LAW OFFICES OF MARK B. GILMARTIN
MARK B. GILMARTIN (State Bar No. 98384)
1534 17th Street, Suite 103
Santa Monica, California 90404-3452
Telephone: (310) 310-2644
Facsimile: (310) 496-1402
Email: mbgilmartin@earthlink.net

Attorney for Petitioner
GOLDEN WEST REFINING COMPANY

STATE OF CALIFORNIA

STATE WATER RESOURCES CONTROL BOARD

In the Matter of California Regional Water Quality Control Board, Los Angeles Region, Order No. R4-2013-0116 to Provide Technical Reports for the Former Golden West Refinery, 13539 E. Foster Road, Santa Fe Springs, California Pursuant to Water Code Section 13267 (SCP No. 0227A; Site ID No. 2040073)	**SWRCB/OCC FILE NO. _____** **PETITION FOR REVIEW OF REGIONAL BOARD ACTION AND REQUEST FOR STAY**

Golden West Refining Company ("Petitioner") submits this petition for review of California Regional Water Quality Control Board – Los Angeles Region ("Regional Board") Order No. R4-2013-0116 ("Order") directing Petitioner to provide technical reports pursuant to California Water Code Section 13267. Pursuant to Water Code Sections 13320 and 13321 and Sections 2050-2068 of Title 23 of the California Code of Regulations ("CCRs"), Petitioner requests that the State Board stay, set aside and/or modify the Order.

I. NAME AND ADDRESS OF PETITIONER

Golden West Refining Company
Attn: Chris Panaitescu
13116 Imperial Highway
Santa Fe Springs, CA 90670
Telephone: 562-921-3581
Email: panaitescu@thriftyoil.com

II. REGIONAL BOARD ACTION BEING PETITIONED

The Regional Board has, *inter alia*, directed Petitioner to take three actions. First, the Order directs Petitioner to submit a work plan to conduct subsurface investigation and install additional

groundwater wells to address gaps in available data defining the extent of an on-site and off-site light non-aqueous phase liquid ("LNAPL") and dissolved phase hydrocarbon plumes in the semi-perched zone and Artesia Aquifer in the vicinity of the former Golden West Refinery, 13539 E. Foster Road, Santa Fe Springs, California ("Site"). The Order requires that the work plan include, but should not be limited to, installation of groundwater wells at on-site and off-site locations to be approved by the Regional Board. Second, the Order directs Petitioner to submit a revised and comprehensive groundwater sampling and monitoring program for the LNAPL and dissolved phase groundwater plumes in the semi-perched zone and Artesia Aquifer both on-site and off-site covering the entire plume. The Order requires that the groundwater sampling and monitoring program address, but not necessarily be limited to, concentrations of contaminants dissolved in groundwater and geochemical parameters to monitor natural attenuation. Third, the Order directs Petitioner to conduct a second round of soil vapor sampling at or near eleven (11) off-site locations previously sampled in August 2013. The stated purpose for repeating the previous soil vapor sampling event is to confirm the previous results and evaluate any threat to human health from vapor intrusion due to the shallow depth of off-site LNAPL. The work plans and soil vapor sampling report are due by September 15, 2014.

III. DATE OF REGIONAL BOARD ACTION

The Regional Board issued the Order to Petitioner on June 26, 2014. The Order states that any person aggrieved by the Order may petition the State Water Resources Control Board to review the Order within the date that is thirty (30) days of the date of the Order (unless the 30th day is a Saturday or Sunday). The date by which a petition for review may be filed is July 28, 2014.

IV. STATEMENT OF REASONS WHY THE REGIONAL BOARD ACTION WAS INAPPROPRIATE OR IMPROPER

There is not "substantial evidence" indicating that the entirety of the off-site LNAPL in semi-perched groundwater originated from a release of petroleum at the Site (in fact there is "substantial evidence" to the contrary), and it is not reasonable to require Petitioner to conduct an investigation of a condition caused by third parties. The evidence presented by Petitioner to the Regional Board demonstrates that LNAPL present on semi-perched groundwater approximately

3,000 feet from the Site has a fresh appearance, a different chemical composition than LNAPL found at and within 599 feet down gradient of the Site and wi, and did not originate from the Site. The Regional Board has failed to consider substantial evidence presented by Petitioner that most of the off-site LNAPL originated from off-site sources such as subsurface pipelines, underground storage tanks ("USTs") and other sources, some of which have been identified by Petitioner as potential contributors to off-site LNAPL.

V. PETITIONER IS AGGRIEVED

Petitioner is aggrieved because the Regional Board is requiring Petitioner to: (1) investigate off-site LNAPL and dissolved phase hydrocarbon plumes in the semi-perched groundwater zone and Artesia Aquifer that did not result from a discharge at the Site, but were caused by third parties; and (2) conduct a second round of soil vapor sampling at locations distant from the Site, unrelated to the discharge at the Site, where hydrocarbons were detected in only one (1) of eleven (11) locations at depths of five (5), ten (10) and fifteen (15) below ground surface ("bgs") in August 2013.

In addition to the substantial cost of the work required by the Order, the Order provides that pursuant to Water Code Section 13268(a), failure to submit a report required by the Order would make Petitioner guilty of a misdemeanor and could result in administrative civil liability in an amount up to one thousand dollars ($1,000.00) per day for each day that a technical report is not received after a due date.

VI. REQUESTED STATE BOARD ACTION

A. Request for Stay

Petitioner requests that the State Board stay the requirement that Petitioner submit work plans, conduct soil vapor sampling and submit a soil vapor sampling report pursuant to Water Code Section 13321 and 23 CCR Section 2053 until the Petition has been adjudicated by the State Board.

B. Request for State Board Order Setting Aside Regional Board Order

Petitioner requests that the State Board set aside the Order pursuant to Water Code Section 13320 and 23 CCR Section 2052 (a)(2)(B). Alternatively, Petitioner requests that the State Board direct the Regional Board to require that Petitioner monitor LNAPL in the semi-perched

groundwater zone that exists within five hundred (500) feet southwest of the Site.

VII. STATEMENT OF POINTS AND AUTHORITIES

A. Site History

The Site is located in the City of Santa Fe Springs, County of Los Angeles, near crude-oil-producing fields. In 1925, Wilshire Oil Company ("Wilshire") purchased the Site and built storage facilities. In 1936, Wilshire constructed an oil refinery located east of Carmenita Road and north of East Foster Road, where gasoline and other finished petroleum products were manufactured. In 1960, Gulf Oil Corporation ("Gulf") purchased the Site from Wilshire. Gulf refined crude oil into finished gasoline, heavy fuel oils, diesel fuel and asphalt. In 1983, Petitioner purchased the Site from Gulf. In 1984, Gulf merged with Standard Oil of California which is now known as Chevron Corporation.

Petitioner operated a refinery process unit at the Site until February 1992, when crude oil processing operations were suspended. Only fuel transport operations were conducted by Petitioner at the Site from February 1992 to August 1997, when all petroleum storage operations ceased. The 265-acre Site was formerly comprised of four former operational units, including: (1) a processing unit area ("PUA"); (2) south tank farm ("STF"); (3) marketing area ("MA"); and (4) west tank farm ("WTF"). Multiple pipelines are or were located beneath Carmenita Road and adjacent to the Atkinson Topeka and Santa Fe Railroad tracks south of the Site.

From 1997 to 2006, the aboveground and subsurface structures were demolished, the shallow impacted soil (up to 10-15 feet bgs) were excavated and removed from the Site and the Site was redeveloped into a business park. The redevelopment of the Site was performed under the supervision of the Regional Board and other state and local government agencies. Petitioner has been recognized for completing one the best Brownfields redevelopment projects in the State of California.[1] The redevelopment has resulted in thousands of new jobs and invigorated economic activity in a previously depressed part of the City of Santa Fe Springs.

[1] The California Association for Local Economic Development, the International Economic Development Council and the California Redevelopment Association have issued awards of excellence for the redevelopment project.

B. Cleanup and Abatement Order No. R4-2004-0020

On August 24, 2004, the Regional Board issued Cleanup and Abatement Order No. R4-2004-0020 ("CAO") directing Petitioner to assess, clean up and abate contamination discharged to the soil and groundwater at the Site. The CAO acknowledges that more than one thousand (1,000) soil borings had been completed and approximately one hundred and sixteen (116) monitoring wells had been installed. Substantial quantities of LNAPL had been removed from the semi-perched groundwater and Artesia Aquifer as of the issuance of the CAO. Petitioner has complied with all requirements of the CAO.

C. Groundwater Monitoring Program Review

1. SGI Groundwater Monitoring Program Review (March 2012)

In March 2012, Petitioner's consultant, The Source Group, Inc. ("SGI"), performed a groundwater monitoring program review. Following is a summary of some of the pertinent findings made by SGI in the Groundwater Monitoring Program Review dated March 2012 ("GMPR") and submitted to the Regional Board.

Two shallow groundwater zones have been identified under the Site. The uppermost water-bearing zone, referred to as the semi-perched zone, is found locally at depths ranging from 20 to 45 feet bgs in the Bellflower Formation.

The laterally discontinuous semi-perched zone is unconfined and occurs both on and off the Site. The soils in this zone are comprised of clay and silt, with lenticular sand and gravel layers. The sand and gravel layers are water saturated in some areas within and south of the Site and these saturated sediments form the semi-perched zone. Where these lenticular sands and gravel layers are not underlain by less-permeable clay and silt layers, the semi-perched zone is absent.

The semi-perched zone exists in the southern part of the Site and extends off-site to the southwest, with a general southwesterly gradient direction. Groundwater elevations and southwestern gradient in the semi-perched zone measured during groundwater monitoring events conducted since the 1980s have been consistent, with a groundwater gradient to the southwest and an average hydraulic gradient of approximately 0.005 ft/ft.

The semi-perched groundwater zone is locally influenced by the continuous groundwater

extraction conducted by the City of Santa Fe Springs to maintain dewatering of the Carmenita Road Underpass. This dewatering-related groundwater extraction conducted since the early 1980s has created a constant depression in groundwater levels centered at the Carmenita/railroad intersection, providing effective LNAPL migration control in the semi-perched groundwater zone.

The Artesia Aquifer is found at a depth of approximately 65 to 110 feet bgs under the Site and off-site. The Artesia Aquifer is the first groundwater encountered under most of the Site. In the southern part of the Site and off-site to the southwest, the Artesia Aquifer occurs under the semi-perched zone and in these areas approximately 20-30 feet of unsaturated sediments underlie the low-permeable perching layer that forms the base of the semi-perched zone.

The Artesia Aquifer is comprised of fluvial sediments of gravel, fine to coarse sand, and interbedded silt and clay. The lithology of the upper portion of the Artesia Aquifer, where most of the Artesia monitoring wells are completed, is irregular and reflects a complex sequence of interbedded and laterally discontinuous layers of sand, silt, and clay. Vertically, the Artesia Aquifer extends to depths of at least 200 feet and consists of sand and gravel with localized fine grain layers.

Groundwater gradient and direction in the Artesia groundwater zone varies throughout the vicinity of the Site with localized mounding. However, in general, the groundwater flow has been reported to move east-northeast and southeast.

In 1990-1991, Petitioner conducted a series of extensive groundwater investigations, including lithology investigation on-site and off-site by cone penetrometer testing (CPT) and aquifer testing in both the semi-perched zone and the Artesia Aquifer. The CPT investigation included a 110-location lithology investigation south of the Site. The investigation resulted in confirmation of the occurrence of the semi-perched groundwater in a sand/silty sand unit, underlain by a clay/silty clay perching layer. The lateral extent of that semi-perched zone is limited areally for two principal reasons. First, where the finer-grained deeper unit is not present, there is no longer any support for the overlying perched zone. Second, where the permeable unit hosting the semi-perched layer pinches out between two lower-permeability units, the fluid cannot accumulate in the tighter pore spaces of these less permeable units and the zone disappears.

In 1991, aquifer tests were conducted in the semi-perched zone and Artesia Aquifer. The

aquifer testing in the semi-perched groundwater zone included the installation of test wells (TW) and observation wells (OW). Testing of the groundwater zone indicated a low calculated hydraulic conductivity of 3.5x10-04 cm/s to 1.7x10-06 cm/s and apparent heterogeneous contribution of groundwater from sand lenses in overall fine-grained clay or silt layers which are expected to retard fluid migration vertically and laterally.

Ongoing remedial efforts at the Site have significantly reduced the occurrence of LNAPL. Monitoring data also indicate that off-site LNAPL is stable and not migrating downgradient. Furthermore, the two on-site and two off-site Artesia Aquifer groundwater monitoring sentinel wells have remained LNAPL-free since their installation. Similarly, the most downgradient wells in the semi-perched groundwater zone (e.g., wells PO-5, PO-9, PO-12 and PO-14), which Petitioner contends are unrelated to the hydrocarbon plume originating at the Site, have remained LNAPL-free since their installation in the early 1990s.

Evaluations of hydrocarbon types in LNAPL from on-site and off-site wells include a 1991 investigation, a 1995 testing of on-site wells, and repeated observations during groundwater monitoring and 2012 LNAPL testing and hydrocarbon fingerprinting.

The 1991 CPT and Hydropunch investigation also reported the distribution and apparent characteristics of the LNAPL present at the Site and at off-site locations. Samples collected from off-site locations, near Rosecrans Avenue and one location along Carmenita Road, appeared to be fresh, unweathered petroleum product. These results contrasted sharply with the more weathered petroleum product samples obtained farther north at the southern boundary of the Site. The degree of weathering strongly suggested there were localized hydrocarbon sources in these areas and off-site sources, not associated with historic releases at the Site, were the source of the off-site unweathered petroleum products. LNAPL samples collected furthest from the Site appeared the freshest.

Petitioner's belief that LNAPL in the semi-perched groundwater more than 500 feet south of the Site was caused by off-site sources was confirmed by SGI in February 2012. SGI obtained product samples from a well in the southern edge of the Site (Well STF-16) and from four wells located west of Carmenita Road, in the area between Cambridge Court (well B-13 and well MYTNN) and north and south of Rosecrans (wells B-16 and PO-16). The visual observations of the LNAPL samples indicate

that the LNAPL present on the groundwater in the semi-perched groundwater along the southwestern boundary of the Site in well STF-16 is characterized by a nearly opaque, black-colored liquid with a viscosity typical of heavily weathered refined product. In the area between Cambridge Court and south of Rosecrans Avenue, semi-perched groundwater monitoring well B-13 contains an amber product, well MYTNN contains black, weathered product, and wells B-16 and PO-16 contain a lighter-colored LNAPL that is visually distinct from well MYTNN.

The five product samples were initially submitted to Zymax Forensics ("Zymax") in Escondido for analysis of additive chemicals (GMPR, Appendix B). The results of the analysis indicated the absence of Ethylene Dibromide (EDB) in all samples, and the unique presence of two lead compounds (Tetramethyl Lead and Trimethylethyl Lead) in the product from wells B-16 and PO-16 near Rosecrans Avenue. Based on this result and the observation of these two samples as visually distinct from upgradient well MYTNN, the source of the product in B-16 and PO-16 is distinct from upgradient wells.

The three remaining upgradient samples (MYTNN, B-13, and STF-16) were further analyzed by Zymax Laboratories and the petroleum gas chromatograms were interpreted by forensic specialists. The fingerprinting analysis reflects the presence in all three wells of severely weathered leaded gasoline and degraded #2 diesel or #2 fuel oil. The report also indicates that the gasoline product in STF-16, at the boundary of the Site, is distinct from samples from wells B-13 and MYTNN, indicating a different source. Based on these fingerprinting results, the LNAPL in the semi-perched wells consists of three types resulting from three separate releases: (1) the product in former STF wells; (2) the product in the area of wells B-13 and MYTNN; and (3) the product in the vicinity of Rosecrans Avenue.

The evaluation of the visual observations and laboratory analysis supports the interpretation that the product found in the Cambridge Court/Rosecrans Avenue area in wells B-13, MYTNN, B-16 and PO-16 is attributable to non-Site sources.

The area surrounding the Site includes multiple commercial and industrial facilities, some of which historically operated gasoline, diesel or waste oil storage tanks and pipelines. In 2011, SGI conducted a review of historical records referenced in Environmental Data Resources ("EDR") report,

and examined files at the City of Santa Fe Springs, City of Norwalk (through the County of Los Angeles records) and the Regional Board. The results of this review are summarized and illustrated on Figure 12 of the GMPR, which presents pipelines and selected facilities with reported petroleum hydrocarbon storage located south and southwest of the Site. Table 3 of the GMPR also lists the corresponding address and findings regarding the potential impact to the subsurface from the facilities south of the Site.

Investigations by Petitioner in the 1980s and 1990s included the installation and sampling of groundwater monitoring wells located several thousand feet southwesterly from the Site. The network of wells is within an area encompassing numerous facilities containing petroleum storage tanks, many of which have been documented to have leaked. Due to the well-documented groundwater monitoring conducted by Petitioner since the late 1980s, most reports associated with underground storage tank ("UST") removals at these facilities include statements that attributed to Petitioner responsibility for petroleum hydrocarbons found in groundwater without evidence supporting such attributions. Such interpretations wrongly resulted in the assignment of responsibility for potential groundwater contamination to Petitioner. Responsible government agencies, including the Regional Board, have not attempted to determine actual responsibility for off-site groundwater contamination. These unilateral, self-serving attributions of contamination to historic operations at the Site apparently perpetuated the general belief that Petitioner is responsible for all local groundwater contamination. The result was that requirements for on-site specific investigation or remediation at these off-site UST locations were limited. Additionally, due to the long history of petroleum storage in the area, the operation of USTs at these off-site small industrial sites included single-wall USTs with limited monitoring, increasing the potential for leaks.

In particular, reports on the following facilities indicate impact to the subsurface or undocumented potential sources within an area previously assigned to a plume originating from the Site:

- Former ChemCentral Corporation, 13900 Carmenita Road, Santa Fe Springs, located immediately south of the STF and railroad. At this site, soil contamination under former gasoline and diesel USTs in the eastern part of the site may not have been fully characterized in

an area without any semi-perched groundwater; the western part of the site contained eighty-eight USTs and three ASTs in an area of semi-perched groundwater. Some of these USTs contained chlorinated VOCs and also compounds such as toluene that are common components of gasoline and diesel. Subsurface contamination under these USTs has been documented but not fully delineated, and an SVE system operated at the site for several years;

- Principal Capital Management, 13827 Carmenita Road, Santa Fe Springs. Reports indicate the presence of hydrocarbons in soil under former USTs and the presence of hydrocarbons in groundwater;
- Aggreko Corp, 13230 Cambridge Road. Reports indicate the presence of a former waste oil UST, but no specific investigation information. Semi-perched well B-13 at the southern edge of the site contains LNAPL;
- Bear State Air Conditioning Services, 13139 Rosecrans Avenue, Santa Fe Springs. Contamination from USTs was documented to extend vertically to the semi-perched groundwater. After continuing the vertical excavation of contaminated soil, a free-product sample from the excavation and a sample from a well north of the Bear State site were collected and analyzed. The laboratory reported that the samples consisted of a product similar to aviation gas, but hydrocarbons were noted to contain high concentrations of aromatic compounds. SGI noted that the presence of high concentrations of aromatics in the LNAPL sample precludes the likelihood that the product migrated from the Site, located more than 2,000 feet from this property. Despite evidence of contamination extending to groundwater and the presence of aromatics, the site was closed;
- Century Refrigeration, 14010 Maryton Avenue, Santa Fe Springs. At this site, a gasoline UST was reported, some soil samples were collected and the site was closed;
- Certified Fasteners, 14107 Dinard Street/14106 Maryton Avenue, Santa Fe Springs. A UST was removed on October 12, 1988. Three soil samples were taken, two from the bottom of the UST and one 2 feet bgs below the dispenser. The highest TPH concentration was 5,190 mg/kg (SP-1) under the west end of the UST excavation. Further soil sampling around the walls of the dispenser excavation at 6 and 7 feet bgs encountered detections below 100 mg/kg. Closure was

granted 8 years later in 1996. No groundwater was encountered during UST excavation to 12 bgs.

In addition to the potential source areas listed on Table 3 and in Appendix A of the GMPR, petroleum product pipelines are known to exist under Carmenita Road, Rosecrans Avenue, and Shoemaker Avenue, providing additional, unexplored or unreported sources of potential contamination (GMPR, Figure 12).

Many of the wells installed by Petitioner as part of early investigations associated with the Site were installed prior to a wider understanding of typical migration of LNAPL and dissolved plumes from petroleum release sites. These early investigations were apparently developed under the premise that LNAPL and dissolved phase petroleum plumes had likely traveled miles away and downgradient from the Site. For example, the installation of well PO-7, located 7,400 feet (1.4 miles) southwest of the Site through an industrial neighborhood, reflects the limited understanding of hydrocarbon contamination behavior in the 1980s. As reported later, for example, in 1998 as part of the study known as the Lawrence Livermore Study (Rice et al., CA LUFT Historical Case Analysis), groundwater-contaminated benzene plumes at ninety percent (90%) of the studied 217 sites extended to 255 feet or less, and the median plume length was 101 feet. These reported typical dissolved plume lengths are in stark contrast with the 1980s investigation pattern by Petitioner which included the installation and testing of eight wells located more than 2,000 feet from the Site. The net result of the installation and sampling of groundwater monitoring wells thousands of feet from the Site was that Petitioner has been monitoring the off-site occurrence of hydrocarbons that originated from a multitude of potential sources, all of which have not been fully delineated.

As mentioned above, the presence of the semi-perched zone at the Site is essentially limited to the southeast boundary of the Site. The primary and secondary sources of contamination have been removed, and remediation (including barrier wells, automated LNAPL removal systems, hand bailing, vapor extraction, and Carmenita sump product and groundwater extraction) is actively reducing the remaining hydrocarbon mass in source zone soils and groundwater and restricting off-site migration of LNAPL. These remediation efforts have been reported under a fixed schedule to the RWQCB since the 1990s without notices of non-compliance form the RWQCB.

The observation of potential sources and characteristics of the reported subsurface contamination south and southwest of the Site indicates that the extent of downgradient contamination in groundwater, reported previously as a large single plume originating from the Site, did not take into account the impact to groundwater from off-site sources south of the Site. The semi-perched zone has been shown to consist of mostly fine-grain material and discontinuous layers. This setting is not conducive to lateral migration of LNAPL hundreds to thousands of feet.

Multiple known or suspected hydrocarbon sources (e.g., leaking USTs and/or pipelines) have been documented to exist downgradient from the Site, located from several hundred to two thousand feet south and southwest of the Site. As discussed above, the contribution of these off-site hydrocarbon releases has resulted in the gross over-estimation of the actual downgradient, lateral extent of the LNAPL extending from the Site. Detailed investigations in 1991 and recent fingerprinting indicate multiple off-site sources of LNAPL southwest of the Site.

As illustrated on Figure 11 of the GMPR, the LNAPL found in the semi-perched zone south of the Site represents three distinct plumes:

- The on- and off-site STF plume, as found along the STF's southern edge, where Petitioner is actively conducting groundwater remediation on multiple wells, including barrier wells and SVE.
- An off-site area of LNAPL extending from Cambridge Court near well B-13 to Maryton Avenue near well MYTNN. This product is distinct from the STF plume in fingerprinting characteristics and did not originate at the STF. It also did not originate at the MA, which does not have a semi-perched zone. Moreover, well B-10, located at the northern edge of the semi-perched hydrogeologic unit, does not contain LNAPL. It is unlikely that the degraded gasoline/diesel mixture was released from the former waste oil tank located at 13230 Cambridge Court. Although undefined, it is possible that the source of the Cambridge/Maryton LNAPL is the network of pipelines in the vicinity of the Carmenita/railroad intersection area, possibly with contribution from the 13827 Carmenita former diesel USTs and the ChemCentral facility at 13900 Carmenita Road.
- An off-site area of LNAPL with distinct fingerprint characteristics in the area of the

Rosecrans/Maryton/Dinard intersection. Gasoline releases to the subsurface were documented at the 13139 Rosecrans Avenue site, and two facilities just north of this site, which also contained gasoline USTs, had only limited sampling conducted. This LNAPL is found at a lateral distance of more than 2,000 feet from the Site, a distance exceeding any expected migration of LNAPL over such a distance in a fine grain, shallow zone of discontinuous lithology.

Groundwater under the Site and off-site has been monitored by Petitioner on a semi-annual basis for more than thirty (30) years. The extent of LNAPL in the semi-perched zone wells was most recently documented in a Semi-Annual Groundwater Monitoring Report for January through June 2014 (GWRC, June 23, 2014).

2. Regional Board Meeting (June 2012)

On June 12, 2012, representatives of the Regional Board and Petitioner met to discuss requirements for the Site. Petitioner presented forensic evidence that the LNAPL originating from the Site does not extend more than hundreds of feet downgradient (southwest) from the Site. Petitioner disputed that LNAPL originating at the Site extends approximately 3,000 feet southwest from the Site. The Regional Board issued a written report summarizing the discussion of the meeting.

3. Regional Board Response (July 2013)

On July 30, 2013, the Regional Board issued a written response to the GMPR Report dated March 12, 2013. The Regional Board continued to maintain that the LNAPL in the semi-perched groundwater extends 3,000 feet southwest of the Site beyond Rosecrans Blvd. The Regional Board noted that Petitioner monitors 133 groundwater wells and samples 11 Artesia Aquifer wells semi-annually for total petroleum hydrocarbons, oxygenates and volatile organic compounds semi-annually. The Regional Board stated that the continuing presence of LNAPL and very high concentrations of dissolved phase after several decades suggest that even a potentially stable plume may require active cleanup inasmuch as the California Department of Public Health maximum contaminant levels ("MCLs") for benzene and MTBE are 1 microgram per liter (µg/L) and 13 µg/L, respectively. The Regional Board concluded that: (a) the results of chemical fingerprinting, combined with the operational and regulatory history of the Site, support the conclusion that the Site is the source of a

3,000-foot long off-site LNAPL plume in the semi-perched groundwater; (b) the current groundwater monitoring program is inadequate in addressing LNAPL and a dissolved phase groundwater plume in the semi-perched groundwater and Artesia Aquifer; and (c) the modifications proposed by SGI are incomplete and not acceptable.

4. Petitioner Response (September/October 2013)

On September 12, 2013, Petitioner issued a letter report responding to the Regional Board's letter dated July 30, 2013, and SGI provided specific response to twenty-eight (28) comments made by the Regional Board. In the September 2012 letters, Petitioner and SGI provided additional technical information that strongly supports Petitioner's position that the distant, off-site LNAPL did not originate from the Site, but likely originated from multiple off-site sources. The RWQCB did not provide technical responses to these 28 comments. Petitioner continues to disagree with the Regional Board's assertion that a 3,000-foot LNAPL plume in semi-perched groundwater originated from the Site.

On October 7, 2013, SGI issued a Revised GMPR. Figure 1 indicates those Artesia Aquifer wells that Petitioner proposes to be included in a revised groundwater monitoring program. Figure 2 indicates those Semi-Perched wells that Petitioner proposes to be included in a revised groundwater monitoring program. SGI proposed to implement the monitoring program in Q1 2014.

The Regional Board did not respond to specifics of the September 12, 2013 letter or the Revised GMPR prior to issuing the Order on June 26, 2014.

D. Soil Vapor Assessment

On June 21, 2012, the Regional Board issued a requirement for soil vapor assessment pursuant to the CAO.

On or about August 15, 2012, Petitioner submitted an Off-Site Soil Vapor Workpan prepared by SGI. SGI reiterated its conclusion that the source of the LNAPL in semi-perched groundwater resulted from off-site releases of fuel for which Petitioner is not responsible. SGI proposed to collect soil gas samples from five (5) locations in the residential area southwest of the WTF and one (1) on-site location.

On October 12, 2012, the Regional Board issued a letter conditionally approving portions of

the Workplan, but directing Petitioner to submit a supplemental work plan to assess the nature and extent of hydrocarbon soil vapor in the residential neighborhood approximately 2,600 feet southwest of the Site near well PO-16 located on the southwest corner of Fidel Avenue and Liggett Street in the City of Norwalk.

On January 13, 2013, Petitioner submitted to the Regional Board a transmittal letter and Vapor Survey Work Plan prepared by SGI dated January 13, 2013. The Work Plan proposed to collect soil gas samples from six (6) locations in the residential area near well PO-16.

On June 14, 2013, the Regional Board issued a letter approving the Work Plan, but requiring collection of soil gas samples from an additional nine (9) locations from 5-foot, 10-foot and 15-foot depths.

On July 9, 2013, SGI submitted a Revised Soil Vapor Investigation Work Plan. The Work Plan proposed to collect soil gas samples from eleven (11) locations at a depth of five (5) feet bgs. Justifications for the proposed sampling locations are set forth in Table 1 of the Revised Work Plan.

On July 23, 2013, the Regional Board issued a letter approving the Revised Work Plan, but requiring collection of soil gas samples from 5-foot, 10-foot and 15-foot depths.

On August 20-21, 2013, SGI installed temporary soil vapor probes and collected soil gas samples from eleven (11) locations at 5-foot, 10-foot and 15-foot depths beneath streets and sidewalks in a widespread area within the City of Santa Fe Springs and City of Norwalk. RWQCB staff observed and approved the field sampling activities. Benzene was detected in only one (1) location (RF-7) located in a commercial, non-residential area along Dinard Avenue in the City of Santa Fe Springs in samples collected from 5-foot, 10-foot and 15-foot depths at concentrations of .72 µg/L, .91 µg/L and 1.14 µg/L, respectively. The concentration of oxygen in the 5-foot sample was 12.5 percent (%) suggesting a condition favorable to natural attenuation of hydrocarbons in the subsurface. SGI used the Johnson and Edinger model for subsurface vapor intrusion to estimate potential human health risk due to benzene and ethylbenzene detected in soil vapor probe location RF-7. The excess cancer risk was calculated to be equal to or slightly greater than one-in-one million. SGI concluded that benzene and ethylbenzene concentrations measured at location RF-7 do not pose a significant human health risk to indoor commercial/industrial worker receptors. The

results of the soil vapor survey were reported in a Soil Vapor Survey Report prepared by SGI dated September 18, 2013.

The Order requires that Petitioner conduct a second round of soil vapor sampling at or near the eleven (11) locations previously sampled in August 2013. The Order states that the second round of sampling is required to confirm the results of previous sampling to evaluate any threat to human health from vapor intrusion. The Regional Board has not provided any reason why it would expect a second round of sampling to produce results different from those that previously demonstrated the absence of any risk to human health from vapor intrusion. Contrary to the finding in paragraph 15 of the Order, Petitioner contends the burden, including cost estimated to be $20,000, does not bear a reasonable relationship to the need for the work.

E. Legal Standard

Water Code Section 13267(b)(1) provides: "In conducting an investigation specified in subsection (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging,...shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports. Water Code Section 13267(e) provides: "As used in this section, "evidence" means any relevant evidence on which responsible persons are accustomed to rely in the conduct of serious affairs, regardless of the existence of any common law or statutory rule which might make improper the admission of the evidence over objection in a civil action."

VIII. THE PETITION HAS BEEN SENT TO THE REGIONAL BOARD AND OTHER INTERESTED PARTIES

A copy of this Petition has been sent by email to the following interested parties:

- Samuel Unger, PE, Executive Officer (sunger@waterboards.ca.gov)
- Arthur Heath, Section Chief (aheath@waterboards.ca.gov)

- Adnan Siddiqui, Project Manager (asiddiqui@waterboards.ca.gov)
- Bradley W. Rogers, PE, Chevron Environmental Management Company (brodgers@chevron.com)

IX. THE ISSUES RAISED IN THE PETITION WERE PRESENTED TO THE REGIONAL BOARD BEFORE THE REGIONAL BOARD ACTED

On or about September 19, 2011, the Regional Board requested that Petitioner submit a groundwater monitoring program review[2].

On March 12, 2012, SGI submitted a GMPR to the Regional Board.[3] The GMPR presents a summary of previous remediation and groundwater monitoring data, provides an evaluation of the current network of monitoring wells and monitoring program, identifies documented and potential off-site sources of LNAPL and presents recommendations for future groundwater monitoring.

