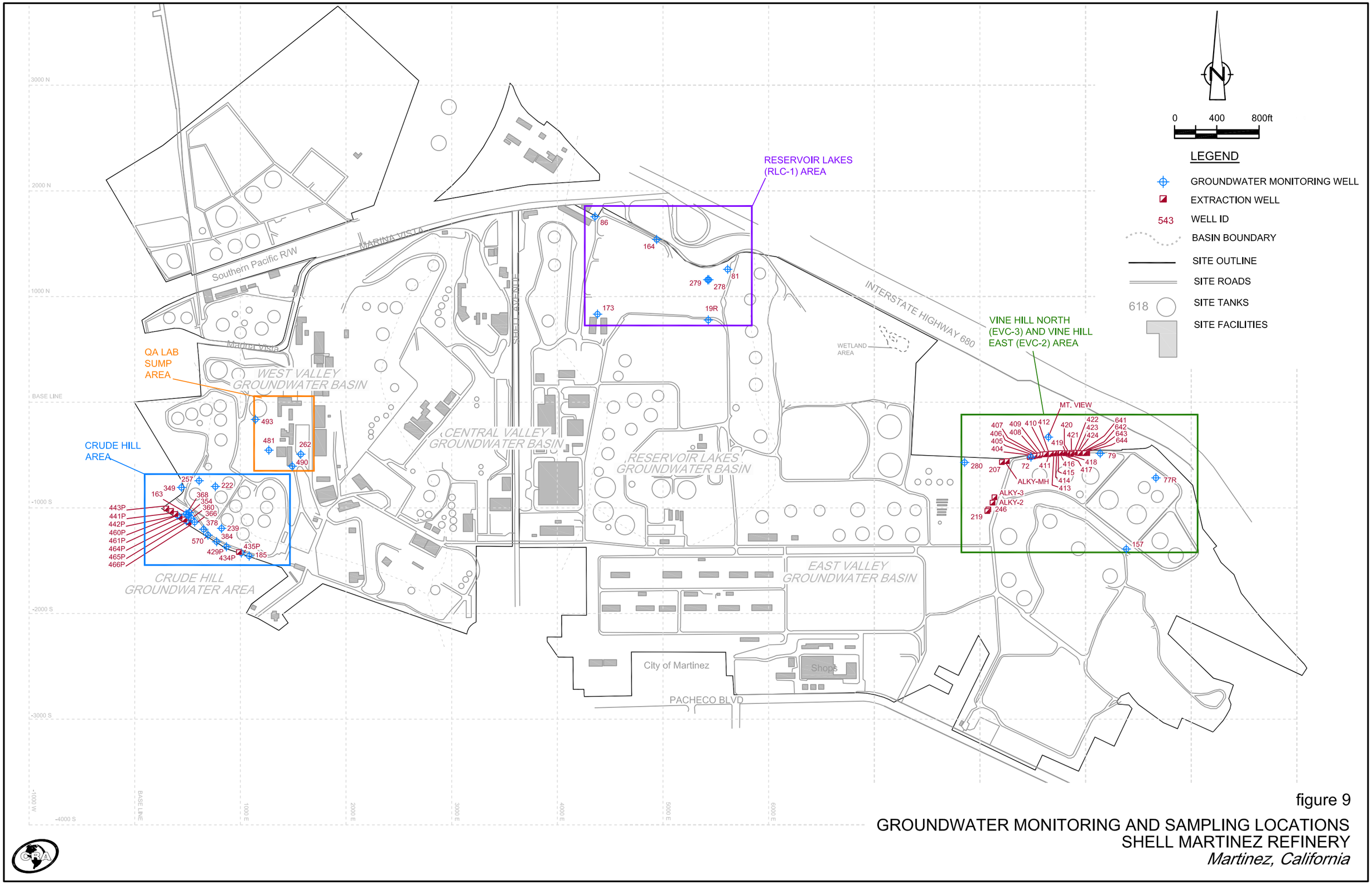


figure 9

GROUNDWATER MONITORING AND SAMPLING LOCATIONS
SHELL MARTINEZ REFINERY
Martinez, California