On June 12, 2012, representatives of Petitioner and SGI met with Regional Board staff to discuss remaining work to be performed under the CAO. The Regional Board expressed the need for, *inter alia*, off-site soil vapor data, particularly in the vicinity of a 2,600-foot plume in the semi-perched groundwater zone. Petitioner argued it is not responsible for the entirety of the LNAPL present on shallow groundwater in a residential neighborhood south of Rosecrans Avenue. Regional Board staff acknowledged that they had not reviewed the GMPR or evaluated potential off-site sources of LNAPL.[4]

On June 21, 2012, the Regional Board issued Requirements for Soil Vapor Assessment Pursuant to CAO.[5]

In August 2012, SGI issued an Off-Site Soil Vapor Survey Workplan.[6]

---

[2] A copy of the Regional Board email dated September 19, 2011 is submitted as Exhibit "1."

[3] A copy of the GMPR dated March 12, 2012 is submitted as Exhibit "2."

[4] A copy of a meeting summary issued by Regional Board staff on June 12, 2012 is submitted as Exhibit "3."

[5] A copy of the Regional Board letter dated June 21, 2012 is submitted as Exhibit "4."

[6] A copy of SGI's Work Plan dated August 2012 is submitted as Exhibit "5."

On October 12, 2012, the Regional Board issued a letter conditionally approving the Workplan, but directing Petitioner to submit a supplemental work plan for a soil vapor survey addressing the nature and extent of a soil vapor plume and vapor intrusion risks in the residential neighborhood southwest of the Site in the City of Norwalk nearby well PO-16.[7]

On January 21, 2013, Petitioner submitted a transmittal letter and a Vapor Survey Work Plan prepared by SGI.[8]

On June 14, 2013, the Regional Board issued a letter in response to SGI's Vapor Survey Work Plan.[9]

On July 9, 2013, SGI issued a Revised Soil Vapor Investigation Work Plan.[10]

On July 23, 2013, the Regional Board issued a letter conditionally approving the Revised Work Plan.[11]

On July 30, 2013, the Regional Board issued a letter in response to SGI's Ground Water Monitoring Program Review dated March 2013.[12]

On September 12, 2013, Petitioner issued a letter in response to the Regional Board's letter dated July 30, 2013, and submitted Comments to: Response to Groundwater Program Review prepared by SGI dated September 6, 2013.[13]

On September 18, 2013, SGI issued a Soil Vapor Survey Report documenting the soil gas

---

[7] A copy of the Regional Board letter dated October 12, 2012 is attached as Exhibit "6."

[8] A copy of Petitioner's letter and SGI's Vapor Survey Work Plan dated January 21, 2013 are submitted as Exhibit "7."

[9] A copy of the Regional Board letter dated June 14, 2013 is submitted as Exhibit "8."

[10] A copy of SGI's Revised Soil Vapor Investigation Work Plan dated July 9, 2013 is submitted as Exhibit "9."

[11] A copy of the Regional Board letter dated July 23, 2013 is submitted as Exhibit "10."

[12] A copy of the Regional Board letter dated July 30, 2013 is submitted as Exhibit "11."

[13] A copy of Petitioner's letter dated September 12, 2013 and SGI's Comments dated September 6, 2013 are submitted as Exhibit "12."

testing witnessed by the RWQCB staff.[14]

On October 7, 2013, SGI issued a Revised Groundwater Monitoring Review.[15]

On June 23, 2014, Petitioner issued a Semi-Anual Groundwater Monitoring Report (January – July 2014).[16]

On June 26, 2014, the Regional Board issued Order No. R4-2013-0116.[17]

X. CONCLUSION

For the foregoing reasons, Petitioner respectfully requests that the State Board grant a stay and set aside the Regional Board action. Petitioner has faithfully complied with Regional Board requirements under the CAO. Petitioner's willingness to cooperate should not be the basis for the Regional Board to require investigation, evaluation and remediation of off-site contamination in the vicinity of but not originating from the Site. Instead, the Regional Board should identify and issue directives to third parties that caused the off-site LNAPL condition.

DATED: July 25, 2014

LAW OFFICES OF MARK B. GILMARTIN

By: _____
Mark B. Gilmartin
Attorney for Petitioner
Golden West Refining Company

[14] A copy of SGI's Soil Vapor Survey Report dated September 18, 2013 is submitted as Exhibit "13."

[15] A copy of SGI's Revised Groundwater Monitoring Program Review dated October 7, 2013 is submitted as Exhibit "14."

[16] A copy of a Semi-Annual Groundwater Monitoring Report dated June 23, 2014 is submitted as Exhibit "15."

[17] A copy of Regional Board Order No. R4-2013-0116 dated June 26, 2014 is submitted as Exhibit "16."

DECLARATION OF MARK B. GILMARTIN

I, Mark B. Gilmartin, declare and state as follows:

1. I am an attorney licensed to practice law in the State of California. I am counsel for Petitioner Golden West Refining Company ("Petitioner") with regard to Order No. R4-2013-0116 ("Order") issued by the Regional Water Quality Control Board, Los Angeles Region ("Regional Board") pursuant to Water Code Section 13267 requiring technical reports for the former Golden West Refinery, 13539 E. Foster Road, Santa Fe Springs, CA ("Site").

2. I make this declaration in support of Petitioner's request for stay of the Regional Board's Order directing Petitioner to: (a) submit a work plan to conduct subsurface investigation and install additional groundwater wells to address gaps in available data in defining the extent of the on-site and off-site light non-aqueous phase liquid ("LNAPL") and dissolved phase plumes in the semi-perched groundwater and Artesia Aquifer; (b) submit a revised and comprehensive groundwater sampling and monitoring program for LNAPL and a dissolved phase groundwater plume in the semi-perched groundwater and Artesia Aquifer, both on-site and off-site covering the entire plume, addressing concentrations of contaminants dissolved in groundwater and geochemical parameters to monitor natural attenuation; and (c) conduct a second round of soil vapor samples to evaluate potential for vapor intrusion at eleven off-site locations southwest of the Site.

3. The facts set forth herein are personally known to me. If called as a witness, I could and would testify thereto under oath.

4. There will be substantial harm to Petitioner if a stay is not granted. There is substantial evidence that Petitioner did not cause a 3,000-foot plume of LNAPL existing at approximately twenty (20) feet below ground surface ("bgs") on the shallow semi-perched groundwater southwest of the Site in a residential/commercial area in the City of Santa Fe Springs and City of Norwalk. Petitioner will incur substantial costs and potential liability if it is required to conduct a second soil vapor survey and evaluate and report the results of the soil vapor survey. The estimated cost to conduct a second round of soil gas sampling and reporting is $20,000. The estimated cost to install and monitor an unspecified number of groundwater monitoring wells is unknown.

5. There is a serious risk that by conducting the required work, owners of commercial and residential property in the vicinity of the investigation area will be misled to believe that Petitioner caused the LNAPL and/or created a potential human health risk when in fact the evidence presented to the Regional Board indicates that the source did not originate from the Site.

6. There will not be any substantial harm to other interested persons or to the public interest if a stay is granted. The Regional Board has the ability to require potentially responsible parties to conduct the required investigation under the authority of Water Code § 13267. The Regional Board has declined to require third parties to investigate releases that caused off-site LNAPL and has instead required that Petitioner assume full responsibility for assessing and monitoring the off-site LNAPL.

7. There are substantial questions of fact or law regarding the disputed action. The information provided by Petitioner to the Regional Board demonstrates that off-site LNAPL did not originate from the Site. There is no evidence to the contrary.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed this 25th day of July, 2014 at Santa Monica, California.

By _____
MARK B. GILMARTIN

EXHIBIT 1

Simon Tregurtha

From: Adnan Siddiqui <asiddiqui@waterboards.ca.gov>
Sent: Monday, September 19, 2011 2:40 PM
To: Simon Tregurtha
Cc: Chris Panaitescu; Arthur Heath
Subject: Request for well destruction

Hi Mr. Tregurtha,
I am sending this e-mail to you in regards to the Golden West Refining Company (GWRC) request dated August 29, 2011 and my telephone call to you on September 13, 2011.

I received the request from Golden West Refining Company (GWRC) dated August 29, 2011 to destroy 6 groundwater monitoring wells located on and off site of GWRC site in Santa Fe Springs. Four groundwater monitoring wells P-10, PO-5, PO-7 and PO-12 are screened in the upper Semiperched Aquifer. Two wells A-29 and A-56A are screened in lower Artesia Aquifer. Figures and data tables are also provided. Figure 1 shows locations of wells related to the groundwater contamination at the GWRC site (all on and off site well) with six aforementioned wells circled. Figure 2 is groundwater elevation contour map of Semiperched Aquifer and Figure 3 is groundwater elevation contour map of Artesia Aquifer. Table 1 provides a summary of water level gauging and analytical data from the most recent event of march 2011. Table 2 presents the summary of historical water level gauging and analytical data.
GWRC provides the following justification for its request for well destruction:

1) The 6 wells are not part of the current semi annual groundwater monitoring program,
2) No free product (NAPL) was ever detected in any of the 6 wells, and
3) There are wells other located close to the 6 wells which are also screened in the same water bearing zone as the 6 wells.

Upon my review I realized that GWRC did not provide a technical rationale to justify their request nor they provided enough information for me to perform the evaluation. A proper evaluation would require information such as the groundwater elevation and gradient, analytical data from the 6 wells as well as surrounding wells, location with respect to the source areas, etc.

There is no analytical data provided for wells A-29, A-56A, P-10, PO-5, PO-7 and PO-12. There is only gauging data and that is not good enough. The rationale provided to destroy the wells is because they are not included in the current semiannual monitoring program. But there are 11 wells are sampled for analyses only in Artesia Aquifer and no Semiperched well is sampled. There is no analytical data from theses wells to determine the water quality so that an evaluation can be made of their usefulness.

There may not be any free product present but the wells can be used to monitor dissolved phase plume. But there is no data provided.

The statement that there are other wells located nearby screened within the same Aquifer is a very general statement. Additional data and evaluation needs to be provided. The horizontal scale on the Figures is 1 inch = ~600 feet.
I also have concern that only 11 wells selected wells are monitored on a semi annual basis. I do not know what criteria is used for the selection of these wells. For example, I noticed that some well that showed high concentrations of benzene in the past were stopped being monitored and some are already abandoned (destroyed?). You told me that GWRC secured approvals for groundwater monitoring reduction and or abandoning a well and I am sure you did. However, I am also concerned that no groundwater monitoring is taking place in the Semiperched Aquifer for the dissolved phase plume. I absolutely disagree with your assertion that no action and monitoring is necessary until the LNAPL is completely removed from the Aquifer. As I have mentioned before, the dissolved phase plume is separate issue from the LNAPL plume and must be delineated and probably remediated simultaneously with LNAPL recovery.

You told me that GWRC is conducting activities that were required by the Regional Board, basically that you are in compliance with the Cleanup and Abatement Order. Therefore unless the existing order is modified, GWRC will continue

to conduct only current work. I understand your position but I also strongly believe that additional work such as delineation of dissolved plume, monitoring and active remediation of dissolved plume in Semiperched and Artesia Aquifer is warranted. As soon I complete the tasks at hand, I will review the information contained in the file and provide my recommendation to the Regional Board management.
Based on my preliminary review and reasons I mentioned earlier in this e-mail, I am unable to approve your August 29, 2011 request for destruction of six wells at this time. I am looking forward for cooperation from you and GWRC management to move this site forward towards a no further action status. Thanks.
Adnan

Adnan Siddiqui, P.G., C.HG.
Senior Engineering Geologist

Phone: (213) 576-6812
Fax: (213)576-6717

EXHIBIT 2

SGI environmental THE SOURCE GROUP, INC.

March 12, 2012

Mr. Adnan Siddiqui
Los Angeles Regional Water Quality Control Board
320 W. 4th Street, Suite 200
Los Angeles, CA 90013

Subject: Golden West Refining Company:
Groundwater Monitoring Program Review

Dear Mr. Siddiqui,

In response to your email/letter to the Golden West Refining Company (GWRC) dated September 19, 2011, The Source Group, Inc. (SGI) prepared and submits on behalf of GWRC the attached Groundwater Monitoring Program Review (GMPR). The GMPR presents a detailed review of the groundwater conditions within and offsite of the former GWRC boundaries, and provides conclusions and recommendations with respect to the future groundwater monitoring and responsibility allocation. The attached GMPR should also be considered as an update of the following two reports previously submitted to and approved by the LARWQCB: *Groundwater Program Review* prepared by Kennedy/Jenks Consultants on January 27, 1999, and *Fate and Transport Modeling* prepared by TRC in September 2002.

As part of our evaluation of the groundwater data, we reviewed previous reports describing the presence of Light Non Aqueous Phase Liquids (LNAPLs) in the Semi-Perched groundwater zone south of the former GWRC site. SGI also collected LNAPL samples from off-site wells and submitted them for fingerprinting analyses which was performed by Zymax Forensics. Based on site conditions, previous site reports, recognized typical LNAPL migration patterns, and the fingerprinting results, the LNAPL found off-site in the Semi-Perched groundwater zone consists of three distinct product types representing separate releases from different sources (responsible parties).

1962 Freeman Avenue
Signal Hill, California 90755

Telephone: (562) 597-1055
Facsimile: (562) 597-1070

The attached report presents a revised groundwater monitoring program for the Semi-Perched groundwater zone that takes these findings into account and it also presents a proposed updated groundwater monitoring program for the Artesia groundwater zone.

If you have any questions, please contact Mr. Chris Panaitescu at GWRC at (562) 921-3581, ext 390; or myself at (562) 597-1055, ext 106.

Sincerely,

Paul Parmentier, P.G. # 3915
Principal Hydrogeologist
The Source Group, Inc.

Cc. Arthur Heath, LARWQCB (No attachment)
Moshe Sassover, GWRC (No attachment)
Chris Panaitescu, GWRC
Neil Irish, SGI

GROUNDWATER MONITORING PROGRAM REVIEW

Former Golden West Refinery
Santa Fe Springs, California

04-GWRC

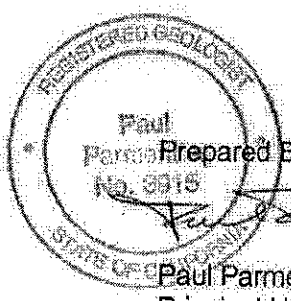
Prepared For:

Golden West Refining Company
13116 Imperial Hwy
Santa Fe Springs, CA 90670

Prepared By:

SGI environmental THE SOURCE GROUP, INC.
1962 Freeman Avenue
Signal Hill, CA 90755

March 2012



Prepared By:

Paul Parmentier
Principal Hydrogeologist

Reviewed By:

Neil Irish
Principal Geologist

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

From 1997 to 2010, the former Golden West Refinery (Refinery or Site) located in Santa Fe Springs, CA was dismantled and redeveloped into commercial and light industrial facilities. Following multiple investigations and remediation activities required by and reported to the Los Angeles Regional Water Quality Control Board (LARWQCB), successive portions of the Refinery were redeveloped and additional in-situ remediation and monitoring are on-going. On behalf of the Golden West Refining Company (GWRC), The Source Group, Inc. (SGI) conducted a review of the historical and current groundwater monitoring program.

This report presents a summary of previous remediation and monitoring data, provides an evaluation of the current network of monitoring wells and monitoring program, identifies documented and potential off-site sources and presents recommendations for future groundwater monitoring.

Contamination under the Refinery was previously documented in multiple site investigation reports and post-remediation sampling reports. Current groundwater conditions are monitored through a network of 136 groundwater wells, including 94 on-site wells and 42 off-site wells, located up to 7,400 feet from the southern boundary of the Refinery property. In association with the redevelopment of the Refinery, all primary sources of contamination were removed. Secondary sources including shallow contaminated soil throughout the Site have been removed, and on-going remediation includes LNAPL removal and soil vapor extraction.

The Refinery is underlain by two groundwater zones, including a laterally limited, shallow Semi-Perched groundwater zone in the southern part of the Refinery that extends off-site to the southwest, and the deeper Artesia groundwater zone. The groundwater gradient direction in the Semi-Perched groundwater zone is to the southwest, while the general gradient direction in the Artesia groundwater zone is to the east.

Multiple known or suspected hydrocarbon sources (e.g., leaking USTs) are noted at several properties southwest off-site from the Refinery, located from several hundred feet to 2,000 feet to the south and southwest of the Refinery. Documentation of these off-site sources is provided as an appendix in this report. The presence of these off-site hydrocarbons near these offsite sources has resulted in the gross over-estimation of the actual downgradient edge of the GWRC hydrocarbon plume.

Previous reports identified distinct product types in off-site Semi-Perched wells. In February 2012, SGI collected LNAPL samples from accessible wells southwest of the refinery containing LNAPL, and submitted the samples to Zymax Laboratories for fingerprinting. The fingerprinting reports confirm that the characteristics of LNAPL in off-site wells are distinctly different from the LNAPL found at the GWRC South Tank Farm.

Groundwater has been monitored in on-Site and off-Site wells since the 1980's. This monitoring has focused on well gauging and the sampling of selected wells within the Refinery and four

sentinel wells located downgradient from the Refinery. As shown in this report, based on previous studies of natural attenuation and modeling of groundwater at the Site and the accumulated monitoring data, the Artesia zone groundwater contamination originating from the Refinery is both well defined laterally, and is stable.

This report presents evidence that the presence of LNAPL in the Semi-Perched groundwater zone southwest of the refinery can be attributed to other sources. This report presents the recommendation for the Semi-Perched groundwater that GWRC focus monitoring on wells located within 1,000 feet from the edge of the Refinery, and an updated groundwater monitoring program for the Artesia and Semi-Perched groundwater zones is proposed.

1.0 INTRODUCTION

From 1997 to 2010, the former Golden West Refinery (Refinery or Site) located in Santa Fe Springs, CA (**Figure 1**) was dismantled and redeveloped into commercial and light industrial facilities. Following multiple investigations and remediation activities required by and reported to the Los Angeles Regional Water Quality Control Board (LARWQCB), successive portions of the Refinery were redeveloped and additional in-situ remediation and monitoring (**Figures 2 and 3**) are on-going. On behalf of the Golden West Refining Company (GWRC), The Source Group, Inc. (SGI) conducted a review of the historical and current groundwater monitoring program.

The investigation and remediation of the Refinery have been conducted under the oversight of the Los Angeles Regional Water Quality Control Board (RWQCB), and current groundwater monitoring is conducted in compliance with Cleanup and Abatement Order (CAO) R4-2004-0020.

This report's objectives are to review the groundwater monitoring program conducted to date at the Refinery as a component of Site remediation and to provide recommendations for continued groundwater monitoring.

1.1 Site Background

The former Golden West Refinery property is located in the city of Santa Fe Springs, California, near crude oil-producing fields, but no oil and gas drilling activities are reported to have occurred on this site. In 1925, Wilshire Oil Company ("Wilshire") purchased the Refinery Property and built storage facilities with more than seven (7) million barrels capacity. In 1936, Wilshire constructed an oil refinery located east of Carmenita Road and north of East Foster Road, where gasoline and other finished petroleum products were manufactured. In 1960, Gulf Oil Corporation ("Gulf) purchased the Refinery Property from Wilshire. Gulf refined crude oil into finished gasoline, heavy fuel oils, diesel fuel and asphalt. In 1983, GWRC purchased the Refinery Property from Gulf. GWRC operated the refinery process unit until February 1992, when crude oil processing operations were suspended. Only fuel transport operations were conducted by GWRC at the Refinery Property from February 1992 to August 1997, when all petroleum storage operations ceased (GWRC, 2011a). The refinery facility was formerly divided into four areas (**Figures 2 and 3**) which included:

- Process Unit Area (PUA);
- West Tank Farm (WTF);
- South Tank Farm (STF); and
- Marketing Area (MA).

The former PUA, located in the northeastern part of the former refinery property, was utilized as the main processing area. The former STF and WTF areas were used for storage and blending of crude oil, intermediate products, and finished products. These finished products were then loaded and distributed in the MA.

Starting in 1997, the WTF, STF, PUA, and MA were successively dismantled and redeveloped into light manufacturing industrial and commercial warehouse facilities. During each phase of site redevelopment, all primary potential contaminant sources (storage tanks, piping, processing units, etc) were removed, along with secondary sources of contamination (impacted shallow soils). These remediation tasks were conducted under oversight of the RWQCB and Santa Fe Springs Fire Department.

1.2 Site Geology and Hydrogeology

The geology, lithology and hydrogeology of the Site have been documented through multiple phases of site investigations that have included soil borings, cone penetrometer testing (CPT) soundings, well installations, vertical groundwater contamination assessments, aquifer tests, groundwater modeling, and evaluation of natural attenuation. A significant network of monitoring wells, composed of over 130 wells, exists at the site and extends off-site, as listed in Table 1 and illustrated on **Figures 2 and 3**.

1.2.1 Lithology

The subsurface lithology at the Site has been investigated since 1986 (TriHydro 1986) and detailed in multiple reports.

Figures 4, 5A and 5B present lithologic cross-sections through the former Refinery and illustrate the lithologic conditions that create the two hydrogeologic units as described in the following sections.

1.2.2 Site Hydrogeology

Two shallow groundwater zones have been identified under the site. The uppermost water-bearing zone, the Semi-Perched zone, is found locally at depths ranging from 20 to 50 feet below ground surface (bgs) in the Bellflower Formation.

The laterally discontinuous Semi-Perched zone is unconfined and occurs both on and off GWRC property. The soils in this zone are composed of clay and silt, with lenticular sand and gravel layers. The sand and gravel layers are water saturated in some areas within and south of the GWRC property and these saturated sediments form the Semi-Perched zone. Where these lenticular sands and gravel layers are not underlain by less-permeable clay and silt layers, the Semi-Perched zone is absent (TriHydro, 1991).

The Semi-Perched zone exists in the southern part of the STF and extends off site to the southwest, with a general southwesterly gradient direction. Drilling in the northern part of the STF and at the MA did not encounter the Semi-Perched zone, providing confirmation of the limited northern lateral extent of that zone. The figures depicting groundwater information also display the interpreted outline of the Semi-Perched groundwater zone. Groundwater elevations and southwestern gradient in the Semi-perched zone measured during groundwater monitoring events conducted since the 1980's have been reported to be consistent, with a groundwater gradient to

the southwest and an average hydraulic gradient of approximately 0.005 ft/ft. A localized perched groundwater horizon has been noted near the eastern boundary of the WTF (well location P-6A).

The Semi-Perched groundwater zone is also locally influenced by the continuous groundwater extraction conducted by the City of Santa Fe Springs to maintain dewatering of the Carmenita Road Underpass. This dewatering-related groundwater extraction conducted since the early 1980's has been creating a constant sink in groundwater levels centered at the Carmenita/railroad intersection. All groundwater and occasional free phase hydrocarbons removed by City operations have been treated by GWRC at a treatment system located in the MA.

The Artesia Aquifer is found at a depth of approximately 65 to110 ft bgs under the Refinery and off-site. The Artesia Aquifer is the first groundwater encountered under most of the Refinery area. In the southern part of the site and off-site southwest of the refinery, the Artesia Aquifer occurs under the Semi-Perched zone and in these areas approximately 20-30 feet of unsaturated sediments underlie the low-permeable perching layer that forms the base of the Semi-Perched zone.

The Artesia Aquifer is composed of fluvial sediments of gravel, fine to coarse sand, and interbedded silt and clay. The lithology of the upper portion of the Artesia Aquifer, where most of the Artesia monitoring wells are completed, is irregular and reflects a complex sequence of interbedded and laterally discontinuous layers of sand, silt, and clay (TriHydro, 1991). Vertically, the Artesia aquifer extends to depths of at least 200 feet and consists of sand and gravel with localized fine grain layers.

Groundwater gradient and direction in the Artesia zone varies throughout the Site and surrounding areas with localized mounding, however, in general the groundwater flow has been reported to the east-northeast and southeast. Groundwater mounding occurs in the area of the intersection of Foster Road and Carmenita Road and has been consistently reported in groundwater monitoring reports since 1986. As depicted in the First Semi-Annual 2011 groundwater monitoring report (GWRC, 2011-Figure 5), the mounded groundwater occurs in an area approximately 1,000 feet in diameter and contains groundwater wells completed in the Artesia groundwater zone. The wells in the area exhibit groundwater at elevations approximately 10 feet higher than the piezometric surface in the surrounding Artesia groundwater zone; the cause of this mounding is unknown.

In 1990-1991, TriHydro conducted a series of extensive groundwater investigations including lithology investigation on-site and off-site by cone penetrometer testing (CPT) and aquifer testing in both the Semi-Perched zone and the Artesia aquifer. The CPT investigation included a 110-location lithology investigation south of the GWRC site. The investigation resulted in confirmation of the occurrence of the Semi-Perched groundwater in a sand/silty sand unit, underlain by a clay/silty clay perching layer. According to TriHydro's interpretation, the lateral extent of that Semi-Perched zone is limited areally for two principal reasons: (1) where the finer-grained deeper unit is not present, there is no longer any support for the overlying perched zone, and (2) where the permeable unit hosting the semi-perched layer pinches out between two lower-permeability units, the fluid cannot accumulate in the tighter pore spaces of these less permeable units and the zone disappears (TriHydro, 1991b).

Aquifer tests were also conducted by Tri-Hydro in 1991 in the Semi-Perched zone and Artesia aquifer. The aquifer testing in the Semi-Perched groundwater zone included the installation of test wells (TW) and observation wells (OW). Testing of the groundwater zone indicated a low calculated hydraulic conductivity of 3.5x10-04 cm/s to 1.7 x10-06 cm/s, and apparent heterogeneous contribution of groundwater from sand lenses in overall fine-grained clay or silt layers which are expected to retard fluid migration vertically and laterally.

The 1991 aquifer test of the Artesia aquifer demonstrated that the upper zone of that aquifer is stratified, non-continuous (TriHydro 1990-1991 - page 12), and non-homogeneous. Transmissivity values were found to range from 200 gpd/ft in the northwestern corner of the PUA, to 2,000 gpd/ft in the southwestern corner of the STF, to 20,000 gpd/ft in the eastern portion of the STF. The storage coefficient calculated from the testing indicated semi-confined aquifer conditions.

1.2.3 Groundwater Gradient

The monitoring data collected over a period of 25 years indicate consistent groundwater gradient magnitude and directions, as reported in historical quarterly and semi-annual groundwater monitoring reports.

Rose diagrams summarizing the direction of historical Semi-Perched and Artesia groundwater gradients for each part of the Refinery were developed and plotted on **Figure 6**. The rose diagrams document the consistency of the historical Semi-Perched groundwater gradient direction to the southwest and Artesia groundwater gradient direction to the northeast and east. This consistency provides a reliable basis for the development of a long-term groundwater monitoring program to be based on monitoring of target sentinel wells, as discussed in Section 3.

1.2.4 Water Supply Wells

During Refinery operations, three groundwater production wells that were operated to provide process water were sampled semi-annually until they were destroyed. The wells (WW-3, WW-7 and WW-8, Figure 2) were all screened at depths of over 200 feet below grade. The wells were all sampled semi-annually for BTEX and later for MtBE. All analyses for MtBE were reported as non-detectable. Except for two reports of detected concentrations at 7 µg/L, all 45 analyses starting in the late 1980s contained no detectable benzene concentrations. After Refinery operations ceased, the wells were no longer operated and subsequently destroyed between 1990 and 2002 with Los Angeles County Department of Health Services approval.

As listed on the on-line GIS Database of the Water Replenishment District (wrd.org) accessed in December 2011 by SGI, the nearest active water supply well is the Golden State Water Company well (WRD ID number 200257/18G5) located approximately one mile west of the Refinery, in an upgradient direction based on the Artesia zone groundwater gradient.

1.3 Site Remediation

1.3.1 Source Removal

During the redevelopment of the Refinery, source removal was conducted under RWQCB and other agencies' directives and oversight. These considerable source removal efforts included the dismantling and removal of all primary sources of contamination (tanks, pipelines, refining equipment, etc) and the excavation and removal of secondary sources (shallow contaminated soil).

In addition to multiple remediation activities conducted by GWRC since 1983, during the redevelopment project initiated in 1997, a total of 271,018 tons (180,679 cubic yards) of impacted soils were excavated and transported offsite to licensed soil disposal or recycling facilities between 1997 and 2006. The soil excavation was conducted as part of the remedial actions approved by the LARWQCB. According to remediation reports and waste manifests, the total of 271,018 tons of impacted soil removed as part of this action consisted of: 62,000 tons from the WTF; 125,090 tons from the PUA; 65,000 tons from the STF; and 18,928 tons from the MA (GWRC, 2011b).

1.3.2 On-Going Remediation

Areas of deeper residual soil contamination are currently under remediation in the WTF, PUA, STF, and MA. In addition, groundwater remediation and monitoring is also on-going throughout the site. As part of an agreement with the City of Santa Fe Springs, GWRC is also treating the groundwater pumped by the city from the Carmenita Road Underpass.

The combined remediation efforts have resulted in bringing the total hydrocarbon mass removed as of the end of the fourth quarter 2011 to 4,141,558 gallons (GWRC, 2011b). Remediation efforts have also removed and treated 9,511,200 gallons of semi-perched groundwater treated and discharged to the sanitary sewer. In addition, significant complementary remediation is also occurring where the soil vapor extraction systems are effectively enhancing the in-situ bioremediation of hydrocarbons in the subsurface. The remediation systems currently operating at the refinery are described in the following sections. Detailed system description and performance are reported in remediation progress reports by GWRC.

1.3.2.1 Process Unit Area Remediation

Following extensive removal and off-site disposal/treatment of shallow soil, two remediation systems currently operate within the PUA. The LNAPL groundwater remediation system extracts free-product from five groundwater wells (A-11A, A-62, A-71, A-72, and A-73). As of December 29, 2011, approximately 16,092 gallons of free product have been removed via the LNAPL system. The SVE system extracts vapor from a network of 93 SVE wells with individual underground conveyance piping connected to three manifold areas, and has removed a cumulative total of 127,607 gallons of vapor-phase hydrocarbons since the unit was started on August 13, 2007.

1.3.2.2 West Tank Farm Remediation

In the WTF, all contaminated shallow soils at the WTF were excavated and removed for off-site recycling during the Site redevelopment. Two areas of residual deep contamination are currently being treated by two SVE systems, each consisting of 3 SVE wells (50,681 gallons of hydrocarbons removed as of December 2011) and of 6 SVE wells (189,903 gallons of hydrocarbons removed as of December 2011). Free-product on groundwater is only found in two minor localized perched zones within the WTF, and hand bailing of hydrocarbons from selected wells located within these two areas is on-going.

1.3.2.3 South Tank Farm Remediation

Following extensive shallow soil removal and disposal or treatment, three remediation systems are operating within the STF. The LNAPL system was designed to extract free product from six groundwater wells and, based on the thickness of LNAPL periodically gauged in monitoring/remediation wells, the LNAPL extraction has been moved to other wells. As of Q4 2011, eleven wells were connected to the LNAPL system, which removed a cumulative total to 55,929 gallons. Free product removal activity is also conducted using manual hand bailing or portable pumps from wells where the appearance of free product is incidental, or wells located outside of the free product plume and for which the connection to the existing LNAPL system (s) is not feasible. The southern SVE system is connected to 36 SVE wells, and has removed 102,872 gallons of hydrocarbons since the unit was started in July 2004. The northern SVE system is connected to a network of 23 wells and has removed a cumulative total of 509,709 gallons since system start up in November 2006.

1.3.2.4 Marketing Area Remediation

In the MA, following extensive shallow soil removal and disposal or treatment, the SVE system installation was started in January 2008. A network of 95 SVE wells were installed and piped to the vicinity of the treatment compound located in the southeastern comer of the site. The SVE system has removed a cumulative total of 253,557 gallons of hydrocarbons. In the MA, ongoing free product removal (hand bailing) is being conducted at wells A-52, A-6R, A-8, A16R and A-17R as necessary.

Hand-bailing of free product is also conducted from off-site wells that contain measurable amounts of LNAPL, with bailing of LNAPL conducted by GWRC personnel at a frequency ranging from bi-weekly to quarterly.

In the southeastern part of the MA, GWRC operates a groundwater treatment system, that treats water pumped by the City of Santa Fe Springs from the Carmenita Road Underpass, as part of an agreement with the City of Santa Fe Springs. The water that is pumped to the system is treated and discharged to the LA County Sanitation District under an approved permit. The system treats an average water flow of approximately 2-3 gpm. Through the fourth quarter of 2011, the system had treated approximately 9,511,200 gallons of water pumped by the City.

1.3.2.5 Off-Site Remediation

Off-site well AO-14, screened in the Artesia groundwater zone and located south of the MA, is usually reported as the well containing the thickest layer of LNAPL, with an apparent thickness of approximately 4 to 10 feet. Free product is bailed from this well and other off-site wells containing LNAPL, and 3,658 gallons of free product have been removed to the fourth quarter of 2011 from off-site wells.

2.0 GROUNDWATER CONTAMINATION

2.1 Contaminant Distribution

2.1.1 Free Product

Groundwater under the Refinery and off-site has been impacted with petroleum hydrocarbons. The extent of LNAPL in the Semi-Perched zone wells, as documented in the June 2011 Monitoring Report (GWRC, 2011a), is illustrated on **Figure 7**, and the distribution of LNAPL in the Artesia aquifer is illustrated on **Figure 8**.

The effectiveness of previous and ongoing remedial efforts at the Site is reflected in the significant reduction in the occurrence of LNAPL in Site wells. In addition to the reduced thickness in wells, the monitoring data also indicate that the LNAPL plumes are stable and not migrating downgradient. Furthermore, the two on-site and the two off-site Artesia aquifer groundwater monitoring sentinel wells (A-38A, A-39A and AO-10 and AO-11) have remained LNAPL-free since their installation. Similarly, the most downgradient wells in the Semi-Perched groundwater zone (e.g., wells PO-5, PO-9, PO-12 and PO-14) have also remained LNAPL-free since their installation in the early 1990's.

2.1.2 Dissolved hydrocarbons

The extent of dissolved phase benzene in the Semi-Perched Zone was defined in the 2002 TRC evaluation of fate and transport for the Site (TRC, 2002) and found to extend around areas of known LNAPL.

The distribution of dissolved phase benzene and MtBE concentrations in the Artesia groundwater zone, as interpreted from historical investigation data and monitoring data, is presented on **Figure 9**. The downgradient extent of dissolved benzene is clearly defined to the east by downgradient wells A-38A, A-39A, AO-10 and AO-11. As delineated in the 2003 MtBE investigation (GWRC, 2003), two localized plumes of detectable MtBE concentrations have been identified in the Artesia groundwater zone: one plume is centered in the WTF near well A-21A and the second localized MtBE plume is present in the MA near well A-17R. The lateral extent of both plumes has been consistently defined by sampling and analysis of groundwater samples collected from wells located downgradient and east of each plume, and by sampling the four downgradient sentinel wells A-38A, A-39A, AO-10 and AO-11.

2.1.3 Emergent Chemicals Testing

In June 2003, GWRC responded to a RWQCB inquiry regarding emergent chemicals at the Refinery by preparing a technical report describing the occurrence of oxygenates and metals, including chromium, at the Site. In 2004, GWRC also completed a series of sampling and analyses events aimed at emergent chemicals testing, as required by the RWQCB on December 2, 2003. The sampling and analyses effort, as reported to RWQCB in 2004, indicated no concern

regarding the investigated constituents, except for the presence of MtBE in two areas of the Refinery (as described above in Section 2.1.2). The monitoring data of these plumes included in that 2003 report demonstrated that the two MtBE plumes were laterally defined and stable. The report also proposed a groundwater monitoring program to monitor the MtBE present in the two localized plumes and to provide overall monitoring of groundwater conditions at the Refinery. That proposed monitoring program was adopted in all subsequent groundwater monitoring events and reports.

2.1.4 Deep contaminant migration

In 1990, GWRC conducted an investigation of potential deep groundwater contamination under the Refinery. Dual sets of groundwater monitoring wells completed in vertically distinct Artesia aquifer zones were installed. At each location, a deep groundwater well was located adjacent to an existing shallower groundwater monitoring well, and screened with a 10-ft slotted PVC section:

- Well DA-1 was drilled to a depth of 145 feet in the southeastern part of the Refinery in the STF. This well was located adjacent to well A-35, which was screened to a depth of 94 feet;
- Well DA-2 was drilled to a depth of 165 feet, in the eastern part of the Refinery, adjacent to well A-37 in the PUA, which had been screened to a depth of 109 feet; and
- Well DA-3 was drilled to a depth of 154 feet near Carmenita Road, in the eastern edge of the WTF, adjacent to well A-26, which had been screened to a depth of 90 feet.

The deep wells were developed, purged, and sampled, and the investigation reported that in all three deep wells the groundwater concentrations of TPH and Total Organic Carbon (TOC) were consistently below detection limits (TriHydro, 1991).

The results indicated that the vertical extent of hydrocarbon contamination beneath the refinery has been defined and that the shallow groundwater contamination did not pose a risk to deeper groundwater resources. The deep wells were subsequently abandoned under RWQCB approval.

2.1.5 Fate and Transport Modeling

In 2002, in response to a requirement in the Cleanup and Abatement Order No.93-082, TRC conducted for GWRC groundwater sampling and modeling of hydrocarbon concentrations in groundwater under the site (TRC 2002). Modeling was based on historical groundwater flow direction and contaminant concentrations data, and on 2002 analyses of organic and inorganic compounds in groundwater.

The resulting TRC report of findings indicated that in both, the Semi-Perched zone and Artesia aquifer, the hydrocarbon plumes were stable under 2002 remedial conditions, and that biodegradation was actively occurring at the site under sulfate-consuming anaerobic conditions as described in the following section. Simulations of contaminant migration demonstrated any future

migration of the plumes would be limited. The report also recommended continued LNAPL removal and groundwater monitoring.

2.1.6 Biodegradation Demonstration

The TRC modeling included sampling of groundwater from 35 selected wells and analyses for inorganic and organic biodegradation indicators. The sampled locations included wells located up-gradient and down-gradient from the LNAPL plumes, and wells within the LNAPL plume, for each of the two groundwater zones. The groundwater samples were analyzed for TPHg, BTEX, nitrate, sulfate, ferrous iron, methane, dissolved oxygen (field measurement), and Redox potential (field measurement).

As cited in the TRC report, the results of sampling and analysis of downgradient wells indicated non-detected to very low BTEX concentrations, confirming the historic data and the premise that "the plumes are in virtual equilibrium" (TRC, 2002, page 3-1) and thus were laterally stable.

The interpretation of the inorganic chemical data indicated that degradation by sulfate reduction is the dominant mechanism at the site, with sulfate concentrations in up-gradient well of up to 1,500 mg/L, reduced to 2 mg/L to non-detect in wells within the LNAPL plumes. The fate and transport of dissolved hydrocarbons were modeled and the results of multiple simulations of fate and transport concluded that steady-state migration conditions would be reached within 25 years. Therefore the modeling can be interpreted to demonstrate that the dissolved plumes as measured in 2002, presumably 25 years after the initial release, can be considered at equilibrium.

SGI reviewed the monitoring data reported by GWRC since 2002, and the recent data confirm the TRC 2002 report interpretation that the plumes are stable.

2.2 Previous Free Product Observations

Previous evaluations of hydrocarbon types found as free product in on-site and off-site wells include a 1991 investigation, a 1995 testing of on-site wells, and repeated observations during groundwater monitoring. In 1995, TriHydro also conducted analyses of free product in wells in the STF, and the results indicated various mixtures of diesel and gasoline (TriHydro, 1995).

The 1991 CPT and Hydropunch™ investigation by TriHydro also reported the distribution and apparent characteristic of the petroleum free product present at the Site and at off-Site locations. **Figure 10** illustrates the 1991 interpreted apparent weathering of the petroleum product. The figure clearly indicates several samples collected from off-Site locations, near Rosecrans Avenue and one location along Carmenita Road, appears as fresh, unweathered petroleum product. These results contrast with the more weathered petroleum product samples obtained farther north. The TriHydro report indicated that the pattern of degree of weathering suggested that there were localized hydrocarbon sources in these areas and that off-site sources, not associated with GWRC operations, are suspected to be the source of the off-Site unweathered petroleum products.

2.3 Semi-Perched Free Product Fingerprinting

The TriHydro interpretation that the observed hydrocarbons in the Semi-Perched groundwater south of the Refinery were due to other off-site sources was further confirmed by SGI in February 2012. As described in **Appendix B**, SGI obtained product samples from a well in the southern edge of the STF (Well STF-16) and from four wells located west of Carmenita Road, in the area between Cambridge Court (well B-13 and well MYTNN) and north and south of Rosecrans (wells B-16 and PO-16).

The observations of the product samples indicate that the free product present on the groundwater in the Semi-perched aquifer along the southwestern boundary of the Refinery in well STF-16 is characterized by a nearly opaque, black color liquid with a viscosity typical of heavily weathered refined product. In the area between Cambridge Court and south of Rosecrans Avenue, Semi-Perched groundwater monitoring well B-13 contains an amber product, well MYTNN contains black, weathered product, and wells B-16 and PO-16 contain a lighter color free product that is visually distinct from MYTNN.

The five product samples were initially submitted to Zymax Laboratory for analysis of additive chemicals. The results of the analysis (**Appendix B and Table 2**) indicated the absence of Ethylene Dibromide (EDB) in all samples, and the unique presence of two lead compounds (Tetramethyl Lead and Trimethylethyl Lead) in the product from wells B-16 and PO-16 near Rosecrans Avenue. Based on this result and the observation of these 2 samples as visually distinct from upgradient well MYTNN, the source of the product in B-16 and PO-16 is distinct from upgradient wells.

The three remaining upgradient samples (MYTNN, B-13, and STF-16) were further analyzed by Zymax and the petroleum gas chromatograms were interpreted, as described in the Zymax fingerprinting report included as **Appendix B**. The fingerprinting interpretation indicates the presence in all three wells of severely weathered leaded gasoline and degraded #2 diesel or #2 fuel oil. The report also indicates that the gasoline product in STF-16 is distinct from samples from wells B-13 and MYTNN, indicating a different release.

Based on these fingerprinting results, the LNAPL in the Semi-Perched wells consists of three types related to three separate releases: the product in STF wells, the product in the area of wells B-13 and MYTNN and the product in the vicinity of Rosecrans Avenue, as illustrated on **Figure 11**.

The evaluation of the analyses and observations supports the interpretation that the product found in the Cambridge Court/ Rosecrans Avenue area in wells B-13, MYTNN, B-16 and PO-16 is attributable to non-Refinery sources. Section 2.4.3 presents further evidence of local hydrocarbons contamination at several former USTs and aboveground storage tanks (ASTs) sites in the vicinity of these wells.

2.4 Sources of Hydrocarbons

2.4.1 On-Site GWRC Refinery Sources

Sources of subsurface contamination at the former refinery included above-ground and below-ground storage tanks, pipelines and process equipment associated with the storage, refining and distribution of raw and refined petroleum products.

2.4.2 On-Site Non-GWRC Sources

In the southeastern part of the PUA, the federal government operated refining operation to produce aviation fuel. From World War II to approximately 1968, the southwestern part of the PUA produced aviation fuel that was subsequently transferred, via underground pipelines, to the Defense Fuel Support Point (DFSP) Norwalk tank farm located approximately 1.5 miles southwest of the Site (England GeoSystem, 2001), at 15306 Norwalk Blvd in Norwalk, CA.

2.4.3 Off-site sources

The area surrounding the Refinery includes multiple commercial and industrial facilities, some of which historically operated gasoline, diesel or waste oil storage tanks. In 2011, SGI conducted a review of historical records as collected by Environmental Data Resources, and examined files at the City of Santa Fe Springs, Norwalk (through the County of Los Angeles records) and the RWQCB. The results of this review are summarized and illustrated on **Figure 12**, which presents selected facilities with reported petroleum hydrocarbon storage located south and southwest of the Refinery. **Table 3** also lists the corresponding address and findings regarding the potential impact to subsurface from the facilities south of the Refinery.

It should be noted that the 1980's-1990's investigations by the GWRC's consultants included the installation and sampling of groundwater monitoring wells located several thousand feet southwesterly from the Refinery. The network of wells forms an area that encompasses numerous facilities containing petroleum storage tanks, many of which have been documented to have leaked. Due to the well-documented groundwater monitoring conducted by GWRC since the late 1980's, most reports associated with UST removals at these facilities included statements that attributed any underlying petroleum hydrocarbons found in soil and groundwater to GWRC. These interpretations resulted in the assignment of any potential groundwater contamination to GWRC, and no clearly defined attempts to separate on-site contamination from the reported GWRC plume were completed. These unilateral attributions of any contamination to GWRC operations apparently perpetuated the general belief that all local groundwater contamination could be assigned to GWRC. The result was that the requirements for on-site specific investigation or remediation at these off-Site UST locations were limited. Additionally, due to the long history of the area, the operation of USTs at small industrial sites included single-wall USTs with limited monitoring, increasing the potential for leaks.

Table 3 and the supporting documentation in **Appendix A** lists several facilities where the site data indicate that hydrocarbons contributed to subsurface contamination of soil and groundwater downgradient of Refinery.

In particular, reports on the following facilities indicate impact to the subsurface or undocumented potential sources within an area previously assigned to a plume originating from GWRC:

- 13900 Carmenita: Former ChemCentral property located immediately south of the GWRC STF and railroad. At this site, soil contamination under former gasoline and diesel USTs in the eastern part of the site may not have been fully characterized in an area of no Semi-Perched groundwater; the western part of the site contained 88 USTs and 3 ASTs in an area of Semi-Perched groundwater. Some of these USTs contained chlorinated VOCs and also compounds such as toluene that are common components of gasoline and diesel. Subsurface contamination under these USTs has been documented but not fully delineated, and an SVE system operated at the site for a several years;
- 13827 Carmenita: Principal Property. Reports indicate the presence of hydrocarbons in soil under former USTs, and the presence of hydrocarbons in groundwater. A soil sample under the site also contained TCE that may be attributed to ChemCentral;
- 13230 Cambridge: Aggreko. Reports indicate the presence of a former waste oil UST, but no specific investigation information. Semi-Perched well B-13 at southern edge of the site contains free phase product;
- 13139 Rosecrans: Former Bear State Air Conditioning Services. At this site, contamination from USTs was documented to extend vertically to the Semi-Perched groundwater. After continuing the vertical excavation of contaminated soil, a free product sample from the excavation and a sample from a well to the north of the site were collected and analyzed. The laboratory reported the samples to consist of a product similar to aviation gas, but hydrocarbons were noted to contain high concentrations of aromatic compounds. SGI notes that the presence of high concentrations of aromatics in the free phase sample precludes the likelihood that the product migrated from the refinery, located at a distance of 2000 feet from this property. Despite evidence of contamination extending to groundwater and the presence of aromatics, the site was closed;
- 14010 Maryton: Century Refrigeration. At this site, a gasoline UST was reported, some soil samples were collected and the site was closed;
- 14107 Dinard/14106 Maryton: Certified Fasteners. The UST was removed October 12, 1988. Three soil samples were taken, two from the bottom of the UST and one 2 feet bgs below the dispenser. The highest TPH concentration was 5,190 mg/kg (SP-1) under the west end of the UST excavation. Further soil sampling around the walls of the dispenser excavation at 6 and 7 feet bgs encountered detections below 100 mg/kg. Closure granted 8 years later in 1996. No groundwater encountered during UST excavation of 12 bgs; and

- 13535 Rosecrans: Lumber yard immediately south of GWRC STF and railroad. Site has diesel and gasoline USTs in an area of assumed absent Semi-Perched groundwater zone, and in a potentially upgradient Artesia location from GWRC.

In addition to the potential source areas listed on Table 3 and in Appendix A, petroleum product pipelines are also known to exist under Carmenita Road, Rosecrans Avenue, and Shoemaker Avenue, providing additional, un-explored or un-reported sources of potential contamination (**Figure 12**).

2.5 Evaluation of the Plumes Reported by GWRC

The evaluation of the wells to be incorporated into the future GWRC groundwater monitoring program should take into account that many of the wells installed as part of the early investigations at the Refinery were installed prior to a wider understanding of typical migration of LNAPL and dissolved plumes from petroleum release sites. These early investigations were apparently developed under the premise that LNAPL and dissolved phase petroleum plumes had likely traveled miles away and downgradient from the Site. For example, the installation of well PO-7, located 7,400 feet southwest of the refinery through an industrial neighborhood reflects the limited understanding of hydrocarbon contamination behavior in the 1980's. As reported later, for example in 1998 as part of the study referred to as the Lawrence Livermore Study (Rice et al, CA LUFT Historical Case Analysis), groundwater contaminated benzene plumes at 90% of the studied 217 sites extended to 255 feet or less, and the median plume length was 101 ft.

These reported typical dissolved plume lengths are in stark contrast with the 1980's investigation pattern by GWRC which included the installation and testing of 8 wells located more than 2,000 feet from the Site. The net result of the installation and sampling of groundwater monitoring wells thousands of feet from the Refinery was that GWRC has been monitoring the off-Site occurrence of hydrocarbons that originated from a multitude of potential sources, all of which have not been fully delineated based on the review of file records.

2.5.1 Evaluation of the Semi-Perched Plume

As mentioned in Section 1.2.2, the presence of the Semi-Perched zone at the Refinery is essentially limited to the southern edge of the STF. The lateral extent of LNAPL observed in Semi-Perched wells within the STF is attributed to past operations at the Refinery. The primary and secondary sources of contamination have been removed, and remediation including barrier wells and soil vapor extraction is actively reducing the remaining hydrocarbon mass in source zone soils and groundwater, and is restricting off-site migration of LNAPL.

The observation of potential sources and characteristics of the reported subsurface contamination south and southwest of the Refinery indicates that the extent of downgradient contamination in groundwater reported previously as a large single plume originating from GWRC did not take into account the impact to groundwater from other off-site sources.

The Semi-Perched zone has been shown to consist of mostly fine grain material and discontinuous layers and this setting is not conducive to lateral migration of LNAPL of hundreds to thousands of feet.

Multiple known or suspected hydrocarbon sources (e.g., leaking USTs and/or pipelines) are documented downgradient and off-site from the Refinery, located from several hundred feet to 2,000 feet to the south and southwest of the Refinery. As discussed above, the contribution of these off-site hydrocarbon releases has resulted in the gross over-estimation of the actual downgradient lateral extent of the GWRC plume. Detailed investigations in 1991 and recent fingerprinting indicate multiple off-site sources of LNAPL southwest of the Refinery.

As illustrated on **Figure 11**, the LNAPL found in the Semi-Perched zone south of the site represents three distinct plumes.

- The on- and off-site STF plume, as found along the STF's southern edge, where GWRC is actively operating barrier wells and SVE.
- An off-site area of LNAPL extending from Cambridge Court near well B-13 to Maryton Avenue near well MYTNN. This product is distinct from the STF plume in fingerprinting characteristics and did not originate at the STF. It also did not originate at the MA, which does not have a Semi-Perched zone, and well B-10, located at the northern edge of the Semi-Perched hydrogeologic unit does not contain LNAPL. It is unlikely that the degraded gasoline/diesel mixture was released from the former waste oil tank located at 13230 Cambridge Court.

  Although undefined, it is possible that the source of the Cambridge/Maryton LNAPL is the network of pipelines in the vicinity of the Carmenita/railroad intersection area, possibly with contribution from the 13827 Carmenita former diesel USTs and the ChemCentral facility at 13900 Carmenita.
- An off-site area of LNAPL with distinct fingerprint characteristics in the area of the Rosecrans/Maryton/Dinard intersection. Gasoline releases to the subsurface were documented at the 13139 Rosecrans site, and two facilities just north of this site which also contained gasoline USTs, had only limited sampling conducted. This LNAPL is found at a lateral distance of 2,000 feet from the refinery, a distance exceeding any expected migration of LNAPL over such a distance in a fine grain shallow zone of discontinuous lithology.

2.5.2 Evaluation of the Artesia Plume

The outlines of the Artesia LNAPL and dissolved plumes indicate principally concentration within the Refinery footprint that includes both GWRC and former US DOD operation areas. The origin of the LNAPL southwest of the MA, as noted particularly in well AO-14, is not well defined, and can be attributed to a southwestern, localized downgradient migration of free-phase product caused by the apparent groundwater mounding near the Foster/Carmenita road intersection, and may be attributable to the pipelines along Carmenita Road or the MA.

Further to the southeast, the presence of LNAPL in well AO-2 and dissolved petroleum hydrocarbons in well AO-18 do not appear to be directly attributed to GWRC operations, as these two wells are interpreted to be located up gradient to side-gradient of the Refinery.

The LNAPL and dissolved hydrocarbon plumes identified within the former refinery are clearly delineated downgradient by a set of four sentinel wells (A-38A, A-39A, AO-10 and AO-11). These wells confirm the interpreted fate and transport modeling performed by TRC in 2002 (TRC, 2002) and further demonstrate the stability of the Artesia zone LNAPL and dissolved-phase plumes.

3.0 GROUNDWATER MONITORING REQUIREMENTS

3.1 Historical Monitoring

Groundwater monitoring at the Refinery has been conducted since 1985 on either a quarterly or semi-annual schedule, with focus on establishing the groundwater flow directions, and confirming the lateral extent of free-phase hydrocarbons, dissolved hydrocarbons, and VOCs. Groundwater monitoring is currently conducted in compliance with CAO R4-2004-0020. Previously, CAO 93-082 listed eight wells to be sampled (MW-2, MW-3, A-21, A-22, A-36, A-53, A-54, AO-21) and two optional additional wells (A-3 and A-24). In addition, as described in Section 2.1, specific groundwater sampling events were completed at the request of RWQCB to evaluate the occurrence of MtBE, emergent chemicals and metal concentrations in groundwater, and as technical requirements associated with temporary Waste Discharge Requirements (WDRs).

In 2003, the RWQCB requested a specific investigation of MtBE in groundwater at and around the Refinery. The subsequent 2004 report (GWRC 2004) describing that investigation included recommendations for wells to be sampled as part of the groundwater monitoring program. This updated list of groundwater wells to be sampled semi-annually was proposed to reflect the abandonment and replacement of a portion of the wells listed in CAO 93-082, and to provide specific sampling locations to monitor the localized MtBE plume present near wells A-21A and A-7. The 2004 recommended list of wells was implemented, and CAO R4-2004-0020 included the semi-annual schedule of sampling for those wells. Since the 2004 CAO, well A-45 was abandoned after approval by RWQCB as part of the STF redevelopment. Well P-13 contains free product and therefore has not been sampled for dissolved phase analysis.

In addition to the groundwater monitoring associated with the CAO, separate temporary groundwater monitoring requirements were also established by RWQCB as part of technical requirements associated with the WDRs. The WDRs were issued during the approval of redevelopment of distinct areas of the refinery. These WDRs included specific wells to be sampled for specified parameters and required additional reporting. GWRC complied with all the respective WDRs as redevelopment progressed for all Refinery areas, until all the WDRs were rescinded.

The 2004 CAO also included specific additional groundwater sampling for the former areas L and Q of the PUA for wells AL-1, AL-2, AL-3, NW-3, A-38A, A-39A, and A-60. On October 11, 2005, the RWQCB authorized discontinuation of that additional sampling, with the conditional requirement to maintain sampling for hydrocarbons in wells A-38A and A-39A.

In accordance with the 2004 CAO, and as part of the on-going evaluation of the groundwater monitoring data, GWRC proposed and then completed the abandonment of on-site and off-site monitoring wells and replacement of wells. These well abandonment/replacement activities were all reported to the RWQCB, as required by the CAO, in individual reports or in the semi-annual reports.

3.2 Current Monitoring

All on-Site and off-Site wells are gauged semi-annually. Selected on- and off-Site wells have been monitored and sampled semi-annually since 2003 and reported in semi-annual groundwater monitoring reports (Table 4). All sampled wells are Artesia wells, and include upgradient wells A4A, A5A and AO-21, wells containing MtBE A-17R and A-21, and downgradient well A-10A and sentinel wells A-38A, A-19A, AO-10, AO-11. This sampling program allows for the evaluation of the stability of the LNAPL and dissolved hydrocarbon concentrations in the Artesia groundwater zone.

Monitoring also includes sampling of the groundwater extracted by the City of Santa Fe Springs' Carmenita Sump. Semi-Perched Zone monitoring focuses on the evaluation of the lateral extent of free product rather than dissolved hydrocarbon concentrations, and this appears justified based on the presence of multiple off-Site, non-GWRC contaminant sources present southwest of the site.

3.3 Proposed Groundwater Monitoring

Table 5 presents the list of wells to be included in the proposed groundwater monitoring program and summarizes the proposed analytical program and schedule.

3.3.1 Semi Perched Groundwater Zone:

The occurrence of hydrocarbons in the Semi-Perched Zone is laterally limited to the correspondingly limited lateral extent of that groundwater zone. Specifically, the presence of LNAPL and dissolved contaminants in the Semi-Perched groundwater within the STF is limited to the southern edge of the STF. The WTF, PUA and MA do not contain laterally extensive Semi-Perched groundwater zones.

The investigations of hydrocarbons in the late 1980's included successive drilling and investigation events in the southwestern direction in the off-site areas away from the Refinery's STF. As described in Section 2.4.3 above, the reports associated with these investigations noted both the presence of other potential sources of contamination in the area of the investigation and the apparent variations in the type of product encountered off-site. GWRC nevertheless has continued to perform the monitoring and sampling of groundwater monitoring wells located at significant distances from the Refinery that contain petroleum hydrocarbons that likely originated from off-site, non-GWRC sources.

Recent fingerprinting of LNAPL confirmed the presence of distinct product types in areas of non-GWRC sources.

The proposed monitoring of hydrocarbons in offsite wells conservatively includes gauging of the wells located in the STF and those off-site wells that occur within 1,000 feet south of the Refinery. The Semi-Perched aquifer wells to be monitored are summarized in **Table 5**. The gauging data will be used to confirm the extent and thickness of residual LNAPL and the groundwater gradient in

the vicinity of the Refinery. As the area has been impacted by LNAPL, sampling and analysis of groundwater from downgradient Semi-Perched wells is not proposed at this time.

The sampling of the water pumped by the Carmenita Sump, as performed since prior to the 2004 CAO, will continue to be completed. In addition, GWRC is proposing to sample on-site well P-10 as an upgradient well for the Semi-Perched groundwater zone.

3.3.2 Artesia Groundwater Zone

The proposed Artesia groundwater zone monitoring program includes gauging of all wells proposed to be maintained (See Section 3.3.5), and sampling of a set of wells generally following the currently approved groundwater monitoring and sampling program under the CAO R4-2004-0020.

The gauging of all Artesia wells will provide the required dataset to demonstrate the containment and overall attenuation of LNAPL at the site. Groundwater gauging data will be contoured to determine the groundwater gradient direction.

Currently, 10 wells are sampled and analyzed for dissolved phase hydrocarbons on a semi-annual basis. As listed in Table 5 and illustrated on Figure 13, 12 wells are proposed to be sampled, including upgradient wells, wells known to contain MtBE, and downgradient sentinel wells. Wells A-4A, MW-2, AO-20 and P-10 are proposed to be included in the monitoring program to serve as upgradient wells in the Artesia and Semi-Perched groundwater zones, respectively. Additionally a sample from the Semi-Perched groundwater zone will be collected at the Carmenita sump as required under CAO R4-2004-0020. The groundwater samples will be analyzed for TPH and VOCs including oxygenates by USEPA methods 8015 and 8260B, respectively.

3.3.3 Proposed Monitoring Frequency

As described in Table 5, the monitoring and sampling of the selected groundwater monitoring wells is proposed to be completed on a semi-annual schedule for most wells, as currently conducted and approved for the Site. For upgradient wells A-4, MW-2, AO-20 and P-10, sampling is proposed to be conducting annually. Reporting of groundwater monitoring will similarly continue on a semi-annual schedule.

3.3.4 Proposed Semi-Perched and Artesia Well Abandonment or Discontinuation of Monitoring

The previous investigations resulted in the installation and subsequent monitoring of numerous on-site and off-site wells for which redundant or irrelevant data was accumulated.

In addition, as described in previous sections, most wells southwest of the Refinery are located within areas of suspected other contamination sources, at a distance from the Refinery well beyond the typical distances of migration reported in documents like the Lawrence Livermore report (500 feet for benzene plumes and 1,000 feet for MtBE plumes). Therefore elimination of some wells is proposed.

Table 6 presents a list of wells proposed for abandonment, and also includes a rationale for the proposed abandonment.

3.3.4.1 Proposed Artesia Well Abandonment or Discontinuation of Monitoring

Ten Artesia wells (AO-12, AO-16, AO-3, AO-21, GW-1, GW-2, A-60, AL-2, AL-3, and A-66) are recommended for destruction as redundant wells (**Table 6**). In addition, the four wells associated with the former landfill MW-1 and NW-2 to NW-4 located at the present Auto Ecology site are proposed to be removed from the GWRC monitoring program.

3.3.4.2 Proposed Semi-Perched Well Abandonment or Discontinuation of Monitoring

Nine Semi-Perched off-site wells (PO-3, PO-5, PO-7, PO-8, PO-9, PO-11, PO-13, PO-16, and PO-17) are located beyond the boundaries of the plume interpreted to be attributable to the Refinery, and are proposed to be destroyed (**Table 6**). In addition, five wells (B-3, B-13, B-15, B-16, and B-18) installed by parties other than GWRC are proposed to be removed from the GWRC monitoring program.

4.0 SCHEDULE

GWRC will implement the revised monitoring program during the semi-annual event immediately following RWQCB approval. The implementation of some of the proposed modifications to the groundwater monitoring program will require obtaining access permits and well permits for well abandonment, and this effort may require several weeks. Similar to past groundwater monitoring program changes, GWRC will keep RWQCB informed of any well abandoned or removed from the groundwater monitoring program through the preparation and submittal of the semi-annual monitoring reports.

5.0 LIMITATIONS

This document was prepared for the exclusive use of the Golden West Refining Company (GWRC) and the Regional Water Quality Control Board (RWQCB) for the express purpose of complying with a client- or regulatory directive for environmental investigation or restoration. Any re-use of this work product in whole or in part for a different purpose or by others must be approved by SGI and GWRC in writing. If any such unauthorized use occurs, it shall be at the user's sole risk without liability to SGI or GWRC. To the extent that this report is based on information provided to SGI by third parties, including GWRC, their direct contractors, previous workers, and other stakeholders, SGI cannot guarantee the completeness or accuracy of this information, even where efforts were made to verify third-party information. SGI has exercised professional judgment to collect and present findings and opinions of a scientific and technical nature. The opinions expressed are based on the conditions of the Site existing at the time of the field investigation, current regulatory requirements, and any specified assumptions. The findings and recommendations presented in this report are intended to be taken in their entirety to assist GWRC and RWQCB personnel in applying their own professional judgment in making decisions related to the property. SGI cannot provide conclusions on environmental conditions outside the completed scope of work. SGI cannot guarantee that future conditions will not change and affect the validity of the presented conclusions and recommended work. No warranty or guarantee, whether expressed or implied, is made with respect to the data or the reported findings, observations, conclusions, and recommendations.

6.0 REFERENCES

England GeoSystem, 2001. Final Design Report, Groundwater Remediation Design, GWRC. May 18.

Golden West Refining Company, 2011a. Semi-Annual Groundwater Monitoring Report (January-June 2011). June 29.

Golden West Refining Company, 2011b. Third Quarter Remediation Report. September 14.

OH Materials, 1989. Report for Laboratory Study to Demonstrate the Biodegradation Potential of Petroleum Hydrocarbons in soil and Groundwater at the Golden West Refinery Site in Santa Fe Springs, CA. April 14.

RWQCB 2003. Requirements for an Emergent Chemicals Subsurface Investigation. December 2.

RWQCB 2004. Cleanup and Abatement Order No. R2-2004-0020. August 24.

RWQCB 2005. Correspondence: Conditional Authorization to Discontinue Groundwater Sampling in Areas L and Q, P.U.A. October 11.

TRC, 2002. Fate and Transport Modeling, Former Golden West Refinery, Santa Fe Springs, CA. September.