060197-2014(PRES002)GN-SO008 APR 3/2014

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

SELF-MONITORING AND REPORTING PROGRAM

FOR

SHELL OIL PRODUCTS US
SHELL MARTINEZ REFINERY
3485 PACHECO BOULEVARD
MARTINEZ, CONTRA COSTA COUNTY

ORDER NO. R2-2013-0034

CONSISTS OF PART A AND PART B

PART A

This Self-Monitoring and Reporting Program (SMP) specifies monitoring and reporting programs necessary to fulfill obligations under the Waste Discharge Requirements (WDRs) including:

(a) General monitoring requirements for waste management units under the WDRs (Part A);
(b) Self-monitoring report content and format (Part A);
(c) Self-monitoring report submittal frequency and schedule (Part B); and
(d) Monitoring locations, parameters, analytes and frequency for programs under the WDRs (Part B).

A. AUTHORITY AND PURPOSE

For discharges of waste to land, water quality monitoring is required pursuant to the California Code of Regulations (CCR), Division 2, Title 27, Subdivision 1, Chapter 3, Subchapter 3, sections 20380 through 20435. The principal purposes of an SMP include:
1) to document compliance with WDRs and prohibitions established by the Regional Water Board, 2) to facilitate self-policing by the discharger in the prevention and abatement of pollution arising from the waste discharge, 3) to develop or assist in the development of standards of performance, and 4) to assist the discharger in complying with the requirements of Title 27. Additionally, under California Water Code (CWC) section 13304, Shell Oil Products US (Shell) is required to implement corrective actions and monitor the effectiveness of the implemented corrective actions under this SMP.

Achievement of the above goals shall occur by collecting sufficient and meaningful data to demonstrate that site conditions are protective of human health and the environment and to serve as an early indicator of any potential concern areas. The specific volume, frequency, and parameter analysis may vary for different locations along the perimeter compliance points depending upon area-specific concerns. Ongoing data analysis shall be conducted to determine if sufficient and meaningful data are being collected as well as to determine if changes to this sampling plan are warranted either due to the collection of data with little or no value or due to the needed collection of additional data to address area specific concerns.

B. MONITORING REQUIREMENTS

Monitoring refers to the observation, inspection, measurement, and/or sampling of environmental media, waste management units (WMUs), containment and control facilities, and waste disposed in each WMU. Monitoring programs designed to evaluate the effectiveness of corrective actions implemented under CWC section 13304 are also described in the SMP. The following defines the types of monitoring that may be required.

Monitoring of Environmental Media

The Regional Water Board may require monitoring of groundwater, surface water, vadose zone, stormwater, leachate, and any other environmental media that may pose a threat to water quality or provide an indication of a water quality threat at the refinery.

Sample collection, storage, and analyses shall be performed according to the most recent version of U.S. EPA-approved methods or in accordance with the most recent version of Shell's Groundwater Monitoring Program Standard Operating Procedures (SOP). Analytical testing of environmental media required by this SMP shall be performed by a California State-approved laboratory for the required analyses. The director of the laboratory whose name appears on the certification shall be responsible for supervising all analytical work in his/her laboratory and shall have signing authority for all laboratory data reports or may designate signing of all such data included in reports submitted to the Regional Water Board.

All monitoring instruments and devices used to conduct monitoring in accordance with this SMP shall be maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices shall be calibrated at least once every two years.

Receiving waters refer to any surface water which actually or potentially receives surface or groundwater that pass over, through, or under waste materials or impacted soils. In this case, the following water bodies are considered receiving waters: the local groundwater beyond the Perimeter Compliance Points, and the marsh/wetlands of the Carquinez Strait.

Standard Observations

Standard observations refer to observations within the limits of each WMU, at their perimeter, and of the receiving waters beyond their limits. Standard observations include:

1. Waste Management Units:
   a. Evidence of ponded water at any point on the WMU;
   b. Evidence of odors, including their presence or absence, characterization, source, and distance of travel from source; and
   c. Evidence of erosion and/or daylighted waste.