TriHydro 1986. Additional Ground-Water Investigation, GWRC. October 6.

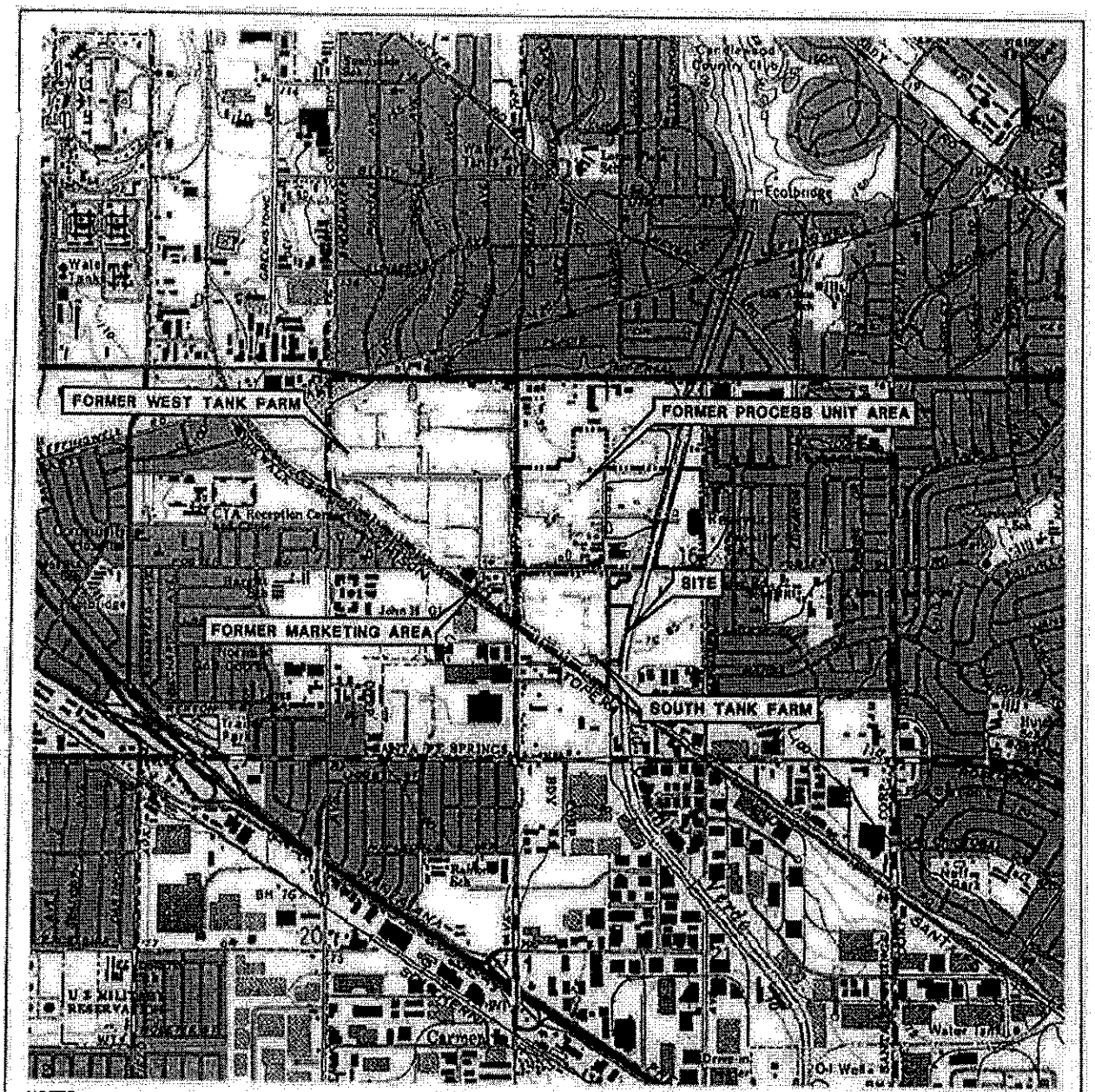
TriHydro, 1990-1991. Reports Evaluating the Semi-Perched Zone and the Artesia Aquifer, GWRC. September 1990-July 1911.

TriHydro, 1991a. Vertical Groundwater Quality Evaluation, Golden West Refinery. January.

TriHydro, 1991b. Off-site Semi-Perched Zone Cone Penetrometer/Hydropunch Sampling Investigation, GWRC. September 18.

TriHydro, 1995. Memorandum: Hydrocarbon Analysis of Free Product, STF, GWRC. February 2.

FIGURES



NOTES:

Reference: 7.5 Minute U.S.G.S. Topographic Map of Whitter, California, Dated: 1964, Photo revised 1981

LEGEND

Property Line

FROM: TRC, 2002 REPORT

SCALE (FEET)

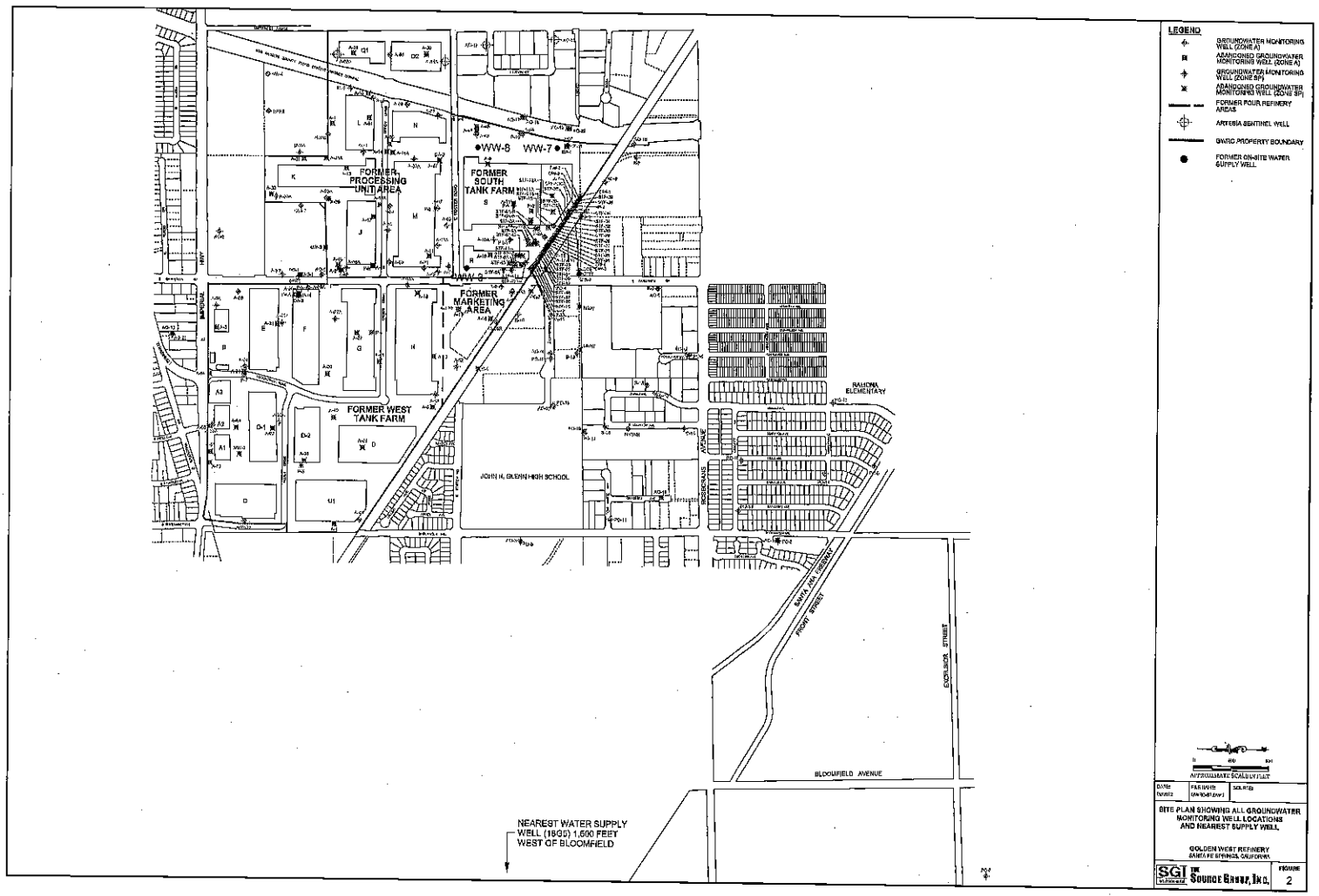
0 2000

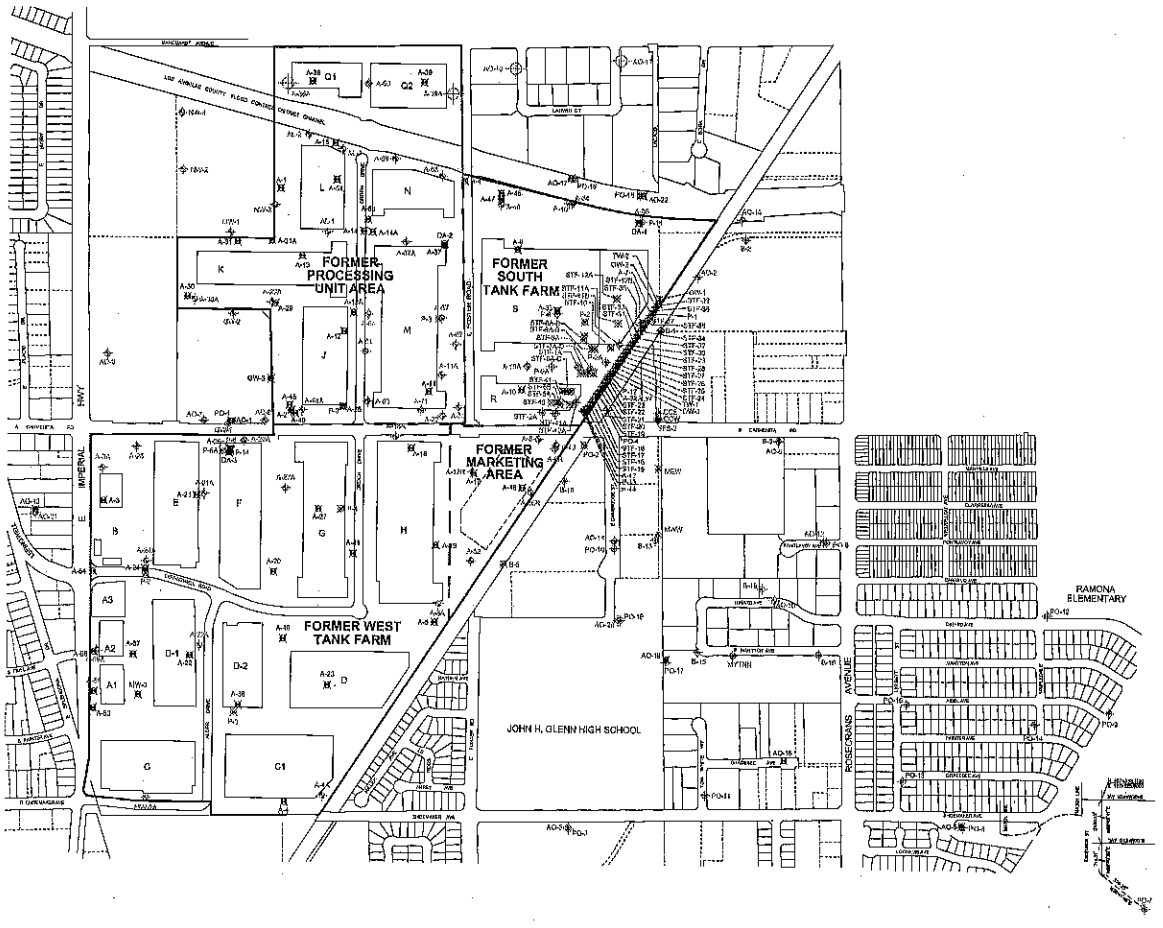
SITE PLAN

Former Golden West Refinery
Santa Fe Springs, California

FIGURE 1

SGI The Source Group Inc


LEGEND
GROUNDWATER MONITORING WELL (ZONE A)
ABANDONED GROUNDWATER MONITORING WELL (ZONE A)
GROUNDWATER MONITORING WELL (ZONE SP)
ABANDONED GROUNDWATER MONITORING WELL (ZONE SP)
FORMER FOUR REFINERY AREAS
ARTESIA SENTINEL WELL
GWTC PROPERTY BOUNDARY
FORMER ON-SITE WATER SUPPLY WELL
FORMER PROCESSING UNIT AREA
FORMER SOUTH TANK FARM
FORMER MARKETING AREA
FORMER WEST TANK FARM
WW-8
WW-7
JOHN H. GLENN HIGH SCHOOL
RAMONA ELEMENTARY
ROSECRANS AVENUE
SANTA FE SPRINGS
FIGARI STREET
EXPLOSIVE STREET
BLOOMFIELD AVENUE
NEAREST WATER SUPPLY WELL (1905) 1,600 FEET WEST OF BLOOMFIELD
APPROXIMATE SCALE IN FEET
SITE PLAN SHOWING ALL GROUNDWATER MONITORING WELL LOCATIONS AND NEAREST SUPPLY WELL
GOLDEN WEST REFINERY
SANTA FE SPRINGS, CALIFORNIA
SGI
THE SOURCE GROUP, INC.
FIGURE 2



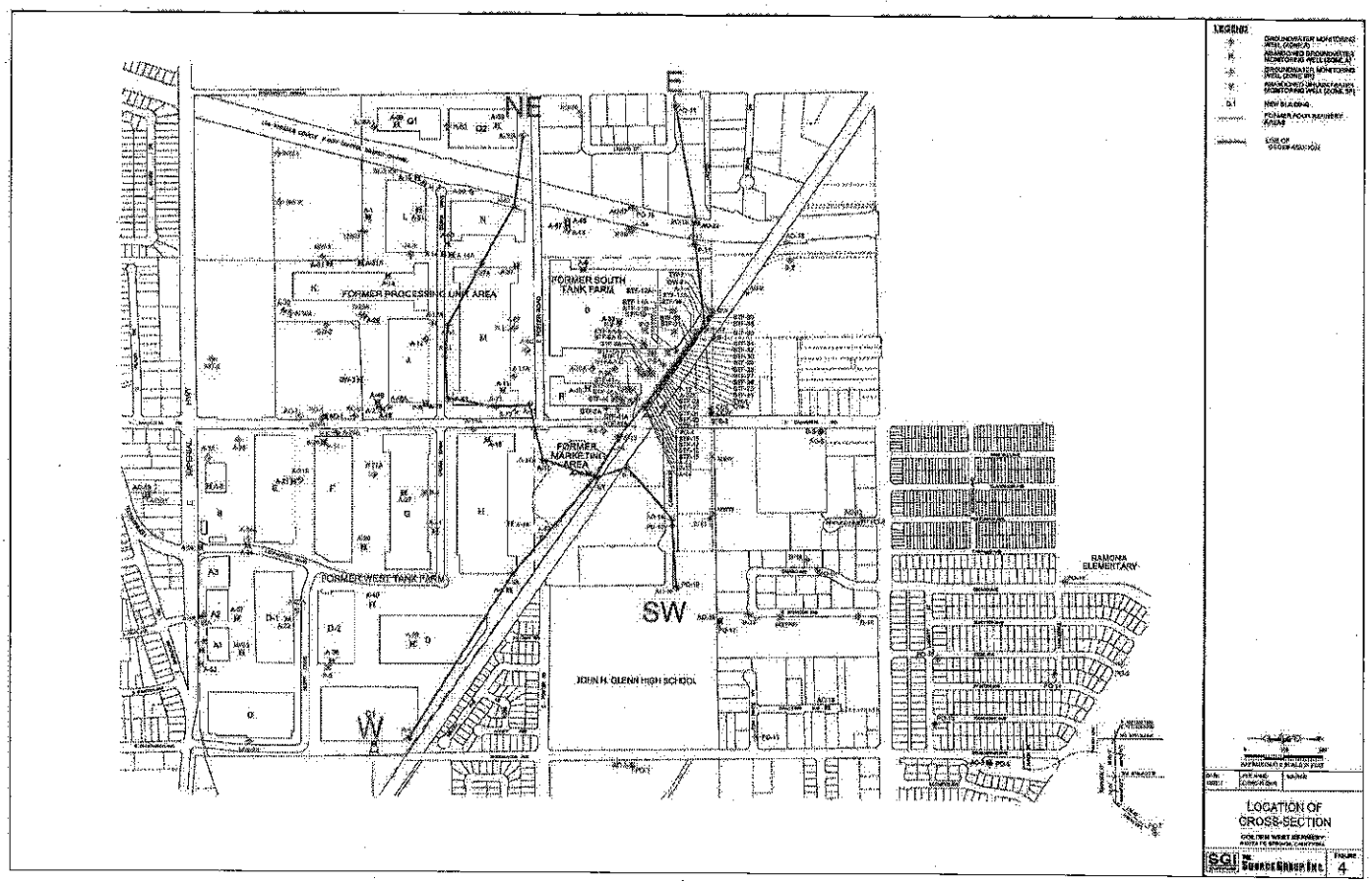
APPROXIMATE SCALE IN FEET

DETAILED SITE PLAN

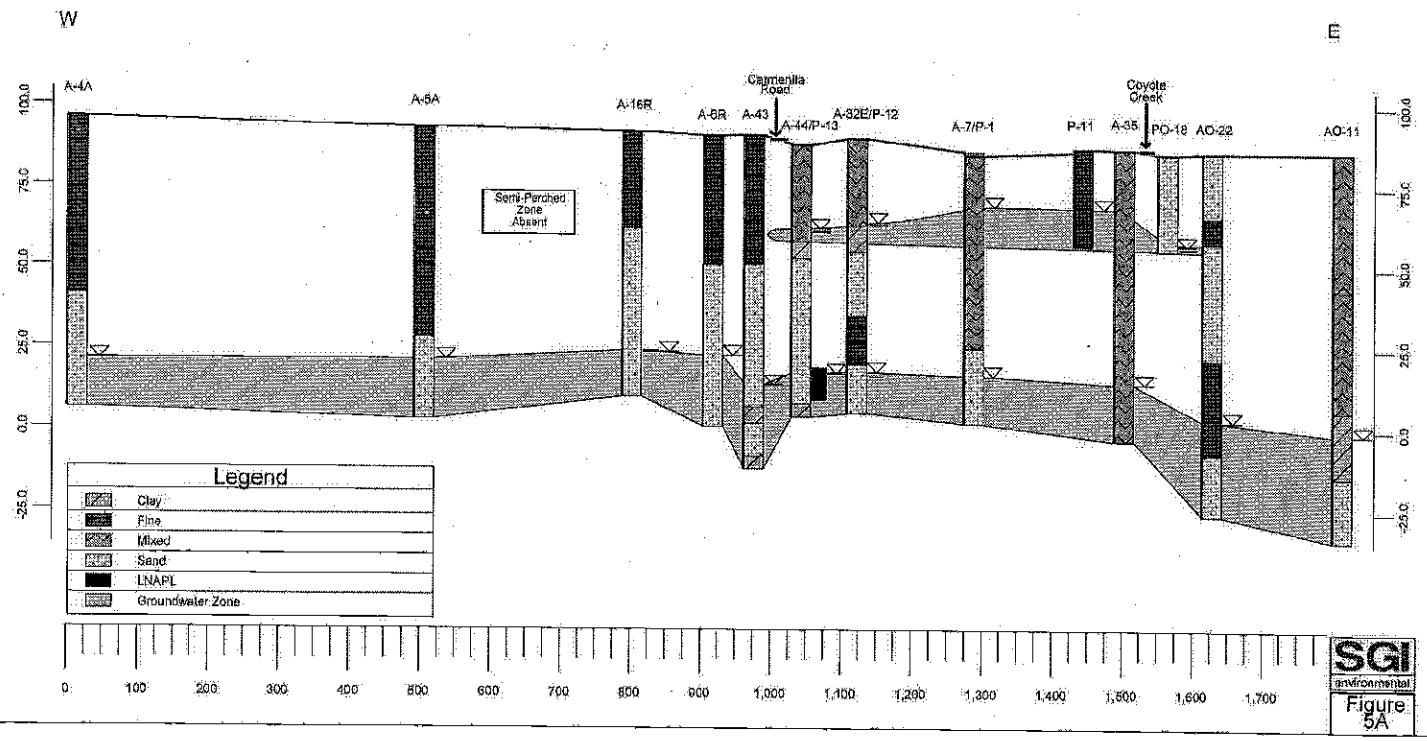
GOLDEN WEST REFINERY
SANTA FE SPRINGS, CALIFORNIA

SGI The Source Group, Inc.

FIGURE 3

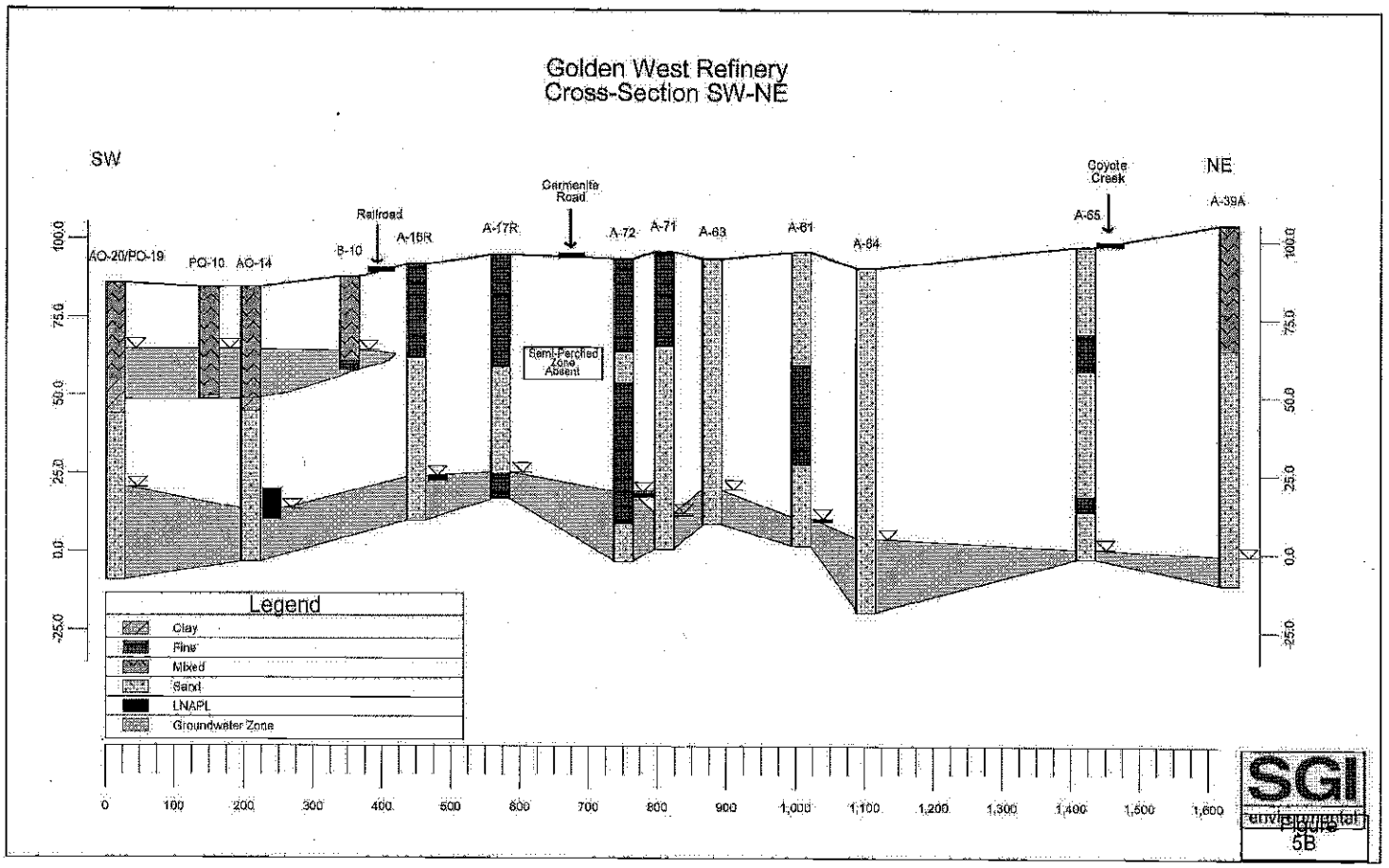

NE
E
SW
W
FORMER PROCESSING UNIT AREA
FORMER SOUTH TANK FARM
FORMER MARKETING AREA
FORMER WEST TANK FARM
JOHN H. GLENN HIGH SCHOOL
RAMONA ELEMENTARY
LEGEND
LOCATION OF CROSS-SECTION
SGI
SOURCE GROUP INC.
FIGURE
4

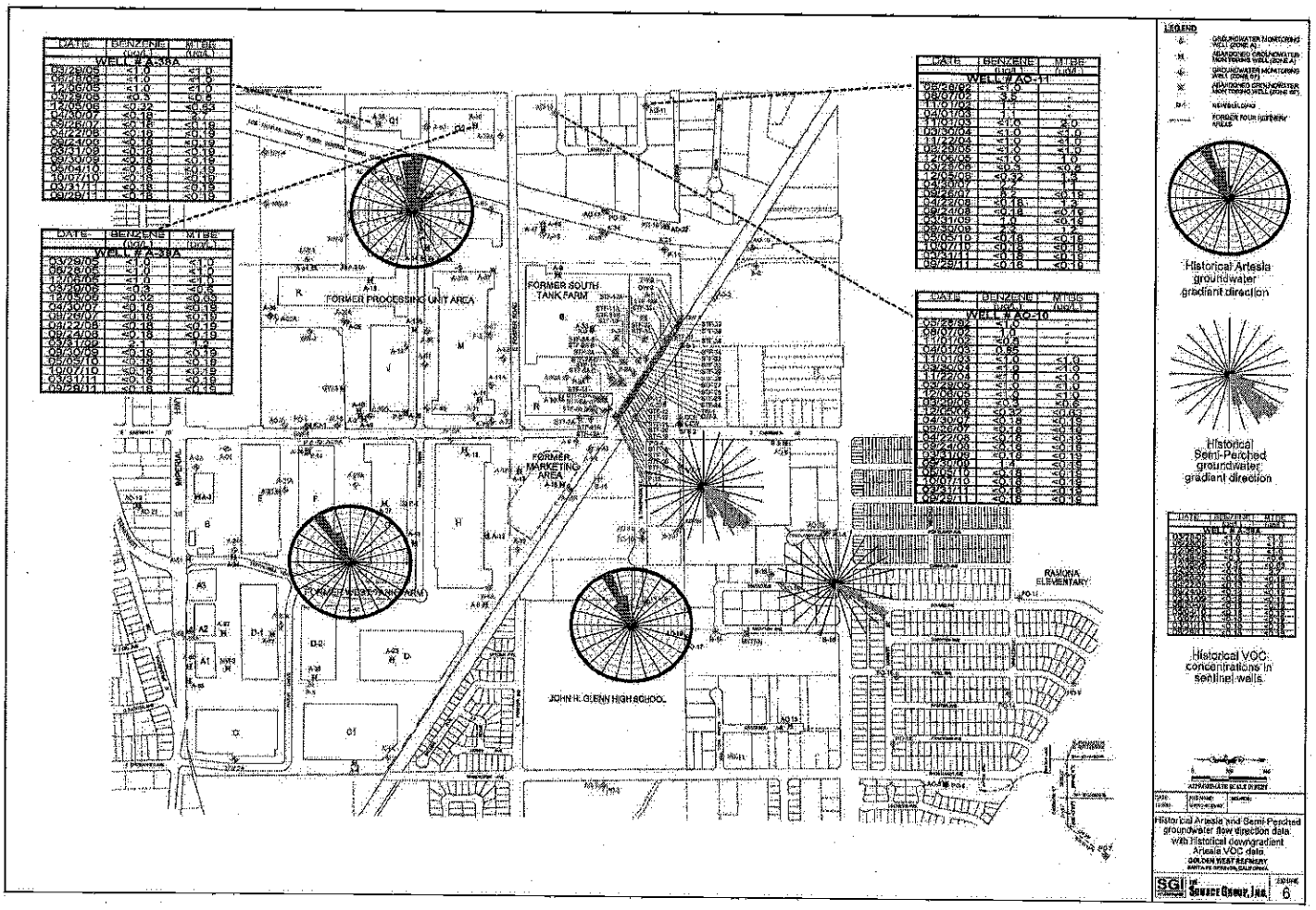
Golden West Refinery
Cross-Section W-E

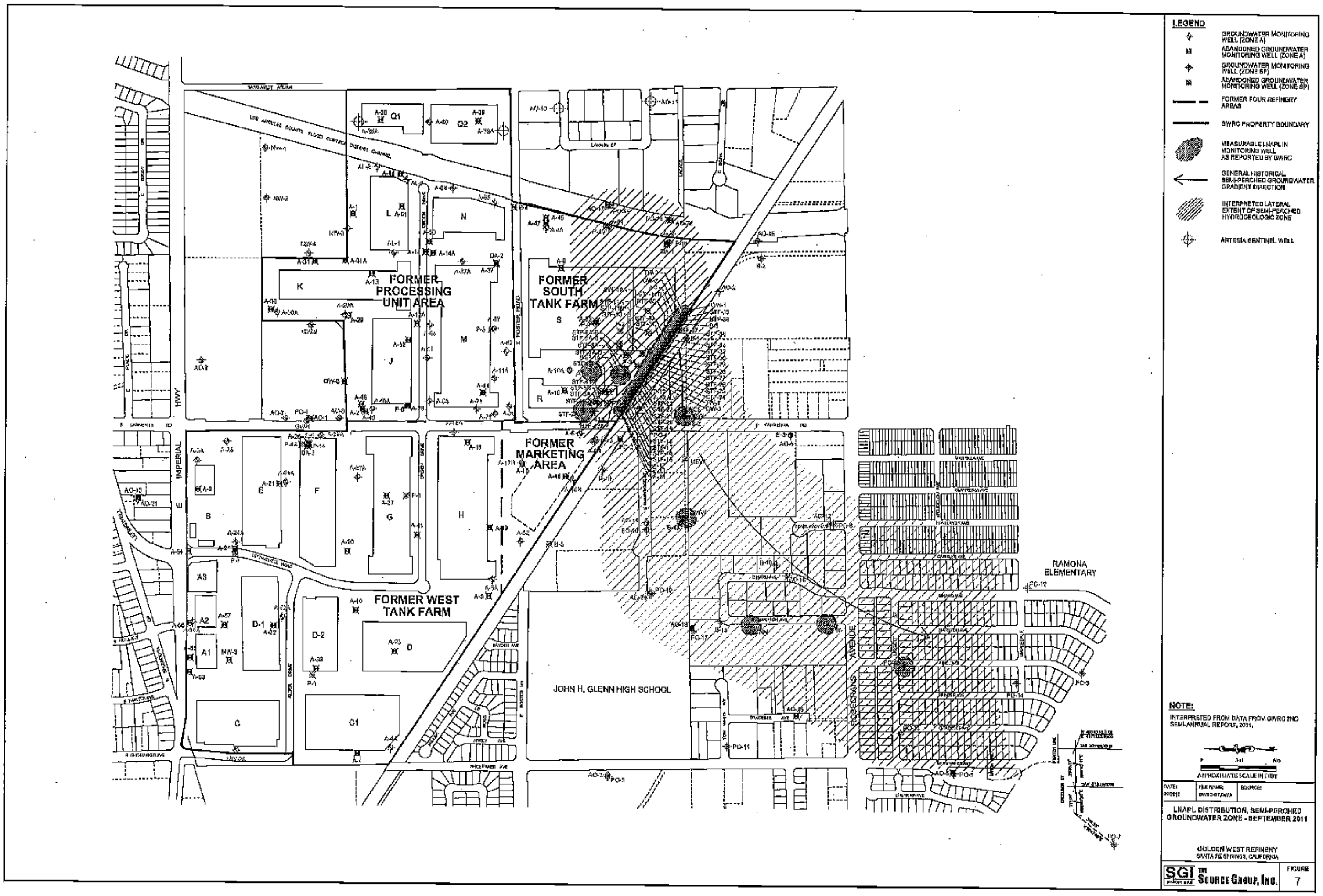


SGI environmental

Figure 5A

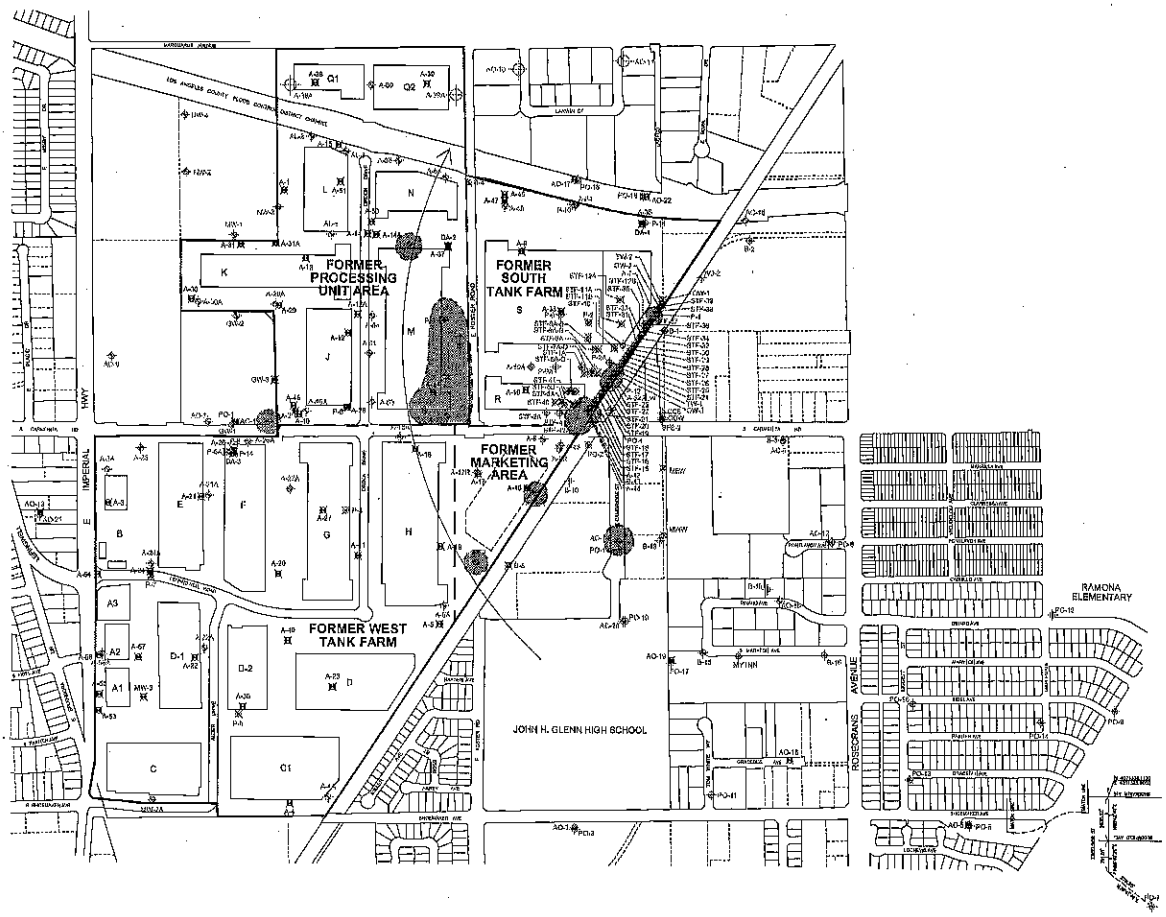

Golden West Refinery
Cross-Section SW-NE
SW
NE
AO-20/PO-19
PO-10
AO-14
B-10
Railroad
A-15R
A-17R
Carmenita Road
A-72
A-71
A-63
A-61
A-64
Coyote Creek
A-65
A-39A
Semi-Perched Zone Absent
100.0
75.0
50.0
25.0
0.0
-25.0
Legend
Clay
Fine
Mixed
Sand
LNAPL
Groundwater Zone
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
1,400
1,500
1,600
SGI
environmental
Figure
5B