2. Perimeter of Waste Management Units:
   a. Evidence of liquid leaving or entering the WMU, estimated size of affected area and flow rate (show affected area on map);
   b. Evidence of odors, including their presence or absence, characterization, source, and distance of travel from source; and
   c. Evidence of erosion and/or daylighted waste.

3. Receiving Waters:
   a. Floating and suspended materials of waste origin, including their presence or absence, source, and size of affected area;
   b. Discoloration and turbidity: description of color, source, and size of affected area;
   c. Evidence of odors, presence or absence, characterization, source, and distance of travel form source;
   d. Evidence of beneficial use, such as presence of water associated with wildlife;
   e. Estimated flow rate; and
   f. Weather conditions, such as estimated wind direction and velocity, total precipitation.

Quality Assurance/Quality Control (QA/QC) Sample Monitoring

Shell shall collect duplicate, field blank, equipment blank (if appropriate) and trip blank samples for each monitoring event at the frequency specified in the latest version of the Shell Groundwater Monitoring Program SOP.

C. REPORTING REQUIREMENTS

Reporting responsibilities of waste dischargers under WDRs are specified in CWC § 13225(a), 13267(b), 13383, and 13387(b) and this Regional Water Board's Resolution No.73-16 and Title 27. At a minimum, each Self-Monitoring Report (SMR) shall include the following information:

1. Transmittal Letter: A cover letter transmitting the essential points of the monitoring report shall be included with each monitoring report. The transmittal letter shall discuss any violations during the reporting period and actions taken or planned to correct the problem. The letter shall also certify the completion of all monitoring requirements. The letter shall be signed by the Discharger's principal executive officer or his/her duly authorized representative, and shall include a statement by the official, under penalty of perjury, that the report is true and correct to the best of the official's knowledge.

2. Graphic Presentation: The following maps, figures, and graphs (if applicable) shall be included in each SMR to visually present data collected pursuant to this SMP:
   a. Plan-view maps showing all monitoring and sampling locations, WMUs, groundwater protection systems (GWPS), and site/property boundaries;
   b. Groundwater level/piezometric surface contour maps with data collected in the 2nd and 4th quarters of each year.

3. Tabular Presentation: The following data (if applicable) shall be presented in tabular form and included in each SMR to show a chronological history and allow quick and easy reference:
   a. Well designation;
   b. Well location coordinates;
   c. Groundwater depths (collected 2nd and 4th quarters of each year);
   d. Groundwater elevations;
   e. Current analytical results;
   f. Historical analytical results (including the past four sampling events); and
   g. Measurement dates.

4. Compliance Evaluation Summary and Discussion:
   a. A summary and certification of completion of all environmental media monitoring, standard observations, and facilities inspections;
   b. The signature of the laboratory director or his/her designee in laboratory data deliverables indicating that he/she has supervised all analytical work in his/her laboratory; and
   c. A discussion of the field and laboratory results that includes the following information:

(1) Data interpretations;
(2) Conclusions;
(3) Recommendations;
(4) Newly implemented or planned investigations and remedial measures;
(5) Data anomalies;
(6) Variations from protocols and;
(7) Condition of wells.

5. Appendices: The following information shall be provided as appendices in electronic format only, unless requested otherwise by Regional Water Board staff and unless the information is already contained in an SOP approved by Regional Water Board staff:

a. Method and time of water level measurements;
b. Purging methods and results including the type of pump used, pump placement in the well, pumping rate, equipment and methods used to monitor field pH, temperature, and electrical conductivity, calibration of the field equipment, pH temperature, conductivity, and turbidity measurements, and method of disposing of the purge water;
c. Sampling procedures, field, equipment, and trip blanks, number and description of duplicate samples, type of sample containers and preservatives used, the date and time of sampling, the name of the person actually taking the samples, and any other relevant observations; and
d. Documentation of laboratory results, analytical methods, detection limits and reporting limits, and QA/QC procedures for the required sampling.