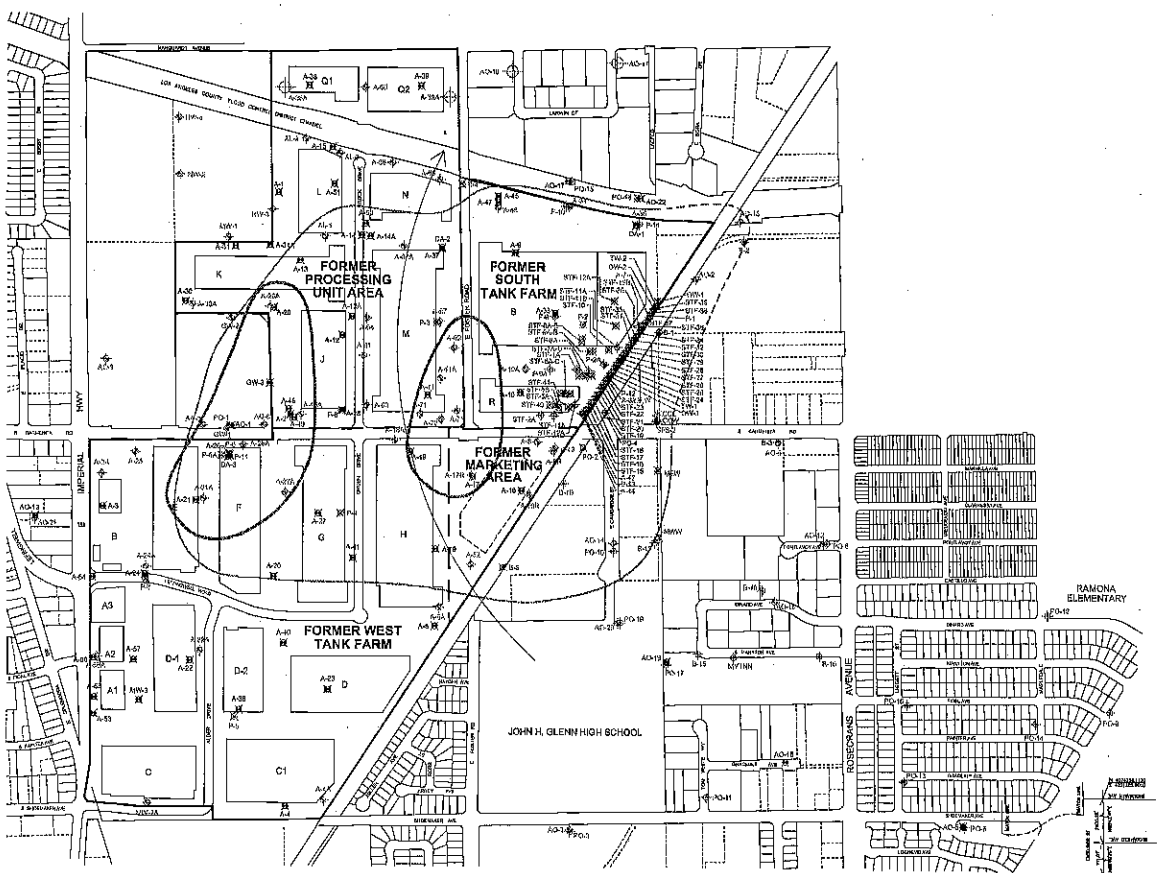

WELL # A-38A
WELL # A-39A
WELL # AO-11
WELL # AO-10
WELL # A-28A
FORMER PROCESSING UNIT AREA
FORMER SOUTH TANK FARM
FORMER MARKETING AREA
FORMER WEST TANK FARM
JOHN R. GLENN HIGH SCHOOL
RAMONA ELEMENTARY
IMPERIAL
LEGEND
Historical Artesia groundwater gradient direction
Historical Semi-Perched groundwater gradient direction
Historical VOC concentrations in sentinel wells
Historical Artesia and Semi-Perched groundwater flow direction data with Historical downgradient Artesia VOC data
GOLDEN WEST REFINERY
SGI
SOUTHWEST GEOSCIENCE, INC.
6



LNAPL DISTRIBUTION, SEMI-PERCHED GROUNDWATER ZONE - SEPTEMBER 2011

FIGURE 7


FORMER PROCESSING UNIT AREA
FORMER SOUTH TANK FARM
FORMER MARKETING AREA
FORMER WEST TANK FARM
JOHN H. GLENN HIGH SCHOOL
RAMONA ELEMENTARY
IMPERIAL HWY
ROSECRANS AVENUE
LEGEND
GROUNDWATER MONITORING WELL (ZONE A)
ABANDONED GROUNDWATER MONITORING WELL (ZONE A)
GROUNDWATER MONITORING WELL (ZONE SP)
ABANDONED GROUNDWATER MONITORING WELL (ZONE SP)
FORMER FOUR REFINERY AREAS
GWRC PROPERTY BOUNDARY
MEASURABLE LNAPL IN MONITORING WELL AS REPORTED BY GWRC
GENERAL HISTORICAL ARTESIA GROUNDWATER GRADIENT DIRECTION
ARTESIA SENTINEL WELL
NOTE:
DATA FROM GWRC 2ND SEMI-ANNUAL REPORT, 2011.
APPROXIMATE SCALE IN FEET
LNAPL DISTRIBUTION, ARTESIA GROUNDWATER ZONE - MARCH 2011
GOLDEN WEST REFINERY
SANTA FE SPRINGS, CALIFORNIA
SGI
SOLUTIONS
SOSEKI GROUP, INC.
FIGURE
8



LEGEND

- GROUNDWATER MONITORING WELL (ZONE A)
- ABANDONED GROUNDWATER MONITORING WELL (ZONE A)
- GROUNDWATER MONITORING WELL (ZONE SP)
- ABANDONED GROUNDWATER MONITORING WELL (ZONE SP)
- FORMER FOUR REFINERY AREAS
- GWRC PROPERTY BOUNDARY
- DETECTABLE BENZENE
- DETECTABLE MIBE
- GENERAL HISTORICAL ARTESIAN GROUNDWATER GRADIENT DIRECTION
- ARTESIA SENTINEL WELL

NOTE:

INTERPRETED FROM TRC, 2002 AND HISTORICAL EMPL DATA.

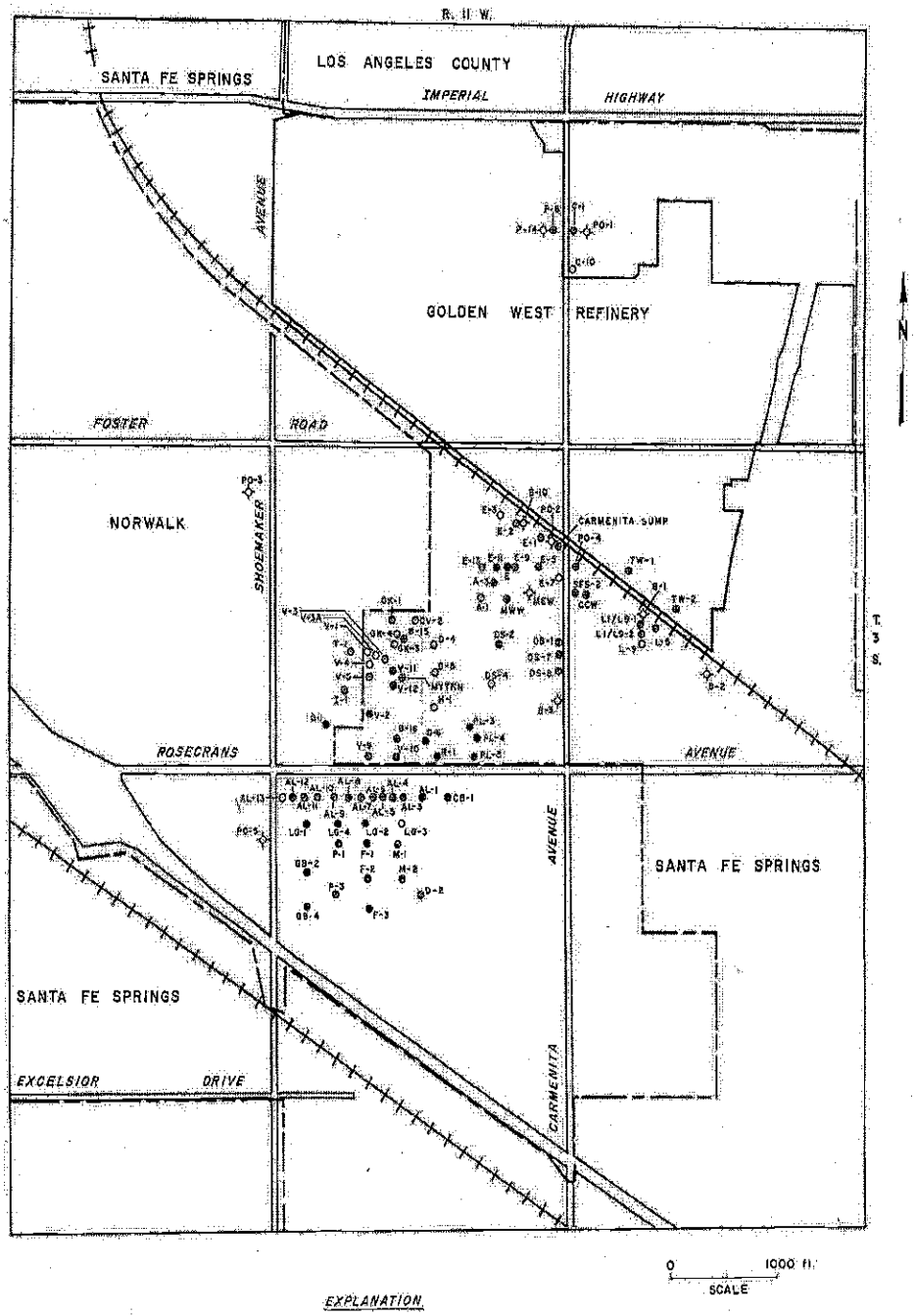
APPROXIMATE SCALE IN FEET

DETECTABLE DISSOLVED BENZENE AND MIBE IN THE ARTESIA GROUNDWATER ZONE

GOLDEN WEST REFINERY
SANTA FE SPRINGS, CALIFORNIA

SGI The Source Group, Inc.

FIGURE 9



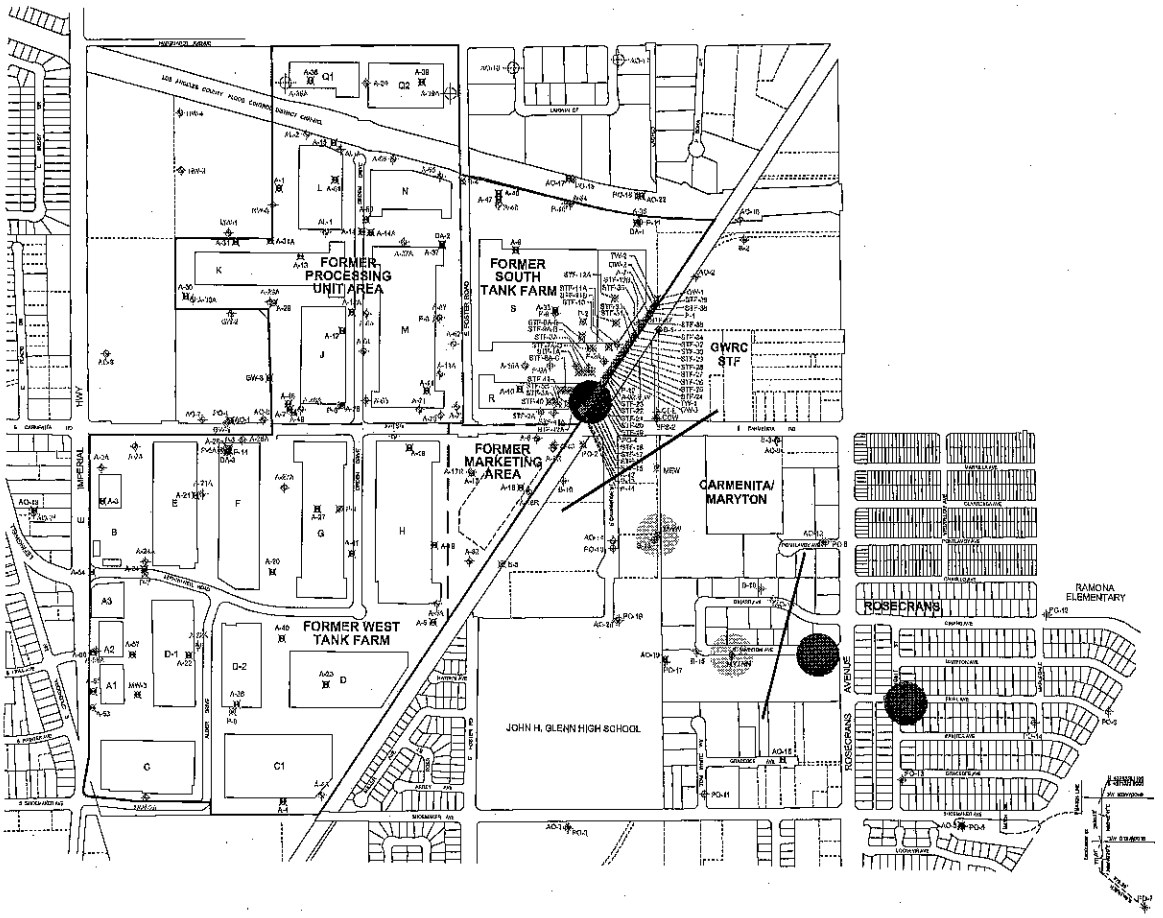
EXPLANATION

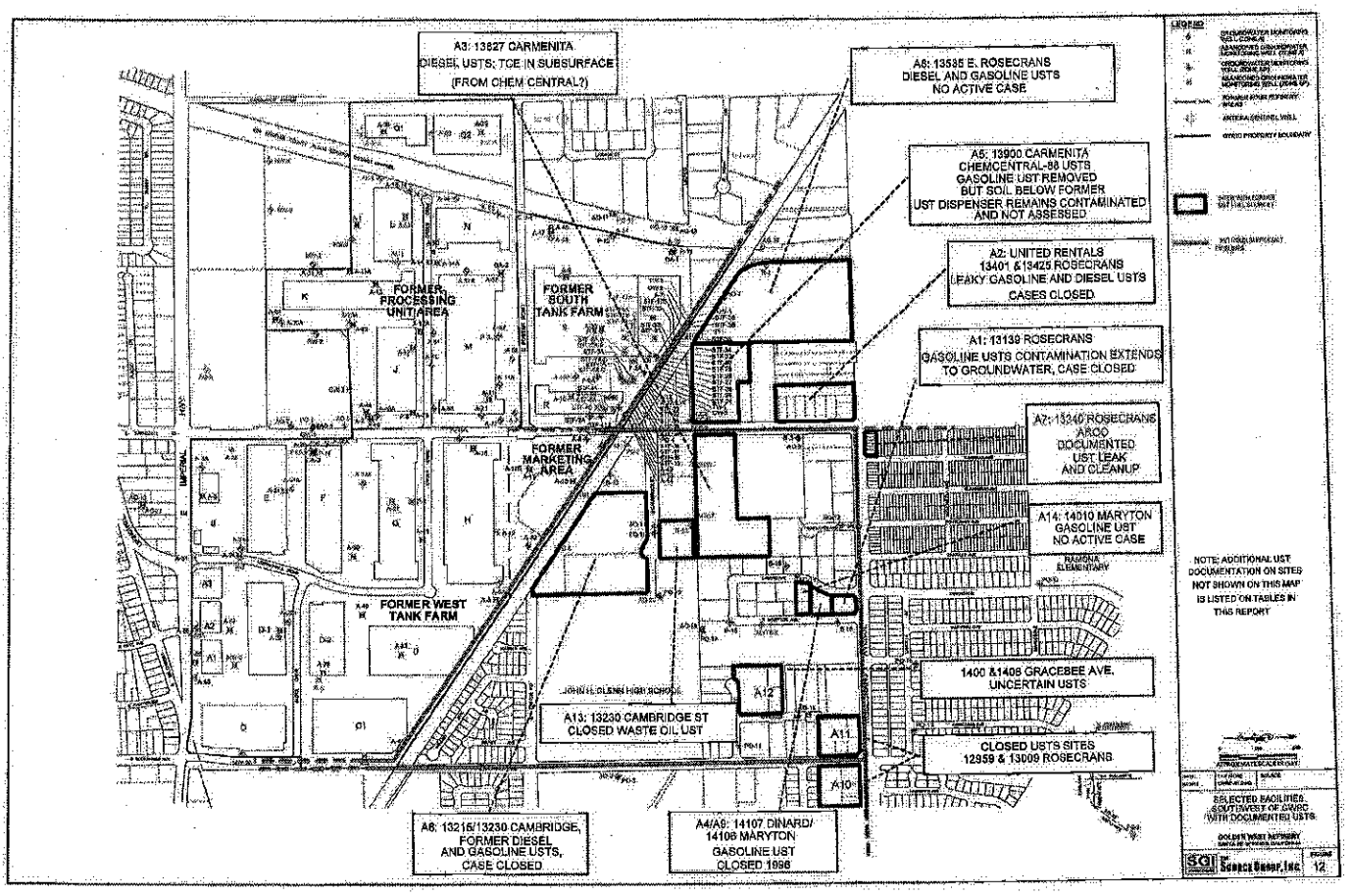
- CPT/HYDROPUNCH SAMPLING LOCATION - NO SAMPLE RETRIEVED
- CPT/HYDROPUNCH LOCATION AND RANGE OF TOTAL DISSOLVED BETX (mg/L)
  - NOT DETECTED (ND)
  - > ND <0.01
  - > 0.01 <0.10
  - > 0.10
- CPT/HYDROPUNCH LOCATION CONTAINING PRODUCT
  - MORE WEATHERED
  - LESS WEATHERED
- SEMI PERCHED MONITORING WELL (Sump) LOCATION
  - CONTAINING PRODUCT
  - CONTAINING NO PRODUCT OR DRY WELL

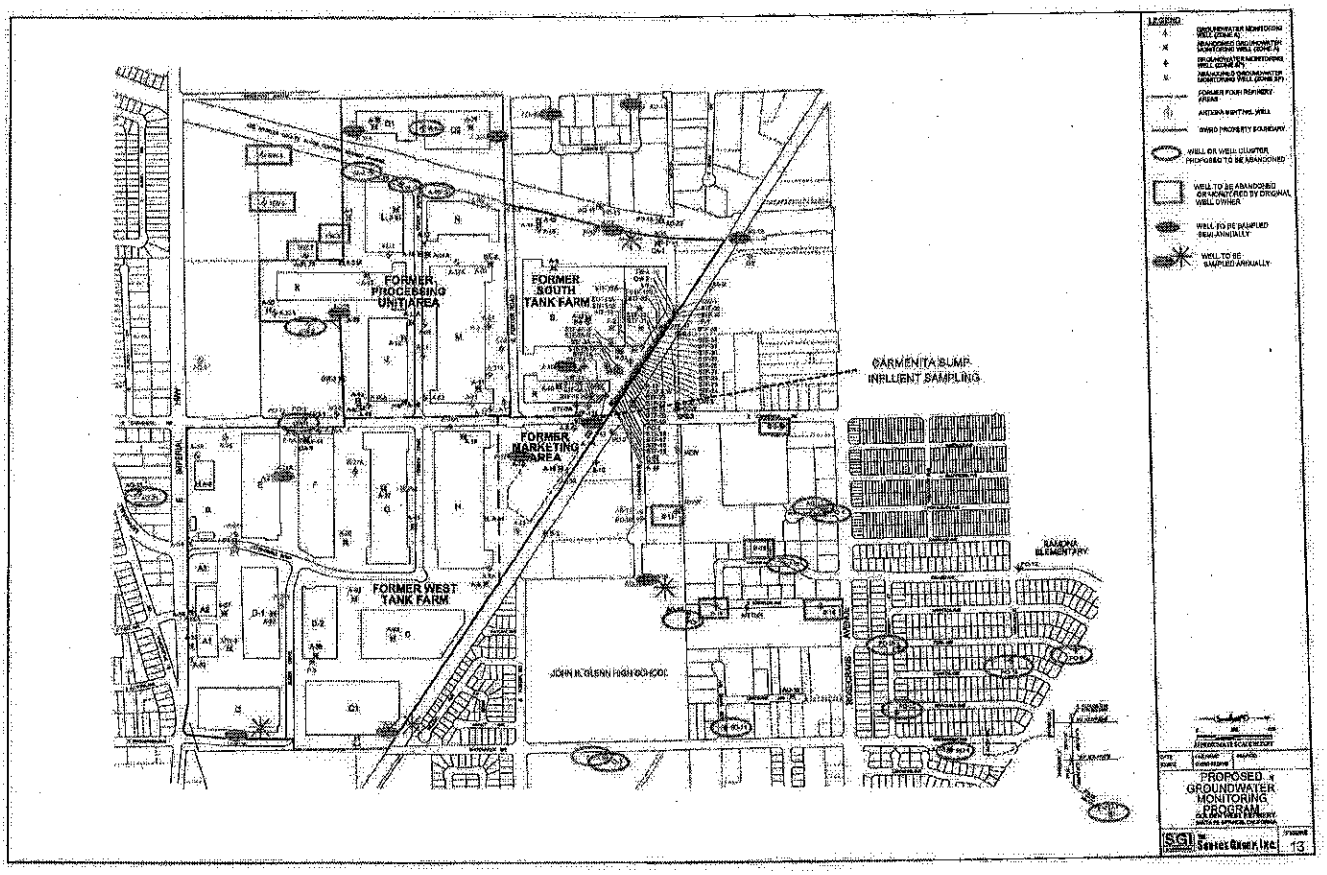
FIGURE IV-1: CPT/HYDROPUNCH SAMPLING LOCATIONS AND ANALYTICAL RESULTS, OFFSITE SEMI-PERCHED ZONE INVESTIGATION, GOLDEN WEST REFINERY (April 1991)

SGI environmental THE SOURCE GROUP, INC.

1991 IDENTIFICATION OF LNAPL PRODUCT CHARACTERISTICS	FIGURE 10


FORMER PROCESSING UNIT AREA
FORMER SOUTH TANK FARM
FORMER MARKETING AREA
FORMER WEST TANK FARM
GWRC STF
CARMENITA/ MARYTON
JOHN H. GLENN HIGH SCHOOL
ROSECRANS
ROSECRANS AVENUE
RAMONA ELEMENTARY
IMPERIAL HWY
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT CHANNEL
S. SORTO ROAD
LEGEND
GROUNDWATER MONITORING WELL (ZONE A)
ABANDONED GROUNDWATER MONITORING WELL (ZONE A)
GROUNDWATER MONITORING WELL (ZONE B/P)
ABANDONED GROUNDWATER MONITORING WELL (ZONE B/P)
FORMER FOUR REFINERY AREAS
ARTESIA SENTINEL WELL
GWRD PROPERTY BOUNDARY
LNAPL TYPES
GOLDEN WEST STF
CAMBRIDGE COURT/MARYRON AVENUE LNAPL
ROSECRANS LNAPL
APPROXIMATE SCALE IN FEET
INTERPRETED LNAPL DISTRIBUTION SEMI-PERCHED GROUNDWATER ZONE
GOLDEN WEST REFINERY
SANTA FE SPRINGS, CALIFORNIA
SGI
THE SOURCE GROUP, INC.
FIGURE 11


A3: 13627 CARMENITA
DIESEL USTS; TCE IN SUBSURFACE
(FROM CHEM CENTRAL?)
A8: 13535 E. ROSECRANS
DIESEL AND GASOLINE USTS
NO ACTIVE CASE
A5: 13900 CARMENITA
CHEMCENTRAL-88 USTS
GASOLINE UST REMOVED
BUT SOIL BELOW FORMER
UST DISPENSER REMAINS CONTAMINATED
AND NOT ASSESSED
A2: UNITED RENTALS
13401 & 13425 ROSECRANS
LEAKY GASOLINE AND DIESEL USTS
CASES CLOSED
A1: 13139 ROSECRANS
GASOLINE USTS CONTAMINATION EXTENDS
TO GROUNDWATER, CASE CLOSED
A7: 13340 ROSECRANS
ARCO
DOCUMENTED
UST LEAK
AND CLEANUP
A14: 14010 MARYTON
GASOLINE UST
NO ACTIVE CASE
1400 &1408 GRACEBEE AVE.
UNCERTAIN USTS
CLOSED USTS SITES
12959 & 13009 ROSECRANS
A13: 13230 CAMBRIDGE ST
CLOSED WASTE OIL UST
A6: 13215/13230 CAMBRIDGE,
FORMER DIESEL
AND GASOLINE USTS,
CASE CLOSED
A4/A9: 14107 DINARD/
14108 MARYTON
GASOLINE UST
CLOSED 1996
FORMER
PROCESSING
UNIT AREA
FORMER
SOUTH
TANK FARM
FORMER
MARKETING
AREA
FORMER WEST
TANK FARM
JOHN GLENN HIGH SCHOOL
NORWALK
ELEMENTARY
NOTE: ADDITIONAL UST
DOCUMENTATION ON SITES
NOT SHOWN ON THIS MAP
IS LISTED ON TABLES IN
THIS REPORT
SELECTED FACILITIES
SOUTHWEST OF GWRC
WITH DOCUMENTED USTS
SGI
Geosyntec Consultants, Inc.
12


FORMER PROCESSING UNIT AREA
FORMER SOUTH TANK FARM
FORMER MARKETING AREA
FORMER WEST TANK FARM
CARMENITA SUMP INFILLENT SAMPLING
JOHN H. OLSEN HIGH SCHOOL
SUSANA ELEMENTARY
PROPOSED GROUNDWATER MONITORING PROGRAM
SGI
Sierra Geotech, Inc.
13

TABLES

TABLE 1
Summary of Groundwater Wells
Golden West Refinery

Well	Artesia	Semi-Perched	Location			Ownership	Status		Construction Details		Install Date	Abandon Date
			Onsite	Offsite	Location		Current well 2011	Abandoned	Screen Interval (ft AMSL)			
WELL # A-1	X		X		PUA	GWRC		X	14.7	-5.3	1985	2000
WELL # A-2	X		X		PUA	GWRC		X	16.6	-1.4	1986	1999
WELL # A-3	X		X		WTF	GWRC		X	22.4	2.4	1985	2000
WELL # A-3A	X		X		WTF	GWRC	X		33.01	8.01	08/06/03	
WELL # A-4	X		X		WTF	GWRC		X	29	9	1985	1999
WELL # A-4A	X		X		WTF	GWRC	X		41.16	6.16	06/04/03	
WELL # A-5	X		X		WTF	GWRC		X	26.7	8.7	1985	1998
WELL # A-5A	X		X		WTF	GWRC	X		37.87	12.87	06/05/03	
WELL # A-6	X		X		MA	GWRC		X	38	6	1985	1994
WELL # A-6R	X		X		MA	GWRC	X		29.6	-0.4	11/18/94	
WELL # A-7	X		X		STF	GWRC	X		26	2.5	09/27/86	
WELL # A-8	X		X		MA	GWRC	X		24.3	4.3	01/29/86	
WELL # A-9	X		X		STF	GWRC		X	19.7	-0.3	1986	2004
WELL # A-10	X		X		STF	GWRC		X	25.1	-4.9	1986	2004
WELL # A-10A	X		X		STF	GWRC	X		43.98	13.98	02/10/06	
WELL # A-11	X		X		PUA	GWRC		X	31.8	1.8	1986	1999
WELL # A-11A	X		X		PUA	GWRC	X		46.77	16.77	02/09/06	
WELL # A-12	X		X		PUA	GWRC		X	4.9	-15.1	1986	1999
WELL # A-12A	X		X		PUA	GWRC		X	17.08	-12.92	2005	dec 10 2008
WELL # A-13	X		X		PUA	GWRC		X	15.3	-4.7	1986	2000
WELL # A-14	X		X		PUA	GWRC		X	17.1	-2.9	1986	2000
WELL # A-14A	X		X		PUA	GWRC		X	22.76	-7.24	2005	dec 10 2008
WELL # A-15	X		X		PUA	GWRC		X	16.6	-3.4	1986	2000
WELL # A-16	X		X		MA	GWRC		X	20.22	0.22	1985	2005
WELL # A-16R	X		X		MA	GWRC	X		45.13	10.13	02/24/06	
WELL # A-17	X		X		MA	GWRC		X	26.8	6.8	1985	
WELL # A-17R	X		X		MA	GWRC	X		47.58	12.58	12/07/06	
WELL # A-18	X		X		WTF	GWRC		X	35.5	16.6	1986	1997
WELL # A-18A	X		X		WTF	GWRC	X		40	15	08/16/03	
WELL # A-19	X		X		WTF	GWRC		X	24.1	4.1	1986	1998
WELL # A-20	X		X		WTF	GWRC		X	28.6	8.5	1986	1998
WELL # A-21	X		X		WTF	GWRC		X	27.9	7.9	1986	1998
WELL # A-21A	X		X		WTF	GWRC	X		34.23	9.23	06/12/06	
WELL # A-22	X		X		WTF	GWRC		X	26.9	6.9	1986	1998
WELL # A-22A	X		X		WTF	GWRC	X		37.19	12.19	06/11/03	
WELL # A-23	X		X		WTF	GWRC		X	26.3	8.3	1986	1998
WELL # A-24	X		X		WTF	GWRC		X	23.9	3.9	1988	1999
WELL # A-24A	X		X		WTF	GWRC	X		32.33	7.33	06/11/03	
WELL # A-25	X		X		WTF	GWRC	X		19	-1	1988	
WELL # A-26	X		X		WTF	GWRC		X	21.8	1.8	1985	1998
WELL # A-26A	X		X		WTF	GWRC	X		30.6	5.6	06/23/03	
WELL # A-27	X		X		WTF	GWRC		X	23.2	3.2	1988	1997
WELL # A-27A	X		X		WTF	GWRC	X		32.16	7.16	06/13/03	
WELL # A-28	X		X		WTF	GWRC		X	19	-1	1988	1999

TABLE 1
Summary of Groundwater Wells
Golden West Refinery

Well	Artesia	Semi-Perched	Location			Ownership	Status		Construction Details		Install Date	Abandon Date
			Onsite	Offsite	Location		Current well 2011	Abandoned	Screen Interval (ft AMSL)			
WELL # A-29	x		x		PUA	GWRC		X	22.6	-7.4	1988	1999
WELL # A-29A	x		x		PUA	GWRC	X		22.62	-7.38	02/23/06	
WELL # A-30	x		x		PUA	GWRC		X	24.3	-5.7	1988	2000
WELL # A-30A	x		x		PUA	GWRC	X		12.72	-17.28	03/07/06	
WELL # A-31	x		x		PUA	GWRC		X	9.5	-10.5	1988	1999
WELL # A-31A	x		x		PUA	GWRC		X	27.1	-2.9	2006	dec 10 2006
WELL # A-32	x		x		STF	GWRC	X		22.2	2.2	01/23/88	
WELL # A-32E	x		x		STF	GWRC	X		26	1	11/11/03 to 11/19/03	
WELL # A-32W	x		x		STF	GWRC	X		27	2	11/11/03 to 11/18/03	
WELL # A-33	x		x		STF	GWRC		X			1988	2004
WELL # A-34	x		x		STF	GWRC	X		11.1	-8.9	01/21/88	
WELL # A-35	x		x		STF	GWRC	X		12.4	-7.6	01/23/88	
WELL # A-36	x		x		WTF	GWRC		X	21.6	1.6	1988	1999
WELL # A-37	x		x		PUA	GWRC		X	9	-11	1988	2000
WELL # A-37A	x		x		PUA	GWRC	X		24.14	-5.86	02/09/06	
WELL # A-38	x		x		PUA	GWRC		X	10	-10	1988	2003
WELL # A-38A	x		x		PUA	GWRC	X		13.11	-16.89	03/08/06	
WELL # A-39	x		x		PUA	GWRC		X	10.7	-9.3	1988	2003
WELL # A-39A	x		x		PUA	GWRC	X		19.86	-10.14	03/07/06	
WELL # A-40	x		x		WTF	GWRC		X			1988	1998
WELL # A-41	x		x		WTF	GWRC		X			1988	1997
WELL # A-42	x		x		STF	GWRC	X		13.3	-16.7	04/26/89	
WELL # A-43	x		x		MA	GWRC	X		0.6	-9.4	04/26/89	
WELL # A-44	x		x		STF	GWRC	X		32	2	05/03/89	
WELL # A-45	x		x		STF	GWRC		X	-2.9	-32.9		late 2004
WELL # A-46	x		x		PUA	GWRC		X	20.4	-24.6	1990	2007
WELL # A-46A	x		x		PUA	GWRC	X		34.08	4.08	02/23/06	
WELL # A-47	x		x		STF	GWRC		X	8.1	-31.9	1990	2004
WELL # A-48	x		x		STF	GWRC	X		8.8	-31.2	01/08/91	
WELL # A-49	x		x		WTF	GWRC		X	19	-31	1991	1999
WELL # A-50	x		x		PUA	GWRC		X	15	-25	1991	1991
WELL # A-51	x		x		PUA	GWRC		X	20	-20	1991	2000
WELL # A-52	x		x		MA	GWRC	X		25	5	03/16/92	
WELL # A-53	x		x		WTF	GWRC		X	5	-35	1993	2000
WELL # A-54	x		x		WTF	GWRC		X	15	-15	1993	1998
WELL # A-55	x		x		WTF	GWRC		X	2.7	-17.3	1993	2000
WELL # A-56	x		x		WTF	GWRC		X	-0.3	-20.3	1994	2000
WELL # A-56A	x		x		WTF	GWRC	X		28.34	8.34	06/09/08	
WELL # A-57	x		x		WTF	GWRC		X	17.3	-2.7	1994	1999
WELL # A-60	x		x		PUA	GWRC	X		24.74	-5.26	3/7/05 3/8/05	
WELL # A-61	x		x		PUA	GWRC	X		31.86	1.86	02/07/06	
WELL # A-62	x		x		PUA	GWRC	X		46.82	16.82	2/7/06 2/8/06	

TABLE 1
Summary of Groundwater Wells
Golden West Refinery

Well	Artesia	Semi-Perched	Location			Ownership	Status		Construction Details		Install Date	Abandon Date
			Onsite	Offsite	Location		Current well 2011	Abandoned	Screen Interval (ft AMSL)			
WELL # A-63	x		x		PUA	GWRC	X		39.42	9.42	02/06/06	
WELL # A-64	x		x		PUA	GWRC	X		14.39	-15.61	12/06/06	
WELL # A-65	x		x		PUA	GWRC	X		30.59	0.59	04/28/06	
WELL # A-66	x		x		PUA	GWRC	X		44.83	14.83	04/26/06	
WELL # A-67	x		x		PUA	GWRC	X		27.63	-2.37	12/08/06	
WELL # A-71	x		x		PUA	GWRC	X		31.17	1.17	02/07/06	
WELL # A-72	x		x		PUA	GWRC	X		26.78	-3.22	02/09/06 02/10/06	
WELL # A-73	x		x		PUA	GWRC	X		44.26	14.26	02/07/06	
WELL # AL-1	x		x		PUA	GWRC	X		21.63	-13.37	09/10/04	
WELL # AL-2	x		x		PUA	GWRC	X		22.02	-12.98	09/13/04	
WELL # AL-3	x		x		PUA	GWRC	X		24	-11	09/09/04	
WELL # MW-2	x		x		WTF	GWRC		x	21.6	1.6	06/10/03	1999
WELL # MW-2A	x		x		WTF	GWRC	x		21.71	1.71	06/10/03	
WELL # DA-1	x		x		STF	GWRC		X	-48.6	-58.6	1990	1994
WELL # DA-2	x		x		PUA	GWRC		X	-57	-67	1990	1994
WELL # DA-3	x		x		WTF	GWRC		X	-52.1	-62.1	1990	1994
WELL # GW-1	x			x	OFF N	GWRC?	x		13.03	-6.97	1987	
WELL # GW-2	x			x	OFF N	GWRC?	x		16.53	-3.47	1987	
WELL # GW-3	x			x	OFF N	GWRC?		x	17.21	-2.79	1987	dec 10 2008
WELL # MW-3	x		x		WTF	GWRC		x	16.6	-4.4	1987	1999
WELL # AO-1	x			x	OFF N	GWRC		X	28.5	8.5	04/27/89	dec 10 2008
WELL # AO-2	x			x	OFF SE	GWRC	X		14.8	-5.2	04/28/89	
WELL # AO-3	x			x	OFF W	GWRC	X		28.1	-1.9	04/28/89	
WELL # AO-5	x			x	OFF SW	GWRC		X	25.7	5.7	04/28/89	2005
WELL # AO-6	x			x	OFF S	GWRC	X		24.3	4.3	1989	
WELL # AO-7	x			x	OFF N	GWRC	X		30.2	-19.8	1989	
WELL # AO-8	x			x	OFF N	GWRC	X		31.2	-18.8	11/16/89	
WELL # AO-9	x			x	OFF N	GWRC	X		28.5	-11.5	11/16/89	
WELL # AO-10	x			x	OFF E	GWRC	X		-2	-32	12/13/90	
WELL # AO-11	x			x	OFF E	GWRC	X		-1.7	-31.7	12/14/90	
WELL # AO-12	x			x	OFF S	GWRC	X		27.6	-12.4	07/29/91	
WELL # AO-13	x			x	OFF N	GWRC		X	22.7	2.7	1991	2005
WELL # AO-14	x			x	OFF S	GWRC	X		25.4	0.4	08/01/91	
WELL # AO-15	x			x	OFF SW	GWRC		X	32.1	7.1	1991	2005
WELL # AO-16	x			x	OFF S	GWRC	X		26.3	-3.7	03/09/92	
WELL # AO-17	x			x	OFF E	GWRC		X	7	-23	03/11/92	May 28 2009
WELL # AO-18	x			x	OFF SE	GWRC	X		16	-14	03/13/92	
WELL # AO-19	x			x	OFF SW	GWRC		X	27.1	-2.9	03/14/92	2010
WELL # AO-20	x			x	OFF SW	GWRC	X		28.9	-6.1	05/11/92	
WELL # AO-21	x			x	OFF N	GWRC	X		8.1	-21.9	05/20/92	
WELL # AO-22	x			x	OFF E	GWRC		X	7.1	-22.9	1992	May 28 2009

TABLE 1
Summary of Groundwater Wells
Golden West Refinery

Well	Artesia	Semi-Perched	Location			Ownership	Status		Construction Details		Install Date	Abandon Date
			Onsite	Offsite	Location		Current well 2011	Abandoned	Screen Interval (ft AMSL)			
WELL # NW-1	x			x	OFF NE	Others	x		16.25	-3.75		
WELL # NW-2	x			x	OFF NE	Others	x		11.1	-8.9		
WELL # NW-3	x			x	OFF NE	Others	x		10.8	-9.2		
WELL # NW-4				x	OFF NE	Others	x		11.1	-8.9		
WELL # NW-5	x			x	OFF NE	Others	x		-7.5	-22.5		
WELL # OW-1		x	x		STF	GWRC		x	79.6	66.6	1991	2001
WELL # OW-2		x	x		STF	GWRC	x				1991	
WELL # OW-3		x	x		STF	GWRC	x				1991	
WELL # OW-4		x	x		STF	GWRC		x	75.6	60.6	1991	2003
WELL # P-1		x	x			GWRC	x		71	50.5	09/23/66	
WELL # P-2		x	x		STF	GWRC		x	71	50.5	1986	2003
WELL # P-2A		x	x		STF	GWRC	x		78.1	63.1	04/26/06	
WELL # P-3		x	x		PUA	GWRC		x	62.4	42.4	1986	2000
WELL # P-4		x	x		WTF	GWRC		x	63	43	1986	1997
WELL # P-4A		x	x		WTF	GWRC	x		63.33	48.33	08/05/03	
WELL # P-5		x	x		WTF	GWRC		x	81.2	66.2	1986	1998
WELL # P-6		x	x		WTF	GWRC		x	76.9	55.9	1986	1998
WELL # P-6A		x	x		WTF	GWRC	x		49.52	34.52	08/06/03	
WELL # P-7		x	x			GWRC		x	62.2	42.2	1986	1998
WELL # P-8		x	x		WTF	GWRC		x	41.4	31.4	1988	1998
WELL # P-9		x	x		STF	GWRC		x	71.1	61.1	1988	2010
WELL # P-9A		x	x		STF	GWRC	x		73.68	58.68	12/08/05	
WELL # P-10		x	x		STF	GWRC	x		68.8	58.8	01/20/88	
WELL # P-11		x	x		STF	GWRC	x		68.6	58.6	01/19/88	
WELL # P-12		x	x		STF	GWRC	x		67.6	57.6	1988	
WELL # P-13		x	x			GWRC	x		75.4	55.4	1989	
WELL # P-14		x	x		WTF	GWRC		x			1989	2002
WELL # B-1		x		x	OFF	Others	x		6	26	1985	
WELL # B-2		x		x	OFF SE	Others	x		64.5	44.5	1985	
WELL # B-3		x		x	OFF S	Others	x		57.2	36.6	1985	
WELL # B-4		x		x		Others	x		79.1	59.1	1985	
WELL # B-5		x		x		Others	x		71.6	51.6	1985	
WELL # B-10		x		x	OFF S	Others	x		79	59	1985	
WELL # B-13		x		x	OFF S	Others	x		76.9	56.9	1985	
WELL # B-15		x		x	OFF SW	Others	x		75.4	55.4	1985	
WELL # B-16		x		x	OFF SW	Others	x		73.4	53.9	1985	
WELL # B-18		x		x	OFF SW	Others	x		74	54	1985	
WELL # CCW		x		x	OFF S	Others	x				1985	
WELL # MEW		x		x	OFF S	Others?		x			1985	2007
WELL # MWW		x		x	OFF S	Others?		x			1985	2007
WELL # MYTNN		x		x	OFF SW	Others?	x				1986	
WELL # PO-1		x		x	OFF N	GWRC		x	76.6	56.6	04/27/89	
WELL # PO-2		x		x		GWRC	x		70.1	60.1	1989	1991

TABLE 1
Summary of Groundwater Wells
Golden West Refinery

Well	Artesia	Semi-Perched	Location			Ownership	Status		Construction Details		Install Date	Abandon Date
			Onsite	Offsite	Location		Current well 2011	Abandoned	Screen Interval (ft AMSL)			
WELL # PO-3		x		x	OFF W	GWRC		x	76.4	66.4	04/28/89	
WELL # PO-4		x		x	OFF S	GWRC	x		75.6	65.6	04/28/89	
WELL # PO-5		x		x	OFF W	GWRC	x		54.9	34.9	05/02/89	
WELL # PO-6		x		x		GWRC		x	50.1	30.1	1989	1990
WELL # PO-7		x		x	OFF SW	GWRC	x		50.5	30.5	06/01/89	
WELL # PO-8		x		x	OFF S	GWRC	x		65.2	55.2	07/30/91	
WELL # PO-9		x		x	OFF S	GWRC	x		53.9	33.9	07/30/91	
WELL # PO-10		x		x	OFF S	GWRC	x		66	51	08/01/91	
WELL # PO-11		x		x	OFF SW	GWRC	x		66.2	54.2	08/02/91	
WELL # PO-12		x		x	OFF S	GWRC	x		60.5	40.5	03/07/92	
WELL # PO-13		x		x	OFF SW	GWRC	x		58.5	38.5	03/08/92	
WELL # PO-14		x		x	OFF S	GWRC	x		55.5	35.5	03/10/92	
WELL # PO-15		x		x	OFF E	GWRC		x	73	58	1992	May 28 2009
WELL # PO-16		x		x	OFF S	GWRC	x		61	46	03/12/92	
WELL # PO-17		x		x	OFF SW	GWRC	x		72	57	03/13/92	
WELL # PO-18		x		x	OFF E	GWRC		x	72.6	67.5	1992	May 28 2009
WELL # PO-19		x		x	OFF SW	GWRC	x		71.5	46.5	05/22/92	
WELL # SFS-2		x		x	OFF S	Others	x				1985	
WELL # STF-1		x	x		not on map	GWRC		x			1985	2004
WELL # STF-1A		x	x		STF	GWRC	x		73.12	58.12	03/03/06	
WELL # STF-2		x	x		not on map	GWRC		x			1985	2003
WELL # STF-2A		x	x		STF	GWRC	x		77.98	62.98	02/24/06	
WELL # STF-3		x	x		STF	GWRC		x			1985	2010
WELL # STF-3A		x	x		STF	GWRC	x		77.62	62.62	04/26/06	
WELL # STF-5A		x	x		STF	GWRC		x			1985	2004
WELL # STF-6A		x	x		STF	GWRC		x			1985	2004
WELL # STF-7D		x	x		STF	GWRC		x			1985	2004
WELL # STF-8B		x	x		STF	GWRC		x			1985	2003
WELL # STF-9B		x	x		STF	GWRC		x			1985	2004
WELL # STF-10		x	x		STF	GWRC		x			1985	2004
WELL # STF-11A		x	x		STF	GWRC		x			1985	2003
WELL # STF-11AA		x	x		STF	GWRC		x	77.05	62.05	2005	2009
WELL # STF-11B		x	x		STF	GWRC	x				2011	
WELL # STF-12		x	x		STF	GWRC		x			1985	2004
WELL # STF-12A		x	x		STF	GWRC		x	76.57	61.57	2005	2009
WELL # STF-12B		x	x		STF	GWRC	x				2011	
WELL # STF-13		x	x		STF	GWRC		x			1985	2001
WELL # STF-14		x	x		STF	GWRC		x			1985	2001
WELL # STF-15		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-16		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-17		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-18		x	x		STF	GWRC	x		74	54	1994	

TABLE 1
Summary of Groundwater Wells
Golden West Refinery

Well	Artesia	Semi-Perched	Location			Ownership	Status		Construction Details		Install Date	Abandon Date
			Onsite	Offsite	Location		Current well 2011	Abandoned	Screen Interval (ft AMSL)			
WELL # STF-19		x	x		STF	GWRC	x		75	55	1994	
WELL # STF-20		x	x		STF	GWRC	x		75	55	1994	
WELL # STF-21		x	x		STF	GWRC	x		75	55	1994	
WELL # STF-22		x	x		STF	GWRC	x		75	55	1994	
WELL # STF-23		x	x		STF	GWRC	x		77	57	1994	
WELL # STF-24		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-25		x	x		STF	GWRC	x		77	57	1994	
WELL # STF-26		x	x		STF	GWRC	x		77	57	1994	
WELL # STF-27		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-28		x	x		STF	GWRC	x		77	57	1994	
WELL # STF-29		x	x		STF	GWRC	x		74	54	1994	
WELL # STF-30		x	x		STF	GWRC	x		74	54	1994	
WELL # STF-31		x	x		STF	GWRC	x		74	54	1994	
WELL # STF-32		x	x		STF	GWRC	x		74	54	1994	
WELL # STF-33		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-34		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-35		x	x		STF	GWRC	x		78	58	1994	
WELL # STF-36		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-37		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-38		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-39		x	x		STF	GWRC	x		76	56	1994	
WELL # STF-40		x	x		STF	GWRC		x	76	56	1994	2004
WELL # STF-41		x	x		STF	GWRC		x	76	56	1994	2004
WELL # STF-41A		x	x		STF	GWRC	x		77.61	62.61	03/03/06	
WELL # STF-42		x	x		STF	GWRC		x	68	54	1994	2004
WELL # STF-42A		x	x		STF	GWRC	x		76.91	61.91	03/03/06	
WELL # TW-1		x	x		STF	GWRC	x				08/30/90	
WELL # TW-2		x	x		STF	GWRC		x			1991	2001
FORMER GW PRODUCTION WELL - WW-3	x		x		STF	GWRC		x	>200?			2002
FORMER GW PRODUCTION WELL - WW-7	x		x		STF	GWRC		x	>200?			1980
FORMER GW PRODUCTION WELL - WW-8	x		x		STF	GWRC		x	>200?			2000

Table 2
Fingerprinting Analyses Results
Golden West Refining
Santa Fe Springs, CA

Additive Concentrations (mg/L)								Key Source Compound Ratios	
Well	EDB	TML	TMEL	DMDEL	MTEL	TEL	MMT	Iso-Octane/ methylcyclohexane	Pristane/Phytane
B-13	<0.5	<5	<5	<5	16.5	104	<5	0.3	1.9
MYTNN	<0.5	<5	<5	<5	8.8	43	<5	<0.1	2.0
STF-16	<0.5	<5	<5	<5	12.5	34	<5	3.3	2
B-16	<0.5	<5	8.7	19	29	68	<5		
PO-16	<0.5	<5	5.8	12	39	94	<5		

Notes:
Samples collected February 7, 2012
EDB: Ethylene Dibromide
TML: Tetramethyl Lead
TMEL: Trimethylethyl Lead
DMDEL: Dimethyldiethyl Lead
MTEL: Methyltriethyl Lead
TEL: Tetraethyl Lead
MMT: Methylcyclopentadienyl Manganese Tricarbonyl

Table 3
Off-Site Potential Sources
South of Former Golden West Refinery

Site Address	Site Name	Figure 12 ID No.	Site Summary	Comments
13139 Rosecrans	Bear State Refrigeration	A1	UST removal 1988, excavation extended to 27 ft depth	Closure may be questionable:
			Fingeprinting of product sample collected from pit at the site compared to a sample from a well near or at refinery indicate both products to be aviation fuel (page 12)	Soil excavation to 27 ft depth (Feb 1996 RWQCB letter, item 2) following contamination found under the USTs indicate that contamination from the USTs did extend to groundwater.
			Site closed based on LNAPL from Golden West (RWQCB Feb 1996 letter)	October 1988 fingerprinting report (page 26) indicates that the fuel exhibits significant volatile hydrocarbons. It is unlikely that significant volatile hydrocarbons would remain if the product were the result of migration on groundwater from a source 500 ft away
			Closure reaffirmed May 2005 by RWQCB	
13401 Rosecrans	United Rentals	A2	Fiberglass 12,000 gallons 2-section (diesel/gasoline) tank removed under Santa Fe Springs Fire Dept supervision in 2006- clean soil samples- Case Closed	No evidence of deep contamination from the UST
13425 Rosecrans	United Rentals	A2	2000 gallon gasoline and diesel tank removed in 2005, contamination found, case transferred by Fire Dept to RWQCB. Soil borings drilled. No semi-perched groundwater encountered-first groundwater at 66 ft depth. 820 tons of soil removed. Groundwater assumed to be not impacted. RWQCB closed case in July 2009	Case closed
13636 Foster Rd	S Fe Springs City UST	–	UST removed in 2003, and closed. 70-ft long buried piping abandoned in place, but with 20-ft spacing samples collected through concrete	No evidence of contamination from UST or piping, but piping was not visually observed
13827 Carmenita Rd	Principal Mgt	A3	2 Diesel USTs removed in 1989-11,000 ppm TRPH under one of the USTs. S F Fire Dept notes gasoline range hydrocarbons not related to the diesel USTs. In April 2000, case is transferred to RWQCB noting presence of hydrocarbons and TCE in soil samples at a depth near groundwater (1989). May 2000 additional shallow soil tested to obtain shallow soil closure. Case closed August 2001	The presence of TCE under the site indicates likely groundwater contribution from ChemCentral facility east of Carmenita

Table 3
Off-Site Potential Sources
South of Former Golden West Refinery

Site Address	Site Name	Figure 12 ID No.	Site Summary	Comments
14107 Dinard/14106 Maryton	Certified Fasteners	A4	Cased closed by RWQCB June 1996. The UST was removed October 12, 1988. Three soil samples taken, two from the bottom of the UST and one 2 feet bgs below the dispenser. The highest TPH concentration was 5,190 mg/kg (SP-1) under the west end of the UST excavation. Further soil sampling around the walls of the dispenser excavation at 6 and 7 feet bgs encountered detections below 100 mg/kg.	Closure granted 8 years later. No groundwater encountered during UST excavation at 12 bgs.
13900 S Carmenita Road	Chem Central	A5	88 USTs and 3 ASTs. Shallow soil contamination documented on site. Major investigations with 60 borings, 14 groundwater wells and 11 vapor extraction wells. Gasoline UST removed, soil contamination noted but only partially excavated due to safety concerns. Soil samples at bottom of excavation contaminated. July 2011 Report acknowledges chlorinated VOCs impact from site to groundwater, but implicates GWRC for LNAPL.	Lateral extent of groundwater contamination undefined. Soil contamination under gasoline/diesel USTs at eastern edge of site remains undefined. Semi-perched zone absent in that eastern part of the site. TCE from site apparently migrated westward in Semi-Perched to 13827 Carmenita
14000 S. Gracebee Ave	D.J. Gunite Inc.	A6	One 10,000 gallon Diesel UST reported present in 2000 by the County of Los Angeles Fire Department.	It is not clear whether the Diesel UST is still present but no UST closure report has been found at this time.
14006 S. Gracebee Ave	Kerber Brothers Inc.	A6	Two 10,000 gallon Gasoline and Diesel USTs are reported present in 1997 by the County of Los Angeles Fire Department.	Not clear whether the Gasoline and Diesel USTs are still present but no UST closure report has been found at this time.
13340 Rosecrans	UNOCAL Station #5203	A7	Case was closed by the Regional State Water Resources Board on March 19, 2007 afte SVE. Three soil borings advanced to 30 feet bgs and one advanced to 50 feet bgs during site assement activities. The 50 foot soil sample did not contain dectecable concentrations of TPH and BTEX.	No Semi-Perched zone.

Table 3
Off-Site Potential Sources
South of Former Golden West Refinery

Site Address	Site Name	Figure 12 ID No.	Site Summary	Comments
13535 E. Rosecrans	Geo. M Huff Lumber Co.	A8	The company had two underground storage tanks that provide fuel for company trucks. One 7,500 gallon Diesel UST and one 4,000 gallon unleaded Gasoline UST. UST's removed March 13, 1991. Installed 15,000 gallon capacity UST, consisting of 11,000 gallons of Diesel and 4,000 gallons of Gasoline in 1991. Modifications to the 4,000 gallon compartment in order to store diesel were made on June 11, 2009.	No evidence of contamination, but no investigation.
13924 Maryton Ave	George's Diesel Service	-	In 1989, the company was cited for discharging waste oil into the ground at the south exterior of the waste storage area by the County of Los Angeles - Department of Health Services. Two soil samples were taken at 1' and 2' and analytical was non-detect for TPH.	The company had 250 gallons of waste oil stored at the facility.
13215 / 13230 (North) Cambridge	Fineman/Cenveo	A6	13215: 10,000 gallon gasoline UST, 10,000 gallon diesel UST removed. Contaminated soil; TRPH 6,400 ppm. Groundwater not encountered at 26 feet bgs on site. no Semi-Perched. Case closed. 13230: Waste oil UST removed- case closed.	No groundwater to 26 ft. No evidence of contamination. Case closed
13230 (South) Cambridge St	Aggreko	A13	No further action letter dated September 29, 2008 was issued to Aggreko. One 550 gallon waste oil UST was removed. A site investigation was conducted according to the no further action letter.	Well B-13 at the edge of the site has LNAPL that appears recent.
12959 Rosecrans	UNOCAL Station #4999	A10	Two generations of USTs installed. First generation were two 7,500 gallon gasoline USTs and one 250 gallon waste oil UST (installed 1963). The second generation were two 12,000 gallon gasoline USTs and one 520 gallon waste oil UST (installed 1985). Deepest soil boring at 18 feet bgs. No groundwater encountered.	Detections of TRPH not found below the UST excavations but were found below the dispenser. Case closed.