D. ANNUAL REPORTING

The Discharger shall submit an annual self-monitoring report to the Regional Water Board covering the previous calendar year. The annual report must summarize all monitoring activities that have occurred in the previous year. The annual report shall include the following information for each monitoring event during the year required pursuant to this SMP, in addition to the transmittal letter, figures, tables and appendices described in Section C of this SMP:

1. **Graphic Presentation**
Include site maps (plot plans) that are drawn to a scale that remains constant from reporting period to reporting period. Line or bar graphs are helpful to illustrate variations in groundwater elevations, phase-separated product thickness, and dissolved chemical concentrations with time. These maps and graphs shall include the following information:

a. Well locations;

b. Groundwater elevation contours;

c. Inferred groundwater flow direction(s);

d. Identify wells containing free product;

e. Extent of dissolved chemical constituents presented in map layout (chemical data box maps).

2. **Tabular Presentation**
   Present all of the following data in one or more tables to show a chronological history and allow quick and easy reference. The table(s) shall include the following information:
   a. Well designations;
   b. Well location coordinates;
   c. Top of well casing elevation;
   d. Groundwater depths;
   e. Groundwater elevations;
   f. Free product thicknesses;
   g. Current analytical results;
   h. Historical analytical results for the most recent four sampling events;
   i. Measurement dates; and
   j. The quantity of groundwater captured by each GWPS.

3. **Discussion**
   Provide a discussion of the field and laboratory results that includes the following information:
   a. Data Interpretations;
   b. Conclusions;
   c. Recommendations;
   d. Newly implemented or planned investigations and remedial measures;
   e. Data anomalies;
   f. Variations from protocols; and
   g. Conditions of wells.

E. CONTINGENGY REPORTING

1. The Discharger shall report any seepage from the surface of any WMU or discharge prohibited in the WDRs immediately after it is discovered to the Regional Water Board by calling the Spill Hotline at 1-800-852-7550 and by sending an email to Rb2SpillReports@waterboards.ca.gov. The Discharger shall submit a written report with the Regional Water Board within five days of discovery of any discharge. The written report shall contain, at a minimum, the following information:
   a. A map showing the location(s) of discharge;
   b. Approximate flow rate;
   c. A description of the nature of the discharge; and

d. Corrective measures underway or proposed.

2. The Discharger shall submit a written report to the Regional Water Board within seven working days of determining that a statistically significant difference occurred in the sample result compared against the historical dataset and above an approved MACLs in a compliance point well. In addition, evaluation of GWPS performance will be reviewed to examine the effectiveness of hydraulic control.

   a. Shell shall immediately re-sample at the compliance point where the anomalous result was observed, evaluate the result against the historical dataset and re-analyze if results are not consistent with historical trends.

   b. If re-sampling and analysis confirm the anomalous result through statistical analysis, Shell shall document this in the text of the next Annual Report and notify the Regional Water Board in writing within 21 days of receiving the final laboratory results. In this letter, Shell shall evaluate whether any re-sampling or additional corrective measures need to be implemented.

F. ELECTRONIC REPORTING

1. **Geotracker Requirements**
   The State Water Board has adopted regulations requiring electronic report and data submittal to Geotracker. The text of the regulations can be found at the following URL:

   http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal/index.shtml

   Parties responsible for cleanup of pollution at sites overseen by the Regional Water Board's Land Disposal Programs are required to submit the following information electronically to Geotracker:

   a. Groundwater analytical data; and

   b. Portable data format (PDF) copies of all reports (the document in its entirety [signature pages, text, figures, tables, etc.] must be saved as a single PDF file).

   Note that the Discharger is still responsible for submitting one hard copy of all reports pursuant to this Order. The Regional Water Board may require direct submittal of electronic reports and correspondence in addition to the State Water Board's Geotracker requirements.

2. **Data Tables**
   Upon request, monitoring results shall also be provided electronically in Microsoft Excel or similar spreadsheet format to provide an easy to review chronological summary of site data, and to facilitate data computations and/or plotting that Water Board staff may undertake during the review process. Data tables submitted in electronic spreadsheet format will not be included in the case file for public review and should therefore be submitted on CD or diskette and included with the hard copy report.

Electronic tables shall include the following information:

a. Well designations;
b. Well location coordinates;
c. Top of casing elevations;
d. Groundwater depths and elevations;
e. Free product thicknesses;
f. Current analytical results by constituent of concern;
g. Historical analytical results (including the past four sampling events); and
h. Measurement dates.

G. MAINTENANCE OF WRITTEN RECORDS

The Discharger shall maintain information required pursuant to this SMP for a minimum of five years. The five-year period of retention shall be extended during the course of any unresolved litigation regarding this discharge or when requested by the Regional Water Board.

PART B: MONITORING AND OBSERVATION SCHEDULE

1. DESCRIPTION OF OBSERVATION STATIONS AND SCHEDULE OF OBSERVATIONS

A. GROUNDWATER MONITORING:

Semi-Annual Report: **Due August 31**
Annual Report: **Due March 31 of each year**

Groundwater shall be sampled and analyzed as detailed in Tables 1, 2 and 3. Groundwater analyses shall include the following field measurements: pH, temperature, specific conductance, water level, volume purged, number of casings volumes purged, and whether the well went dry during sampling (including measures taken to ensure accuracy of analyses given this condition).

B. FACILITIES MONITORING - **Observe semi-annually, report semi-annually**

Semi-Annual Report: **Due August 31**
Annual Report: **Due March 31 of each year**

The Discharger shall inspect all WMUs to ensure proper and safe operation and report semi-annually.

2. GWPS PERFORMANCE MONITORING

Shell shall annually demonstrate that all perimeter GWPS are containing and extracting all perimeter compliance point groundwater at concentrations greater than the approved MACLs. The system performance evaluation shall include but not necessarily be limited to, groundwater capture zone modeling and/or evaluating chemical monitoring data to demonstrate site conditions are protective of human health and the environment at the perimeter compliance points. Historically, Shell has provided the Regional Water Board with an annual *Groundwater Boundary Control Capture Verification Modeling Report* to satisfy this requirement. Continued submittal of this report or submittal of an annual report using groundwater analytical data to demonstrate site conditions are protective of human health and the environment at the compliance points, or a combination of these reports is required.

For perimeter compliance point locations where groundwater capture is not achieved and where chemical monitoring data are above the MACLs, Shell shall inform the Regional Water Board of their plans to provide groundwater capture or to collect additional data to demonstrate site conditions are protective of human health and the environment at the perimeter compliance points.

3. CHEMICAL CONSTITUENT MONITORING

a. Refinery-Wide Groundwater Monitoring Program: Shell shall sample the Refinery-Wide Groundwater Monitoring Program compliance points (wells) listed in Table 1 for the analytical parameters and at the frequencies listed in Table 1. All monitoring activities, including analytical and QA/QC procedures will be conducted in accordance with the most recent version of Shell's Groundwater Monitoring Program SOPs.

b. Five-Year Groundwater Monitoring Program: Shell shall sample the wells listed on Table 3 for the analytical parameters listed on Table 3 at a frequency on once every five years. All monitoring activities, including analytical and QA/QC procedures will be conducted in accordance with the most recent version of Shell's Groundwater Monitoring Program SOPs.

Attachments:

Table 1:	List of Monitoring Wells and Analyses
Table 2:	Maximum Allowable Concentration Limits (MACLs) for Perimeter Compliance Points
Table 3:	5 Year Sampling List of Wells and Analyses