Table 3
Off-Site Potential Sources
South of Former Golden West Refinery

Site Address	Site Name	Figure 12 ID No.	Site Summary	Comments
13009 Rosecrans	Shell LUST	A11	Three 10,000 gallon gasoline USTs were removed in March 2003. Site assessment was conducted in 2005 and 2006. Groundwater monitoring wells showed impacts of MTBE at ~11 ug/L. A no further action letter dated February 18, 2010 was issued to Shell.	Soil and groundwater impacts are minimal.
14010 Maryton	Century Refrigeration	A14	One 5,000 gallon gasoline UST was removed on October 12, 1988. Three soil samples taken. Two soil samples had no detectable hydrocarbons. The third soil sample had a detectable hydrocarbon detection of 2.84 mg/kg.	No groundwater encountered during UST excavation of 12 bgs.
Carmenita / Rosecrans / Shoemaker	Multiple historical pipelines	–	No report of pipeline leaks or investigations. Major pipeline repiping assumed to have occurred in early 1980's during Carmenita Underpass construction	No information

TABLE 6
Proposed Discountinuation Of Monitoring
Former Golden West Refinery

Well No.	Proposed Action	Rationale
AO-12	Abandon	Redundant upgradient Artesia well
AO-16	Abandon	Redundant upgradient Artesia well
AO-3	Abandon	Redundant upgradient Artesia well
AO-21	Abandon	Redundant upgradient Artesia well
GW-1	Abandon	Redundant well near other Artesia wells AO-7, AO-8, A-28A
GW-2	Abandon	Redundant well near other Artesia wells A-30A and A-29A
A-60	Abandon	Redundant: surrounded by wells A-38 and A-39. Well tested and found ND in 2005.
AL-2	Abandon	Redundant: other wells exist upgradient and downgradient
AL-3	Abandon	Redundant: other wells exist upgradient and downgradient
A-66	Abandon	Redundant: other wells exist upgradient and downgradient
NW-2, NW-3, MW-4, and MW-1	Discontinue Monitoring	Wells belong to others - continued access is uncertain. Wells approved for abandonment by RWQCB in 2008
B-3, B-13, B-15, B-16, B-18	Discontinue Monitoring	Wells drilled by others - wells are in Semi-Perched zone beyond interpreted GWRC Plume
PO-3, PO-5, PO-7, PO-8, PO-9, PO-11, PO-13, PO-16, PO-17	Abandon	Wells are in Semi-Perched zone beyond interpreted GWRC Plume

TABLE 4
Current Grounwater Monitoring Program
Former Golden West Refinery

Well No.	Task/Frequency	Comments / Rationale
All	Gauging/Semi-Annually	Wells found to contain LNAPL are bailed and gauged frequently, up to twice/week.
A-4A	Sampling & Analysis / Semi-Annual	Upgradient Well
A-5A	Sampling & Analysis / Semi-Annual	Upgradient Well
A-10A	Sampling & Analysis / Semi-Annual	Downgradient of A-17R
A-17R	Sampling & Analysis / Semi-Annual	Localized MtBE Plume
A-21A	Sampling & Analysis / Semi-Annual	Localized MtBE Plume
A-38A	Sampling & Analysis / Semi-Annual	Downgradient Sentinel Well
A-39A	Sampling & Analysis / Semi-Annual	Downgradient Sentinel Well
AO-10	Sampling & Analysis / Semi-Annual	Downgradient Sentinel Well
AO-11	Sampling & Analysis / Semi-Annual	Downgradient Sentinel Well
AO-21	Sampling & Analysis / Semi-Annual	Upgradient Well
Carmenita Sump	Sampling & Analysis / Semi-Annual	Representative of STF Semi-perched groundwater

TABLE 5
Proposed Groundwater Monitoring Program
Former Golden West Refinery

Gauging: all Semi-Perched and Artesia Wells, Semi-Annually			
Sampling of Selected Wells, Semi-Annually to Annually			
Well No.	**Sampling Frequency**	**Recommended Analyses**	**Rationale**
MW-2A	Annually	TPH, BTEX, Oxygenates	Upgradient Well
A-4A	Annually	TPH, BTEX, Oxygenates	Upgradient Well
A-21A	Semi-annually	TPH, BTEX, Oxygenates	MtBE Local Plume
A-29A	Semi-annually	TPH, BTEX, Oxygenates	Downgradient of A-21A
A-17R	Semi-annually	TPH, BTEX, Oxygenates	MtBE Local Plume
A-10A	Semi-annually	TPH, BTEX, Oxygenates	Downgradient of A-17R
AO-18	Semi-annually	TPH, BTEX, Oxygenates	Southeastern edge of Plume
A-38A	Semi-annually	TPH, BTEX, Oxygenates	Downgradient Sentinel Well
A-39A	Semi-annually	TPH, BTEX, Oxygenates	Downgradient Sentinel Well
AO-10	Semi-annually	TPH, BTEX, Oxygenates	Downgradient Sentinel Well
AO-11	Semi-annually	TPH, BTEX, Oxygenates	Downgradient Sentinel Well
AO-20	Annually	TPH, BTEX, Oxygenates	Upgradient Artesia Well and lateral extent of LNAPL
P-10	Annually	TPH, BTEX, Oxygenates	Upgradient Semi-Perched Well
Carmenita Sump	Sami-annually	TPH, BTEX, Oxygenates	Representative of Semi-Perched STF Groundwater

APPENDIX A

APPENDIX A-1	AGENCY FILE REVIEW SUMMARY: TABLES A-1 AND A-2
APPENDIX A-2	DOCUMENTATION FROM REGULATORY FILES FOR SELECTED OFF-SITE HYDROCARBON SOURCES- ON CD ROM

APPENDIX A-1

Agency File Review Tables A-1 and A-2

TABLE A-1
AGENCY FILE REVIEW SITE SUMMARY
Sites Near Former Golden West Refinery

Address:		Street Name:	City:	On Geotracker?	Agency checked	SFSFD	RWQCB	LACHD	Comments
13215		Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	Contaminated soil; TRPH 6,400 ppm; 10,000 gallon gasoline UST, 10,000 gallon diesel UST removed. Groundwater not encountered at 26 feet bgs on site. Off-site well B-5 vapor sample taken 1991 and DTB of 40 feet. Case closed
13230		(North) Cambridge Road	Santa Fe Springs, CA	T0603701578	Yes	--	--	--	Closed Waste Oil UST. Completed site investigation and corrective action.
13230		(South) Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	No further action letter dated September 29, 2006 was issued to Aggreko. One 550 gallon waste oil UST was removed. A site investigation was conducted according to the no further action letter. Well B-13 at the edge of the site contains LNAPL.
13320		Cambridge Road	Santa Fe Springs, CA		Yes	Yes	--	--	TEG/LVI Environmental Services, Inc. Fire Deparment inspection in 1997 provided no evidence of potential sources of hydrocarbon contamination to the soil or groundwater at the site.
13322		Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	
13441		Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	
13344		Cambridge Road	Santa Fe Springs, CA		Yes	Yes	--	--	Santa Fe Springs Fire Department inspected the facility in 1997 to determine possible visible sources of potential hydrocarbon contamination. None observed. Staff interviewed.
13812		Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	
13893		Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	
13974		Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	
14054		Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	
14135		Cambridge Road	Santa Fe Springs, CA		Yes	--	--	--	
13083	S.	Carmenita Road	Santa Fe Springs, CA		Yes	--	--	--	
13715		Carmenita Road	Santa Fe Springs, CA		Yes	--	--	--	
13827	S.	Carmenita Road	Santa Fe Springs, CA	T0603792939	Yes	--	Yes	--	2 Diesel USTs removed in 1989-11,000 ppm TRPH under one of the USTs. S F Fire Dept notes gasoline range hydrocarbons not related to the diesel USTs. In April 2000, case is transferred to RWQCB noting presence of hydrocarbons and TCE in soil samples at a depth near groundwater (1989) - May 2000 additional shallow soil tested to obtain shallow soil closure. Case closed August 2001. The presence of TCE under the site may indicate groundwater contribution from ChemCentral facility east of Carmenita.
13900		Carmenita Road	Santa Fe Springs, CA	T0603701558 SL2043F1563	Yes	Yes	Yes	--	66 USTs and 3 ASTs. Shallow soil contamination documented on site. Major investigations with 60 borings, 14 groundwater wells and 11 vapor extraction wells. Groundwater VOCs not delineated. Gasoline UST in eastern part of the site removed, soil contamination noted but only partially excavated due to safety concerns. Soil samples at bottom of excavation contaminated. July 2011 Report acknowledges chlorinated VOCs impact from site to groundwater, but implicates GWRC for LNAPL. Soil contamination under gasoline/diesel USTs at eastern edge of site remains undefined. Semi-perched zone absent in that eastern part of the site.
13901		Carmenita Road	Santa Fe Springs, CA		Yes	Yes	--	--	California Box company. No known hydrcarbon storage
14008		Carmenita Road	Santa Fe Springs, CA		Yes.	Yes	--	--	Western Pacific Alliance. Excavated 23 tons of hydrocarbon impacted soil from an equipment service area. No further assessment conducted.
14215	S.	Carmenita Road	Santa Fe Springs, CA		Yes	--	--	--	
12989		Dinard Avenue	Santa Fe Springs, CA		Yes	--	--	--	
13922		Dinard	Santa Fe Springs, CA		Yes	--	--	--	
13929		Dinard	Santa Fe Springs, CA		Yes	Yes	--	--	ND Industries.
13938		Dinard	Santa Fe Springs, CA		Yes	Yes	--	--	Econo Products. Phenolic Molding Compounds stored and used.
14026		Dinard	Santa Fe Springs, CA		Yes	Yes	--	--	Unitech Mold Company, Inc.

TABLE A-1
AGENCY FILE REVIEW SITE SUMMARY
Sites Near Former Golden West Refinery

Address:		Street Name:	City:	On Geotracker?	Agency checked	SFSFD	RWQCB	LACHD	Comments
14107		Dinard Avenue	Santa Fe Springs, CA	T0603704172	Yes	--	Yes	--	5,000 gal unleaded gasoline tank Cased closed by RWQCB June 1996. The UST was removed October 12, 1988. Three soil samples taken, two from the bottom of the UST and one 2 feet bgs below the dispenser. The highest TPH concentration was 5,190 mg/kg (SP-1) under the west end of the UST excavation. Further soil sampling around the walls of the dispenser excavation at 6 and 7 feet bgs encountered detections below 100 mg/kg. Closure granted 8 years later. No groundwater encountered during UST excavation of 12 bgs. 14107 Dinard and 14108 Maryton may refer to one property.
14110		Dinard	Santa Fe Springs, CA		Yes	--	--	--	Larry's Auto Body and Paint. Solvents, thinners and paints storec
13636		Foster Road	Santa Fe Springs, CA		Yes	Yes	--	--	UST removed in 2003, and closed. 70-ft long buried piping abandoned in place, but with 20-ft spacing samples collected through concrete. No evidence of contamination from UST or piping but piping was not visually observed
12919		Gracebee Avenue	Norwalk, CA		Yes	--	--	--	
14000		Gracebee Avenue	Norwalk, CA		Yes	--	--	Yes	One 10,000 gallon Diesel UST reported present in 2000 by the County of Los Angeles Fire Department. It is not clear whether the Diesel UST is still present but no UST closure report has been found at this time.
14006		Gracebee Avenue	Norwalk, CA	T0603735379	Yes	--	--	Yes	Two 10,000 gallon Gasoline and Diesel USTs are reported present in 1997 by the County of Los Angeles Fire Department. Not clear whether the Gasoline and Diesel USTs are still present but no UST closure report has been found at this time.
12895		Maryton Avenue	Santa Fe Springs, CA						
13901	N.	Maryton	Santa Fe Springs, CA		Yes	Yes	--	--	GK Distributing and Trucking. Two small trailer buildings installed
13924	N.	Maryton	Santa Fe Springs, CA		Yes	Yes	--	--	George's Diesel Service. In 1989, the company was cited for discharging waste oil into the ground at the south exterior of the waste storage area by the County of Los Angeles - Department of Health Services. Two soil samples were taken at 1' and 2' and analytical was non-detect for TPH. The company had 250 gallons of waste oil stored at the facility.
13940	N.	Maryton	Santa Fe Springs, CA		Yes	Yes	--	--	ITW OIP Tool & Die Facility
14010		Maryton Avenue	Santa Fe Springs, CA		Yes	Yes	--	--	Century Refrigeration Company. 5,000 gal unleaded gasoline tank Cased closed by RWQCB June 1996. The UST was removed October 12, 1988. Three soil samples taken, two from the bottom of the UST and one 2 feet bgs below the dispenser. No groundwater encountered during UST excavation of 12 bgs.
14101		Pontiavoy	Santa Fe Springs, CA		Yes	Yes	--	--	Spectrum Paint Corp.
14105		Pontiavoy	Santa Fe Springs, CA		Yes	Yes	--	--	Natia Italia. Wholesale ceramic tile was manufactured. No known storage of hydrocarbons.
14106		Pontiavoy	Santa Fe Springs, CA		Yes	Yes	--	--	Anderson & Vreeland
14115		Pontiavoy	Santa Fe Springs, CA		Yes	Yes	--	--	Super Laundry Equipment manufacturer. Site was converted into a cell site in 2008.
14124		Pontiavoy	Santa Fe Springs, CA		Yes	Yes	--	--	Best Quality Transportation and currently City Town Transportation
12969		Rosecrans Avenue	Norwalk, CA	T0603703102	Yes	--	Yes	--	UNOCAL Station #4999. Two generations of USTs installed. First generation were two 7,500 gallon gasoline USTs and one 250 gallon waste oil UST (installed 1963). The second generation were two 12,000 gallon gasoline USTs and one 520 gallon waste oil UST (installed 1985). Deepest soil boring at 18 feet bgs. No groundwater encountered. Detections of TRPH not found below the UST excavations but were found below the dispenser. Case closed.
13003	E.	Rosecrans Avenue	Norwalk, CA		Yes	--	--	--	
13009		Rosecrans Avenue	Santa Fe Springs, CA	T0603742038 T0603702955		Yes	--	--	Borings to 25 feet and 45 feet bgs. TPHg 3,500 ug/kg, benzene 87 ug/kg and MTBE 12,000 ug/kg @25 feet bgs. Groundwater @55 feet bgs. Southwest @ 0.003 ft/ft. Groundwater monitoring wells showed impacts of MTBE at ~11 ug/L. A no further action letter dated February 19, 2010 was issued to Shell. Soil and groundwater impacts are minimal.
13039	E.	Rosecrans Avenue	Santa Fe Springs, CA		Yes	--	--	--	
13071	E.	Rosecrans Avenue	Santa Fe Springs, CA		Yes	Yes	--	--	Auto Service. Prior to 1990 the facility was a radiator service site.
13101	E.	Rosecrans Avenue	Santa Fe Springs, CA		Yes	Yes	--	--	Norwalk Dairy. Phase I conducted by Tetra Tech.

TABLE A-1
AGENCY FILE REVIEW SITE SUMMARY
Sites Near Former Golden West Refinery

Address:		Street Name:	City:	On Geotracker?	Agency checked	SFSFD	RWQCB	LACHD	Comments
13139		Rosecrans Avenue	Santa Fe Springs, CA	T0603704170	Yes	Yes	--	--	Two 5,000 gallons gasoline USTs removed in 1988, contamination observed to extend to 26 ft below grade. Excavation extended to 27 ft depth. Fingeprinting of product sample collected from pit at the site compared to a sample from a well near or at refinery reported as aviation gas (page 12), but the analysis was noted to contain significant volatile hydrocarbons. Site closed based on the attribution of LNAPL from Golden West (RWQCB Feb 1996 letter).
13209	E.	Rosecrans Avenue	Santa Fe Springs, CA		Yes	--	--	--	
13340		Rosecrans Avenue	Santa Fe Springs, CA	T0603703622 T0603792920	Yes	--	--	--	Arco facility #5203. Contaminated soil by MTBE and TBA stopped @ 30 feet bgs. Soils collected under dispensers and piping. No UST removal. Refusal @ 50 feet bgs by Geoprobe. SVE for several years. Groundwater @43.47 to 52 feet bgs. Generally east but has been north-east @ 0.1 ft/ft. No Semi-Perched zone.
			Santa Fe Springs, CA	T0603768344	Yes	--	--	--	
13401		Rosecrans Avenue	Santa Fe Springs, CA		Yes	Yes	--	--	Fiberglass 12,000 gallons 2-section (diesel/gasoline) tank removed under Santa Fe Springs Fire Dept supervision in 2008- clean soil samples- Case Closed. No evidence of deep contamination from the UST.
13404	E.	Rosecrans Avenue	Santa Fe Springs, CA		Yes	--	--	--	Chevron Service - Cobb Beg, Joe Snider, John Sloan- 1957-1964
13425	E.	Rosecrans Avenue	Santa Fe Springs, CA	T0603753439	Yes	Yes	--	--	2000 gallon gasoline and diesel tank removed in 2005, contamination found, case transferred by Fire Dept to RWQCB. Soil borings drilled. No semi-perched groundwater encountered-first groundwater at 66 ft depth. 820 tons of soil removed. Groundwater assumed to be not impacted. RWQCB closed case in July 2009
13426	E.	Rosecrans Avenue	Santa Fe Springs, CA		Yes	--	--	--	
13456		Rosecrans Avenue	Santa Fe Springs, CA		Yes	--	--	--	
13535		E. Rosecrans Ave.	Santa Fe Springs, CA		Yes	Yes	--	--	Geo. M Huff Lumber Co. has two underground storage tanks that provide fuel for company trucks. One 7,500 gallon Diesel UST and one 4,000 gallon unleaded Gasoline UST. UST's removed March 13, 1991. Installed 15,000 gallon capacity UST, consisting of 11,000 gallons of Diesel and 4,000 gallons of Gasoline in 1991. Modifications to the 4,000 gallon compartment in order to store diesel were made on June 11, 2009. No evidence of contamination, but no investigation

TABLE A-2
SITE SUMMARY OF DOCUMENTED OR SUSPECTED SOURCE AREAS
South of Former Golden West Refinery

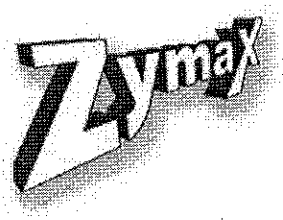
Address	Comments	Depth to Water	Details: Number of borings/wells?	Details: Remedial Action done?
13827 Carmenita	Principal Property. 2 Diesel USTs removed in 1989-11,000 ppm TRPH under one of the USTs. S F Fire Dept notes gasoline range hydrocarbons not related to the diesel USTs. In April 2000, case is transferred to RWQCB noting presence of hydrocarbons and TCE in soil samples at a depth near groundwater (1989) - May 2000 additional shallow soil tested to obtain shallow soil closure. Case closed August 2001	20-23 ft	14 soil borings near former USTs to 20-25 ft depth.	None?
13900 Carmenita	Chem Central / Univar. 88 USTs and 3 ASTs up to 15,000 gallons existed at the site. Contaminated soil remains undefined under dispensers near gasoline USTs in eastern part of the site where no Semi--Perched groundwater exists. Documented goundwater contamination with chlorinated solvents. Active SVE remediation for several years, and LNAPL removal from wells.	Semi-Perched in western part; Artesia only in Eastern part	60 borings, 11 SVE wells/13 groundwater monitoring wells	SVE-currently inactive. 900 gallons LNAPL removed to date. Soil under dispensers of fuel USTs not remediated?
13139 Rosecrans	Former Bear State Air Conditioning. Two 5,000 gallons gasoline USTs removed in 1988, contamination observed to extend to 26 ft below grade. Excavation extended to 27 ft depth Sidewalls observed to be contaminanted, and partial lateral ecavation conducted. Fingeprinting of product sample collected from pit at the site compared to a sample from a well near or at refinery reported to indicate both products to be aviation fuel (page 12), but the analysis was noted to contain significant volatile hydrocarbons. SGI note: if product had migrated from refinery area, about 2,000 ft away, volatile fraction would have been degraded. Site closed based on the attribution of LNAPL from Golden West (RWQCB Feb 1996 letter).	26-27 ft in 1988.	Excavation samples, no drilling	Soil Removal.
13535 Rosecrans	Geo. M Huff Lumber Co. has two underground storage tanks that provide fuel for company trucks. One 7,500 gallon Diesel UST and one 4,000 gallon unleaded Gasoline UST. UST's removed March 13, 1991. Installed 15,000 gallon capacity UST; consisting of 11,000 gallons of Diesel and 4,000 gallons of Gasoline in 1991. Modifications to the 4,000 gallon compartment in order to store diesel were made on June 11, 2008. No report of sampling	Unknown, but suspected Artesia groundwater only		None
13215 - 13230 (north) Cambridge	13215: 10,000 gallon gasoline UST, 10,000 gallon diesel UST removed. Contaminated soil; TRPH 6,400 ppm. Groundwater not encountered at 26 feet bgs on site. Off-site well B-5 vapor sample taken 1991 and DTB of 40 feet.- no Semi-Perched. Case closed. 13230 (north): Waste oil UST removed- case closed.	No groundwater to 26 ft	Soil borings in area of USTs	None
13230 (South) Cambridge Road	No further action letter dated September 29, 2008 was issued to Aggreko. One 550 gallon waste oil UST was removed. A site investigation was conducted according to the no further action letter. Well B-13 at the edge of the site has LNAPL that appears recent.	Semi-perched well - B-13 has LNAPL		
14107 Dinard/ 14106 Maryton	5,000 gal unleaded gasoline tank Cased closed by RWQCB June 1996. The UST was removed October 12, 1988. Three soil samples taken, two from the bottom of the UST and one 2 feet bgs below the dispenser. The highest TPH concentration was 5,190 mg/kg (SP-1) under the west end of the UST excavation. Further soil sampling around the walls of the dispenser excavation at 6 and 7 feet bgs encountered detections below 100 mg/kg. Closure granted 8 years later. No groundwater encountered during UST excavation	No groundwater observed.	Nine soil samples under UST and dispenser	None
14010 Maryton	5,000 gal unleaded gasoline tank Cased closed by RWQCB June 1996. The UST was removed October 12, 1988. Three soil samples taken, two from the bottom of the UST and one 2 feet bgs below the dispenser. No groundwater encountered during UST excavation of 12 bgs.	No groundwater observed	Three soil samples under UST and dispenser	

APPENDIX A-2

Documents from Regulatory Files for Selected Off-Site Hydrocarbon Sources

APPENDIX B

FINGERPRINTING REPORT



forensics

Golden West Refining

Report Prepared for:

The Source Group
1962 Freeman Avenue
Signal Hill, CA 90755

Report Prepared By:

Alan Jeffrey, PhD

ZymaX Forensics, 600 S. Andreasen Drive, Suite B, Escondido, CA 92029

3 March 2012

TABLE OF CONTENTS

Introduction

Three product samples, labeled B-13, MYTNN, and STF-16, were received at Zymax on February 9, 2012 for characterization of petroleum products in the samples. The following analyses were performed.

1. C_3-C_{44} whole oil analysis by GC/FID
2. 6 oxygenate blending agent by EPA 1625 mod
3. EDB/MMT/Organic lead speciation by GC/ECD

The complete laboratory data report is presented as an Appendix to this report.

Methodology

C_3-C_{44} whole oil analysis of product samples by GC/FID (ASTM D3328)

Identifies up to 149 compounds in the range between gasoline and residual oil. Includes gasoline-range PIANO analysis. Assists in the identification of types of petroleum products or crude oils present.

Product samples are directly injected into a GC equipped with a 100 meter Petrolcol column to separate the hydrocarbon, which are detected with a flame ionization detector (FID) interfaced to the GC. Hydrocarbons in the range of C_3 to C_{44} are identified and the peak areas measured. The relative area percent of hydrocarbons in the range of C_3 to C_{10} are calculated and presented as a PIANO distribution (normalized amounts of paraffins, isoparaffins, aromatics, naphthenes, olefins).

6 oxygenate blending agents in product samples by EPA Method 1625 Modified

*Quantifies oxygenated additives **(MtBE, DIPE, EtBE, TAME, TBA, Ethanol)** in samples. Data can provide information on the age of unleaded gasoline.*

Product samples are frozen in a vial in liquid nitrogen. Distilled water is added to the vial, and the product allowed to warm to partition the fuel oxygenates into the water. Recovery is monitored by isotopic dilution of deuterated fuel oxygenates. Six fuel oxygenates (MTBE, ETBE, DIPE, TAME, TBA, and ethanol) are identified and quantified in the water by injection into a gas chromatograph (GC) equipped with a 30 meter narrow bore ZB Wax capillary column interfaced to a mass spectrometer (MS) in Selected Ion Monitoring (SIM) mode.

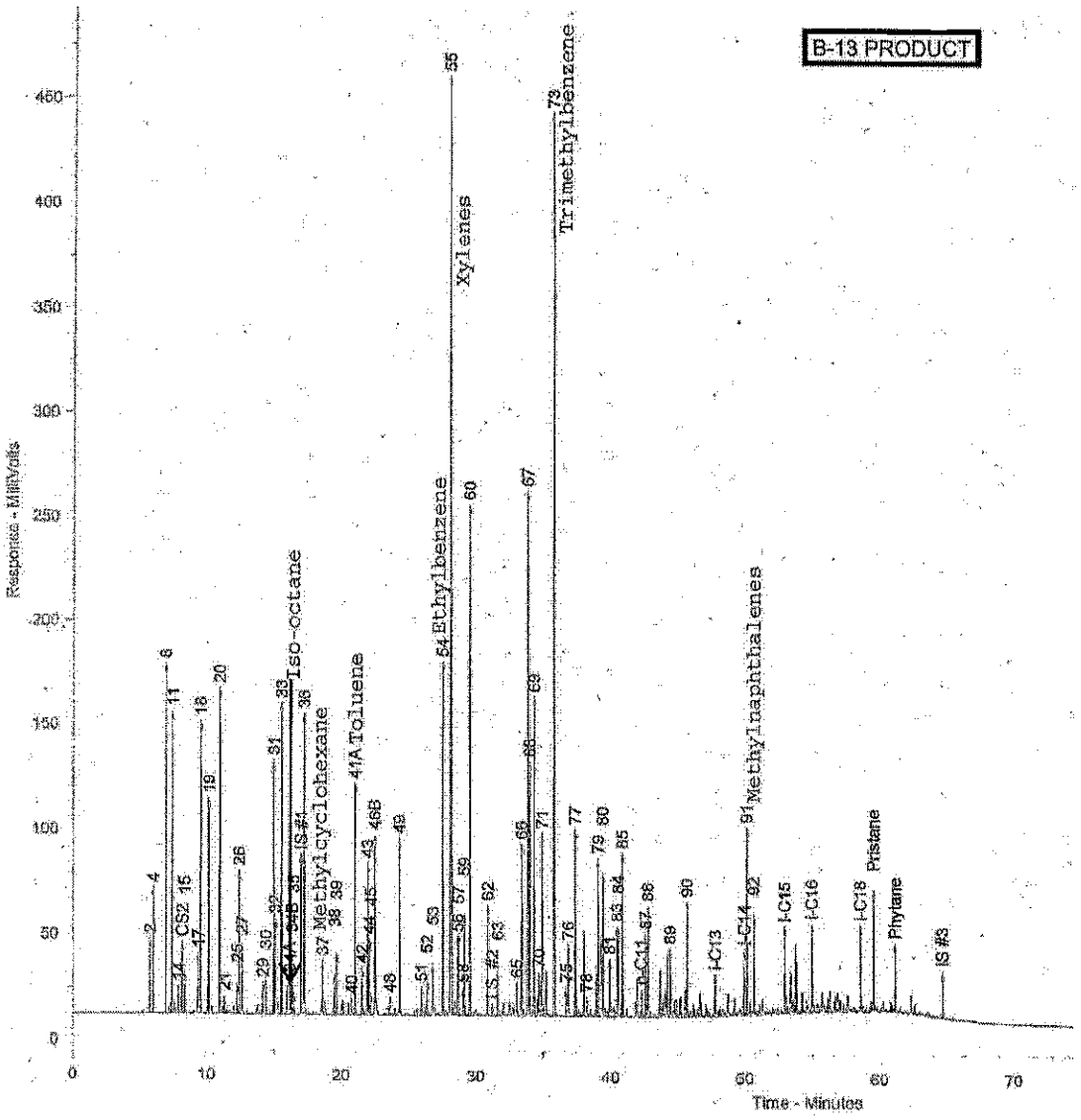
EDB, MMT, and alkyllead speciation in product samples by GC/ECD

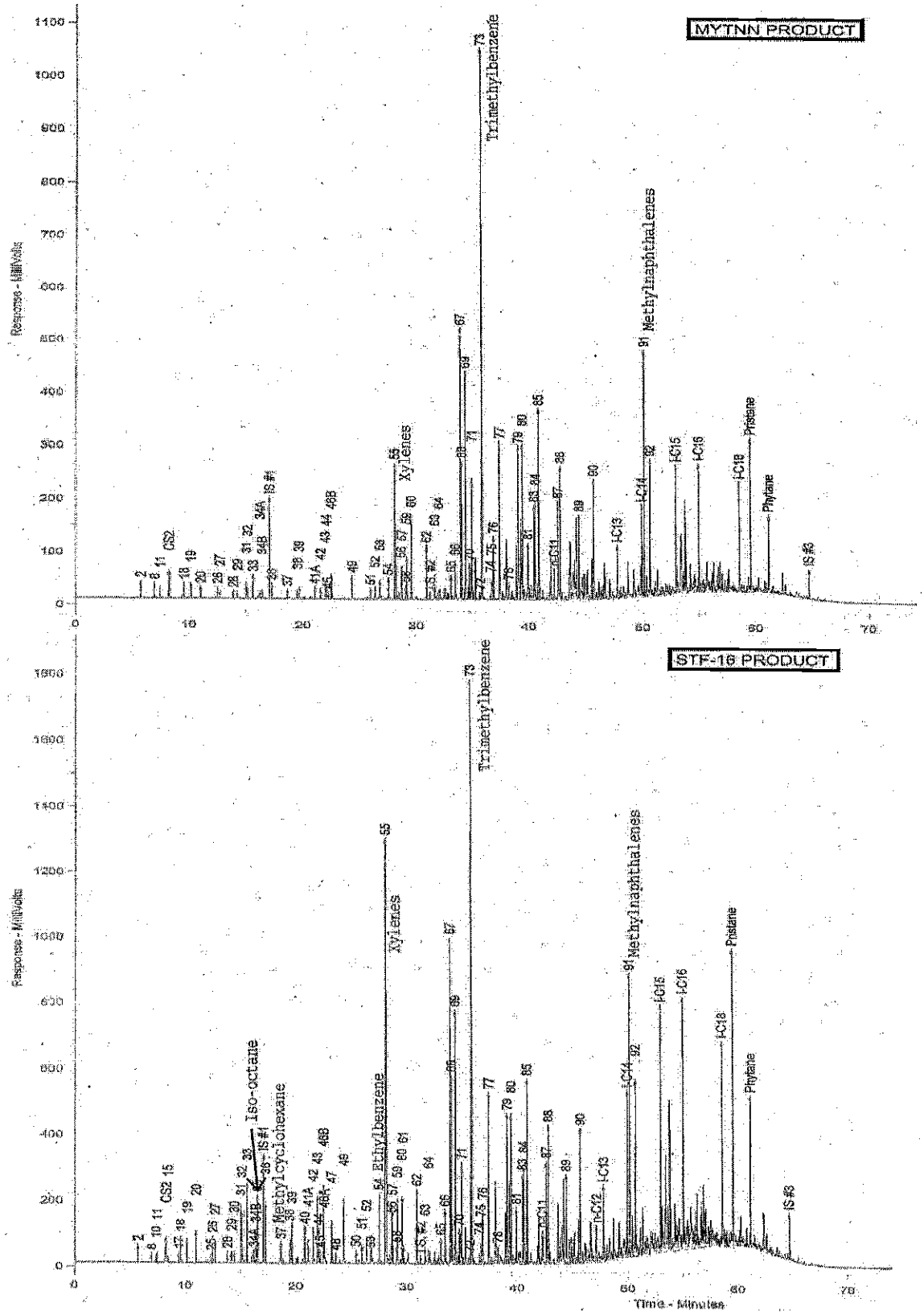
Quantifies the five alkyl lead compounds added to leaded gasoline as well as the lead scavenger, edb, and the manganese additive MMT. Provides information on age of leaded gasoline.

Product samples are directly injected into a GC equipped with a 60 meter DB1 column. Tetramethyllead, trimethylethyllead, dimethyldiethyllead, methyltriethyllead, tetraethyllead, methylcyclopentadienyl manganese tricarbonyl, and ethylene dibromide are detected with an electron capture detector (ECD) interfaced to the GC.

Petroleum Product Characterization

The C_3-C_{44} chromatograms of the samples, below and on the next page, show volatile hydrocarbons from 6 min to about 50 min retention time, and higher boiling hydrocarbons from about 50 min to about 65 min retention time. Complete compound identifications are provided in the data appendix.




MYTNN PRODUCT
STF-16 PRODUCT
Response - Millivolts
Time - Minutes
Trimethylbenzene
Xylenes
Methylnaphthalenes
Pristane
Phytane
Iso-octane
Methylcyclohexane
Ethylbenzene
IS #1
IS #2
IS #3
C32
nC11
nC12
nC13
nC14
nC15
nC16
nC18

The volatile products in the three samples are characterized by the presence of alkyl lead compounds, shown in Table 1, which were added to leaded gasoline to increase octane levels. B-13 and STF-16 also contain 2,2,4-trimethylpentane (iso-octane), which is also blended into many gasolines, and is a marker compound for gasoline. A very small so-octane peak was also present in the MYTNN chromatogram, but was not large enough to be quantified. The gasoline in the three samples has been severely weathered, as indicated by the depletion of the more volatile hydrocarbons on the left of the chromatograms, and of the water soluble aromatic hydrocarbons, benzene, toluene, and in MYTNN, xylenes. The alkyl lead concentrations are higher in B-13 than in the other two samples. However, this sample also contains a higher proportion of gasoline.

Table 1. EDB and ORGANIC LEAD SPECIATION

LAB NUMBER	SAMPLE DESCRIPTION	EDB mg/L	TML mg/L	TMEL mg/L	DMDEL mg/L	MTEL mg/L	TEL mg/L	MMT mg/L
42542-4	B-13	<0.5	<5	<5	<5	16.6	104	<5
42542-5	MYTNN	<0.5	<5	<5	<5	8.8	43	<5
42542-8	STF-16	<0.5	<5	<5	<5	12.5	34	<5
Detection Limit:		0.5	5.0	5.0	5.0	5.0	5.0	5.0
Method Blank:		<0.5	<5	<5	<5	<5	<5	<5

EDB: Ethylene Dibromide
TML: Tetramethyl Lead
TMEL: Trimethylethyl Lead
DMDEL: Dimethyldiethyl Lead
MTEL: Methyltriethyl Lead
TEL: Tetraethyl Lead
MMT: Methylcyclopentadienyl Manganese Tricarbonyl

There is a marked difference in the iso-octane/methylcyclohexane ratio in STF-16 compared to B-13 and MYTNN, as shown in Table 2. This ratio is controlled by the formulation of the gasoline, and different ratios in free products indicate different gasoline releases. There are other differences in the hydrocarbon formulations that confirm that STF-16 contains gasoline that is different from B-13 and MYTNN. The low abundance of gasoline hydrocarbons in MYTNN complicates its comparison with B-13. But there appear to be no significant differences in their formulations that would indicate that they contain different gasoline. Fuel oxygenates, which are added to many unleaded gasolines, were not detected in the samples. The leaded gasoline in the samples was banned in California in 1992, and the alkyl lead formulation in these gasolines was introduced in 1960. So the gasoline in the samples would have been released in this time period.

Table 2. Key source compound ratios in the samples

Sample	Iso-octane/ methylcyclohexane	Pristane/ Phytane
B-13	0.3	1.9
MYTNN	<0.1	2.0
STF-16	3.3	2.0

The higher boiling hydrocarbons in the three samples have a carbon range from about C12 to C23, a distribution that is consistent with a middle distillate such as #2 diesel or #2 fuel oil. The ratio of Pristane/Phytane is inherited by petroleum products from the crude oil from which they are refined, and can be used to distinguish middle distillates from different sources. As shown in Table 2, this ratio is similar in the three samples. N-alkanes, which are the most readily biodegraded hydrocarbons in petroleum products, are absent in the diesel/#2 fuel oil in the three samples; the product is dominated by the more resistant isoalkanes (iC14, iC15, iC16, iC18, Pristane, Phytane). This indicates that the diesel in the samples has been degraded, and the degree of degradation is consistent with a release that was most likely more than 10 years ago.