TABLE 1
LIST OF MONITORING WELLS AND ANALYSES
SHELL MARTINEZ REFINERY

Well	POC Well	Groundwater Basin	WMU	Sampling Frequency	Purpose	Analytical Suite
86	Yes	Reservoir Lakes	na	Semiannual (1Q & 3Q)	WMU Monitoring	A
159	No	East Valley	PG&E	Semiannual (1Q & 3Q)	WMU Monitoring	A
164	Yes	Reservoir Lakes	na	Semiannual (1Q & 3Q)	WMU Monitoring	A
173	No	Reservoir Lakes	N	Semiannual (1Q & 3Q)	WMU Monitoring	A
207	Yes	East Valley	JT	Semiannual (1Q & 3Q)	WMU Monitoring	A
237	No	Reservoir Lakes	YY	Semiannual (1Q & 3Q)	WMU Monitoring	A
242	No	Central Valley	Ms	Semiannual (1Q & 3Q)	WMU Monitoring	A
350	Yes	East Valley	JT	Semiannual (1Q & 3Q)	WMU Monitoring	A
438	Yes	East Valley	JT	Semiannual (1Q & 3Q)	WMU Monitoring	A
449	Yes	East Valley	Z'	Semiannual (1Q & 3Q)	WMU Monitoring	A
459	No	West Valley	I	Semiannual (1Q & 3Q)	WMU Monitoring	A
481	No	West Valley	K	Semiannual (1Q & 3Q)	WMU Monitoring	A
524	Yes	East Valley	Z'	Semiannual (1Q & 3Q)	WMU Monitoring	A
525	Yes	East Valley	Z'	Semiannual (1Q & 3Q)	WMU Monitoring	A
540	No	Reservoir Lakes	YY	Semiannual (1Q & 3Q)	WMU Monitoring	A
574	No	West Valley	I	Semiannual (1Q & 3Q)	WMU Monitoring	A
575	No	West Valley	I	Semiannual (1Q & 3Q)	WMU Monitoring	A
581	No	East Valley	DD	Semiannual (1Q & 3Q)	WMU Monitoring	A
583	No	East Valley	DD	Semiannual (1Q & 3Q)	WMU Monitoring	A
63	Yes	East Valley	Y	Annual (1Q)	System Performance	A & B
81	Yes	Reservoir Lakes	na	Annual (1Q)	System Performance	A
224	Yes	West Valley	Pond 5C/5D/8	Annual (1Q)	System Performance	A
279	No	Reservoir Lakes	na	Annual (1Q)	System Performance	A
437	Yes	East Valley	Y	Annual (1Q)	System Performance	A & B
471	Yes	East Valley	Y	Annual (1Q)	System Performance	A & B
504	Yes	West Valley	PS	Annual (1Q)	System Performance	A & B
516	Yes	East Valley	X	Annual (1Q)	System Performance	A & B
518	Yes	East Valley	X	Annual (1Q)	System Performance	A & B
520	Yes	East Valley	X	Annual (1Q)	System Performance	A & B
529	Yes	East Valley	X	Annual (1Q)	System Performance	A & B
554	Yes	West Valley	PS	Annual (1Q)	System Performance	A & B
293S	Yes	West Valley	Pond 5C/5D/8	Annual (1Q)	System Performance	A
294FB	Yes	West Valley	Pond 5C/5D/8	Annual (1Q)	System Performance	A
294S	Yes	West Valley	Pond 5C/5D/8	Annual (1Q)	System Performance	A
296FB	Yes	West Valley	Pond 5C/5D/8	Annual (1Q)	System Performance	A
316B	Yes	West Valley	PS	Annual (1Q)	System Performance	A & B
317B	Yes	West Valley	PS	Annual (1Q)	System Performance	A & B
319FB	Yes	West Valley	na	Annual (1Q)	System Performance	A
321F	Yes	West Valley	Pond 4	Annual (1Q)	System Performance	A
323G	Yes	West Valley	Pond 6	Annual (1Q)	System Performance	A
M-6	Yes	West Valley	Pond 5	Annual (1Q)	System Performance	A
228	No	West Valley	Pond 7	Semiannual (1Q & 3Q)	RCRA Monitoring	C
600	No	West Valley	Pond 7	Semiannual (1Q & 3Q)	RCRA Monitoring	C
604	No	West Valley	Pond 7	Semiannual (1Q & 3Q)	RCRA Monitoring	C
225R	No	West Valley	Pond 7	Semiannual (1Q & 3Q)	RCRA Monitoring	C
292B	Yes	West Valley	Pond 7	Semiannual (1Q & 3Q)	RCRA Monitoring	C
292S	Yes	West Valley	Pond 7	Semiannual (1Q & 3Q)	RCRA Monitoring	C
293B	Yes	West Valley	Pond 7	Semiannual (1Q & 3Q)	RCRA Monitoring	C
293S	Yes	West Valley	Pond 7	Semiannual (1Q & 3Q)	RCRA Monitoring	C

Analytical Suite	Constituents
A	Ba, Cr, Pb, Ni, Zn, BTEX/TPH-G & Purgeables
B	Phenols
C	Ba, Cr, Cu, Pb, Hg, Ni, Se, V, BTEX/TPH-G & Purgeables, Semivolatiles/Phenols

Notes:
WMU = Waste management unit
na = not applicable
POC = Point of Compliance

TABLE 2
MAXIMUM ALLOWABLE CONCENTRATION LIMITS (MACLs)
FOR PERIMETER COMPLIANCE POINTS
SHELL MARTINEZ REFINERY

Constituents of Concern	Recommended Shell MACL (µg/L)	Basis for MACL
TPH-Gas	500	ESL - Aquatic Habitat
TPH-Diesel	640	ESL - Aquatic Habitat
Benzene	46	ESL - Aquatic Habitat
Toluene	130	ESL - Aquatic Habitat
Ethylbenzene	43	ESL - Aquatic Habitat
Xylenes	100	ESL - Aquatic Habitat
MTBE	8,000	ESL - Aquatic Habitat
Naphthalene	24	ESL - Aquatic Habitat
Antimony	30	ESL - Aquatic Habitat
Arsenic	36	ESL - Aquatic Habitat
Barium	1000	ESL - Aquatic Habitat
Beryllium	0.53	ESL - Aquatic Habitat
Cadmium	0.25	ESL - Aquatic Habitat
Chromium (total)	180	ESL - Aquatic Habitat
Cobalt	3	ESL - Aquatic Habitat
Copper	3.1	ESL - Aquatic Habitat
Lead	2.5	ESL - Aquatic Habitat
Manganese	100	EPA Aquatic Life Protection
Mercury	0.025	ESL - Aquatic Habitat
Molybendum	240	ESL - Aquatic Habitat
Nickel	8.2	ESL - Aquatic Habitat
Selenium	5	ESL - Aquatic Habitat
Silver	0.19	ESL - Aquatic Habitat
Thallium	4	ESL - Aquatic Habitat
Vanadium	19	ESL - Aquatic Habitat
Zinc	81	ESL - Aquatic Habitat
Bis(2-ethylhexyl)phthalate	32	ESL - Aquatic Habitat
2,4-Dimethylphenol	110	ESL - Aquatic Habitat
Phenol	260	ESL - Aquatic Habitat

Notes:
ESL Aquatic Habitat reference from Table F1b of the December 2013 SFRWQCB ESL document
µg/L = micrograms per liter
These MACLs are applicable at perimeter compliance points except for the Crude Hill Groundwater Basin.

TABLE 3
5 YEAR SAMPLING
LIST OF WELLS AND ANALYSES

Well	Groundwater Basin
63	East Valley
81	Reservoir Lakes
86	Reservoir Lakes
145	Central Valley
159	East Valley
164	Reservoir Lakes
173	Reservoir Lakes
207	East Valley
224	West Valley
228	West Valley
237	Reservoir Lakes
242	Central Valley
279	Reservoir Lakes
280	East Valley
350	East Valley
437	East Valley
438	East Valley
449	East Valley
452	Central Valley
459	West Valley
471	East Valley
476	East Valley
481	West Valley
504	West Valley
516	East Valley
518	East Valley
520	East Valley
524	East Valley

Well	Groundwater Basin
525	East Valley
529	East Valley
540	Reservoir Lakes
554	West Valley
574	West Valley
575	West Valley
581	East Valley
583	East Valley
600	West Valley
604	West Valley
627	East Valley
225R	West Valley
292B	West Valley
292S	West Valley
293B	West Valley
293S	West Valley
294FB	West Valley
294S	West Valley
296FB	West Valley
298S	West Valley
316B	West Valley
317B	West Valley
319FB	West Valley
321F	West Valley
323G	West Valley
457R	Reservoir Lakes
M-6	West Valley

Notes:
5-year sampling schedule: 2001, 2006, 2011, 2016, etc

The wells listed above are analyzed for:
- TPH as Gasoline
- TPH as Diesel (with Silica Gel Clean Up)
- CAM 17 Metals
- Manganese
- Semi Volatiles/Phenols (EPA 8270B Full List)
- Volatile Organic Compounds (EPA 8260 Full List)
- Phenols