Conclusions

Product samples B-13, MYTNN, and STF-16 contain severely weathered leaded gasoline and degraded #2 diesel or #2 fuel oil.

The gasoline is very similar in B-13 and MYTNN; the gasoline in STF-16 is a different release. The gasoline in the samples would have been released between 1960 and 1992.

The degraded diesel/#2 fuel oil is very similar in the three samples and was most likely released more than 10 years ago.

EDB/MMT/Organic Lead Speciation

(By GC-ECD EPA 8080M Method)

REPORT OF ANALYTICAL RESULTS

ZymaX FORENSICS

Client:	Paul Parmentier The Source Group 1962 Freeman Ave. Signal Hill, CA 90755
Project:	
Project Number:	
Collected by:	

Lab Number:	42542
Collected:	2/7/2012
Received:	2/9/2012
Matrix:	Product
Sample Description:	See Below
Analyzed:	2/22/2012
Method:	GC/ECD

EDB and ORGANIC LEAD SPECIATION

LAB NUMBER	SAMPLE DESCRIPTION	EDB mg/L	TML mg/L	TMEL mg/L	DMDEL mg/L	MTEL mg/L	TEL mg/L	MMT mg/L
42542-4	B-13	<0.5	<5	<5	<5	16.5	104	<5
42542-5	MYTNN	<0.5	<5	<5	<5	8.8	43	<5
42542-8	STF-16	<0.5	<5	<5	<5	12.5	34	<5
Detection Limit:		0.5	5.0	5.0	5.0	5.0	5.0	5.0
Method Blank:		<0.5	<5	<5	<5	<5	<5	<5

EDB: Ethylene Dibromide
TML: Tetramethyl Lead
TMEL: Trimethylethyl Lead
DMDEL: Dimethyldiethyl Lead
MTEL: Methyltriethyl Lead
TEL: Tetraethyl Lead
MMT: Methylcyclopentadienyl Manganese Tricarbonyl

Submitted by,
Zymax Forensics, A DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

42542e-b.xls
STL

QUALITY ASSURANCE REPORT

ZymaX FORENSICS

Client:	
	The Source Group
	1962 Freeman Ave.
	Signal Hill, CA 90755

Lab Number:	42542
Analyzed:	2/22/2012
Method:	GC/ECD

QA DATA FOR EDB and TEL

ANALYTES	RF	RF_D	%D	ACCEPTANCE LIMIT %
EDB	0.684	0.68	0.50	± 15
TEL	0.038	0.033	13.50	± 15

EDB: Ethylene Dibromide
TEL: Tetraethyl Lead
RF = Mean response factor from 3 point calibration
RF_D= Daily calibration standard response factor
% D = % Difference
Calibration file: ORG07168.M / MMT07168.M

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

42542e-b.xls
STL

Oxygenated Blending Agents

(By EPA 1625 Modified Method)

ZymaX FORENSICS

REPORT OF ANALYTICAL RESULTS

Client: Paul Parmentier The Source Group 1962 Freeman Ave. Signal Hill, CA 90755	Lab Number: 42542-4 Collected: 2/7/2012 Received: 2/9/2012 Matrix: Product
Project: Project Number: Collected by:	Sample Description: B-13 Analyzed: 2/22/2012 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Dilsopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	ND
Percent Surrogate Recovery (MTBE-d3)		100

*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

42542-4.oxy.xls
STL

Shan-Tan Lu, Ph.D.

ZymaX FORENSICS

REPORT OF ANALYTICAL RESULTS

Client: Paul Parmentier The Source Group 1962 Freeman Ave. Signal Hill, CA 90755	Lab Number: 42542-5 Collected: 2/7/2012 Received: 2/9/2012 Matrix: Product
Project: Project Number: Collected by:	Sample Description: MYTNN Analyzed: 2/22/2012 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Diisopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	ND
Percent Surrogate Recovery (MTBE-d3)		104

*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.

42542-5.oxy.xls
STL

ZymaX FORENSICS

REPORT OF ANALYTICAL RESULTS

Client: Paul Parmentier The Source Group 1962 Freeman Ave. Signal Hill, CA 90755	Lab Number: 42542-8 Collected: 2/7/2012 Received: 2/9/2012 Matrix: Product
Project: Project Number: Collected by:	Sample Description: STF-16 Analyzed: 2/22/2012 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Dilsopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	ND
Percent Surrogate Recovery (MTBE-d3)		95

*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.

42542-8.oxy.xls
STL

C_3-C_{44} Whole Oil Analysis

1) Whole Chromatogram

2) Expanded Chromatogram (in 3 pages)

3) Quantitation Report with peak areas

Reviewed by: STL

ZymaX FORENSICS

2/15/2012

ZymaX ID	42542-4
Sample ID	B-13
Evaporation	
n-Pentane / n-Heptane	0.57
2-Methylpentane / 2-Methylheptane	1.45
Waterwashing	
Benzene / Cyclohexane	0.00
Toluene / Methylcyclohexane	4.01
Aromatics / Total Paraffins (n+iso+cyc)	1.80
Aromatics / Naphthenes	14.26
Biodegradation	
(C4 - C8 Para + Isopara) / C4 - C8 Olefins	49.17
3-Methylhexane / n-Heptane	1.04
Methylcyclohexane / n-Heptane	0.20
Isoparaffins + Naphthenes / Paraffins	2.33
Octane rating	
2,2,4,-Trimethylpentane / Methylcyclohexane	0.31
Relative percentages - Bulk hydrocarbon composition as PIANO	
% Paraffinic	10.65
% Isoparaffinic	20.35
% Aromatic	63.92
% Naphthenic	4.48
% Olefinic	0.60

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

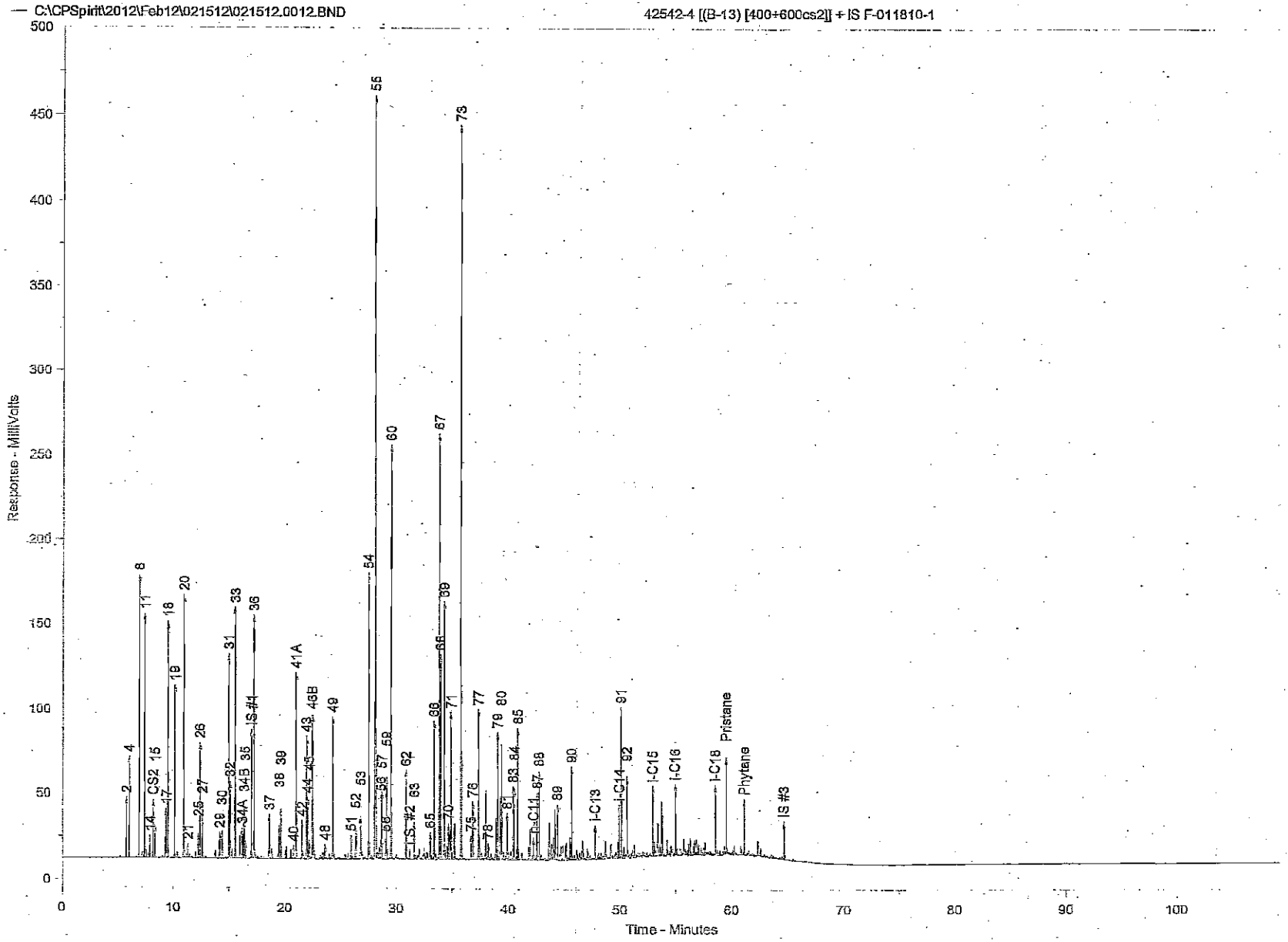
2/15/2012

ZymaX ID		42542-4
Sample ID		B-13
		Relative Area %
1	Propane	0.00
2	Isobutane	0.29
3	Isobutene	0.00
4	Butane/Methanol	0.49
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	1.70
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.00
11	Pentane	1.56
12	trans-2-Pentene	0.00
13	cis-2-Pentene/t-Butanol	0.00
14	2-Methyl-2-butene	0.11
15	2,2-Dimethylbutane	0.20
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.39
18	2-Methylpentane	2.07
19	3-Methylpentane	1.60
20	Hexane	2.50
21	trans-2-Hexene	0.07
22	3-Methylcyclopentene	0.00
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.00
25	3-Methyl-trans-2-pentene	0.19
26	Methylcyclopentane	1.15
27	2,4-Dimethylpentane	0.37
28	Benzene	0.00
29	5-Methyl-1-hexene	0.23
30	Cyclohexane	0.24
31	2-Methylhexane/TAME	2.29
32	2,3-Dimethylpentane	0.82
33	3-Methylhexane	2.86
34A	1-trans-3-Dimethylcyclopentane	0.27
34B	1-cis-3-Dimethylcyclopentane	0.37
35	2,2,4-Trimethylpentane	0.17
I.S. #1	à,à,à-Trifluorotoluene	0.00

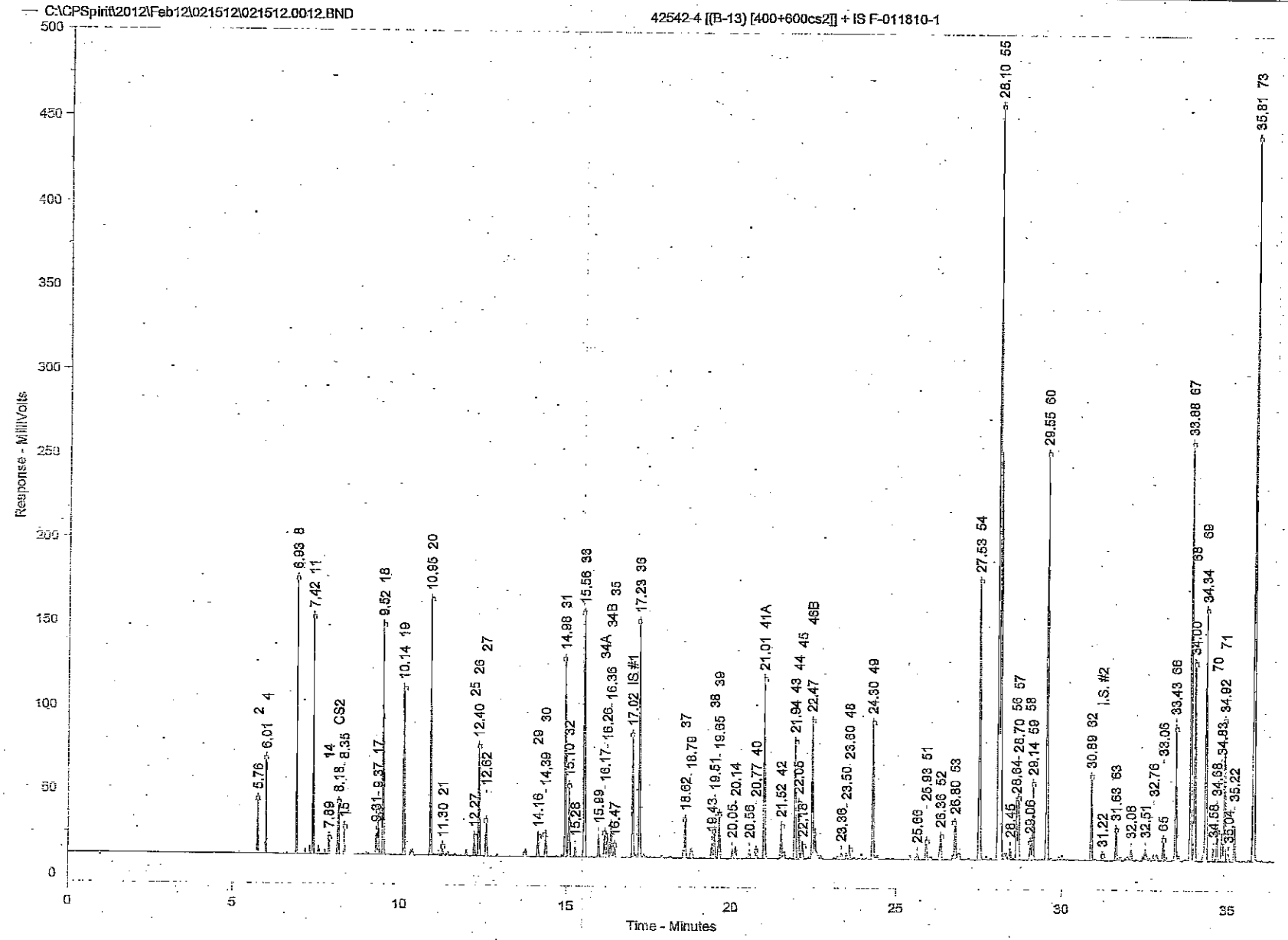
ZymaX FORENSICS

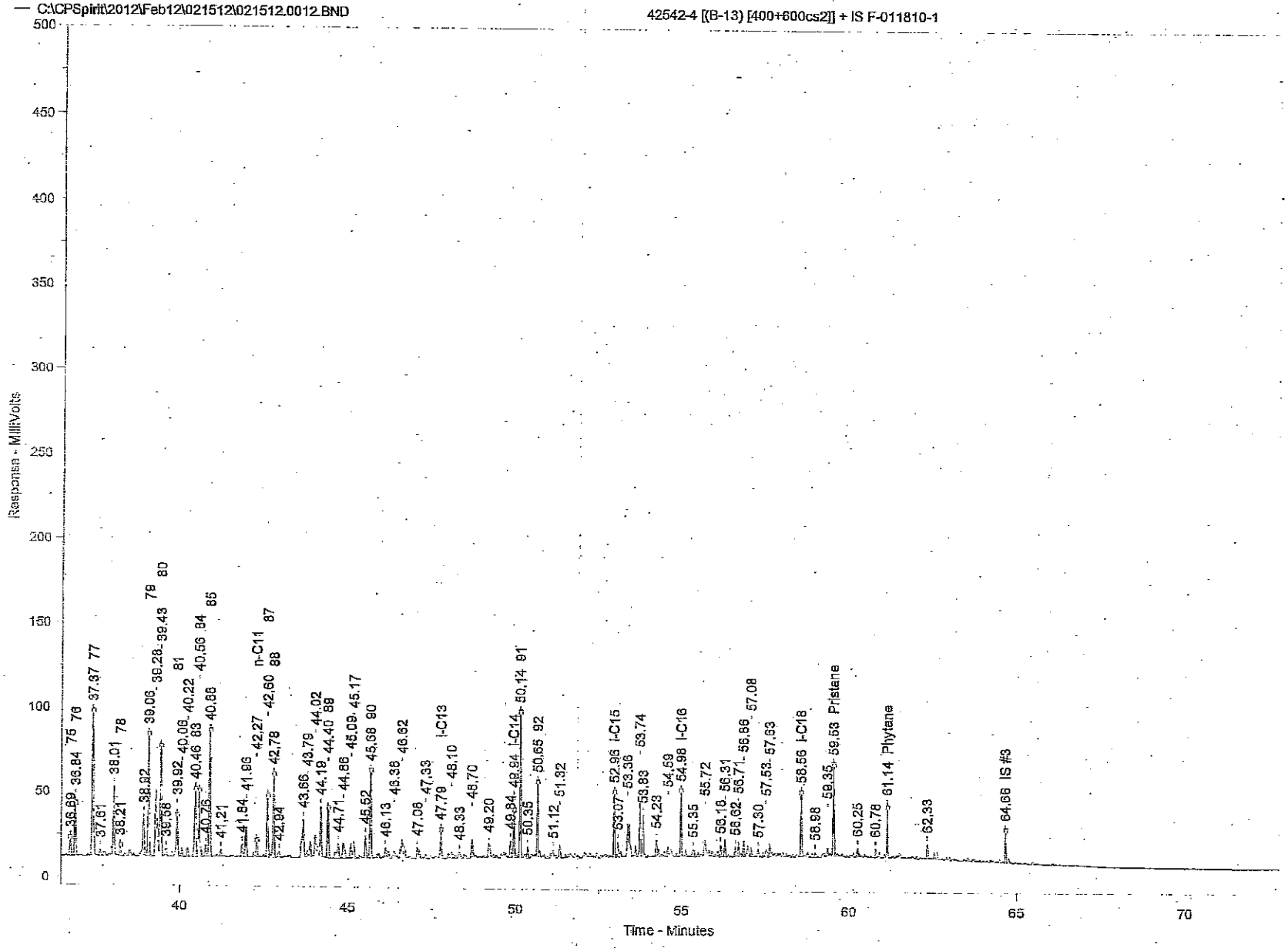
2/15/2012

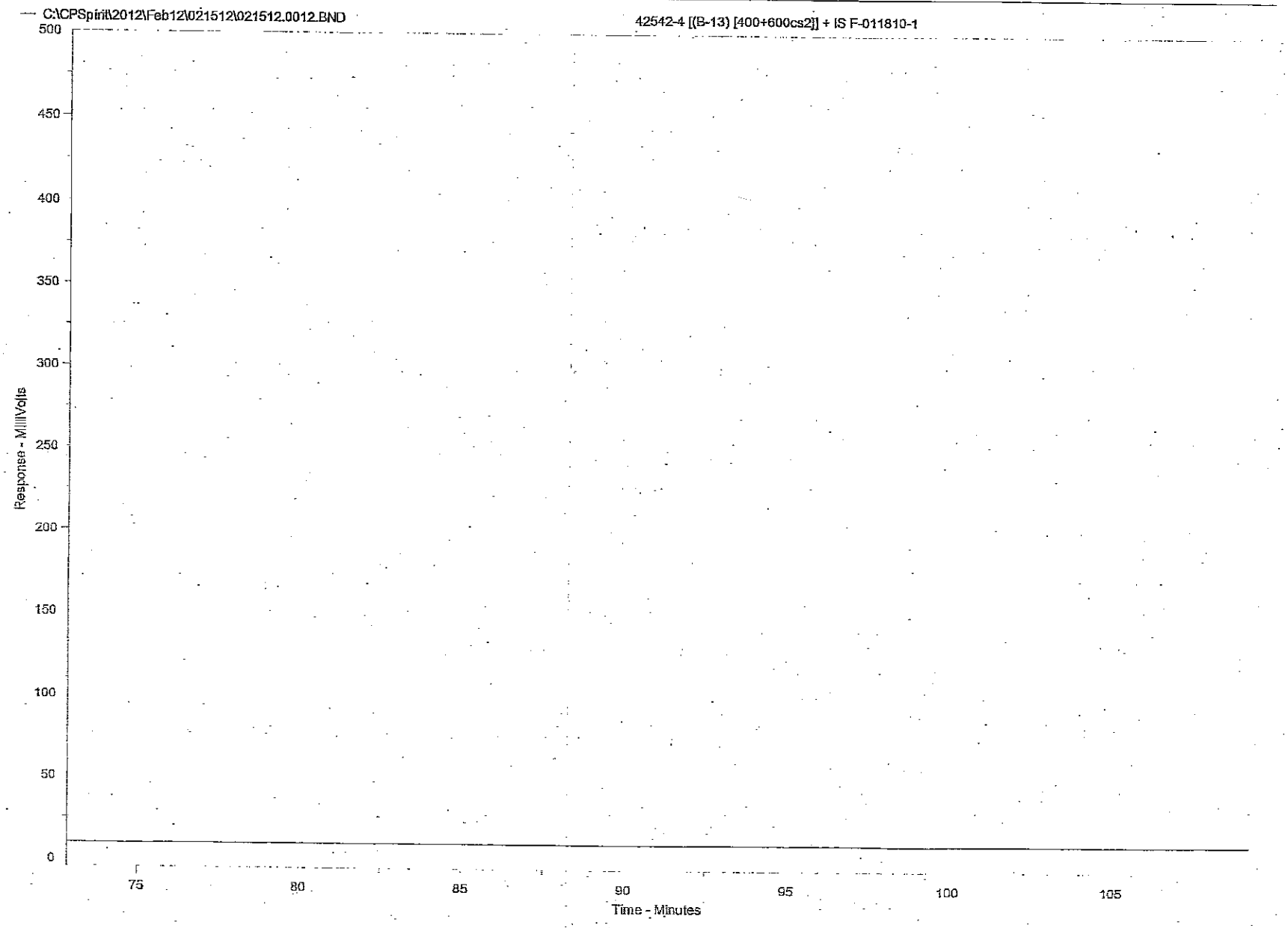
ZymaX ID		42542-4
Sample ID		B-13
		Relative Area %
71	1-Methyl-2-ethylbenzene	1.73
72	3-Methylnonane	0.00
73	1,2,4-Trimethylbenzene	9.12
74	Isobutylbenzene	0.00
75	sec-Butylbenzene	0.22
76	n-Decane	0.69
77	1,2,3-Trimethylbenzene	2.00
78	Indan	0.12
79	1,3-Diethylbenzene	1.58
80	1,4-Diethylbenzene	1.37
81	n-Butylbenzene	0.57
82	1,3-Dimethyl-5-ethylbenzene	0.00
83	1,4-Dimethyl-2-ethylbenzene	0.95
84	1,3-Dimethyl-4-ethylbenzene	0.93
85	1,2-Dimethyl-4-ethylbenzene	1.60
86	Undecene	0.00
87	1,2,4,5-Tetramethylbenzene	0.79
88	1,2,3,5-Tetramethylbenzene	1.08
89	1,2,3,4-Tetramethylbenzene	0.63
90	Naphthalene	1.07
91	2-Methyl-naphthalene	1.47
92	1-Methyl-naphthalene	0.77

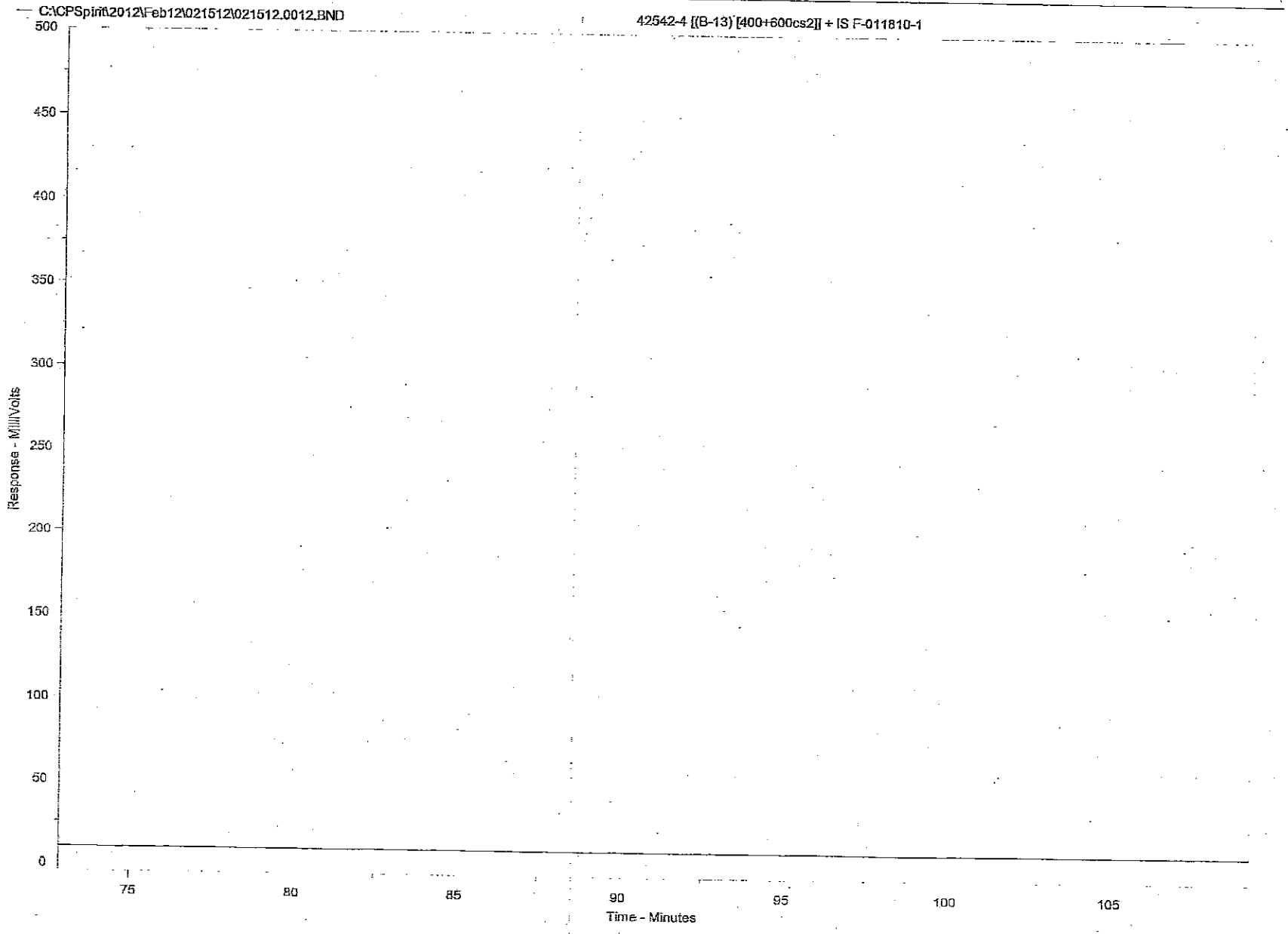

C:\CPSpirit\2012\Feb12\021512\021512.0012.BND
42542-4 [(B-13) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
CS2
IS #1
IS #2
IS #3
n-C11
n-C14
n-C15
n-C16
n-C18
Pristane
Phytane

ZymaX FORENSICS




C:\CPSpirit\2012\Feb12\021512\021512.0012.BND
42542-4 [(B-13) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
n-C11
i-C13
i-C14
i-C15
i-C16
i-C18
Pristane
Phytane
IS #3


C:\CPSprint\2012\Feb12\021512\021512.0012.BND
42542-4 [(B-13) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
500
450
400
350
300
250
200
150
100
50
0
75
80
85
90
95
100
105
Time - Minutes


C:\CPSpirit\2012\Feb12\021512\021512.0012.BND
42542-4 [(B-13) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
500
450
400
350
300
250
200
150
100
50
0
75
80
85
90
95
100
105
Time - Minutes

Sample Name = **42542-4 [(B-13) [400+600cs2]] + IS F-011810-1**

Instrument = Instrument 1
Heading 1 =
Heading 2 =

Acquisition Port = DP#

Raw File Name = **C:\CPSpirit\2012\Feb12\021512\021512.0012.RAW**
Method File Name = C:\CPSpirit\C344.met
Calibration File Name = C:\CPSpirit\2012\Feb12\021512\021512.0012.BND

Date Taken (end) = 2/16/2012 8:01:06 PM
Method Version = 44
Calibration Version = 7

Peak Name	Ret. Time	Area %	Area
2	5.76	0.2383	36148.86
4	6.01	0.3965	60142.20
8	6.93	1.3831	209782.50
11	7.42	1.2676	192272.80
14	7.89	0.0863	13082.88
CS2	8.18	0.4664	70741.21
15	8.35	0.1644	24937.81
	9.31	0.1474	22351.87
17	9.37	0.3170	48085.90
18	9.52	1.6760	254215.50
19	10.14	1.2987	196987.40
20	10.95	2.0311	308075.30
21	11.30	0.0554	8407.71
25	12.27	0.1577	23915.88
26	12.40	0.9363	142012.10
27	12.62	0.3000	45502.89
29	14.16	0.1842	27940.63
30	14.39	0.1923	29174.40
31	14.98	1.8584	281875.50
32	15.10	0.6651	100881.70
	15.28	0.0957	14509.61
33	15.56	2.3229	352339.30
	15.99	0.2182	33101.05
34A	16.17	0.2180	33062.59
	16.26	0.2431	36867.57
34B	16.36	0.3012	45692.65
35	16.47	0.1352	20502.54
IS #1	17.02	1.1314	171609.60
36	17.23	2.2338	338819.50
37	18.62	0.4397	66693.90
	18.79	0.1711	25956.37
	19.43	0.1508	22868.39
38	19.51	0.2522	38252.84
39	19.65	0.4427	67145.07
	20.05	0.0964	14617.68
	20.14	0.1283	19464.17
	20.56	0.0875	13265.18
40	20.77	0.0771	11689.83
41A	21.01	1.7638	267529.80
42	21.52	0.2799	42456.93
43	21.94	1.1554	175242.80
44	22.05	0.5392	81786.40
45	22.18	0.1821	27628.07
46B	22.47	1.2482	189325.40
	23.36	0.0669	10139.92
	23.50	0.0682	10337.25
48	23.60	0.0766	11625.21
49	24.30	1.3405	203330.20
	25.66	0.0848	12861.66
51	25.93	0.1676	25421.79
52	26.36	0.3012	45682.29
53	26.80	0.4032	61154.98
54	27.53	2.8490	432133.80
55	28.10	11.6704	1770158.00
	28.45	0.1119	16965.35

Peak Name	Ret. Time	Area %	Area
56	28.64	0.5690	86311.72
57	28.70	0.5907	89591.98
58	29.06	0.1732	26264.04
59	29.14	0.7607	115382.20
60	29.55	4.0334	611774.20
62	30.89	0.8151	123628.90
I.S. #2	31.22	0.0282	4275.03
63	31.63	0.2878	43651.26
	32.08	0.1034	15677.98
	32.51	0.1312	19900.03
	32.76	0.0633	9604.44
65	33.06	0.1898	28789.67
66	33.43	1.3174	199820.30
67	33.88	4.2101	638587.20
68	34.00	1.9453	295055.40
69	34.34	2.6721	405299.70
	34.58	0.1371	20788.58
70	34.68	0.2899	43965.82
	34.83	0.2944	44661.41
71	34.92	1.4071	213423.90
	35.04	0.0801	12149.53
	35.22	0.3541	53708.07
73	35.81	7.4010	1122575.00
75	36.69	0.1774	26906.87
76	36.84	0.5560	84327.77
77	37.37	1.6217	245978.90
	37.61	0.0658	9980.19
	38.01	0.7284	110483.40
78	38.21	0.1008	15283.01
	38.92	0.3955	59994.56
79	39.06	1.2846	194843.90
	39.28	1.0821	164131.70
80	39.43	1.1076	168005.60
	39.58	0.1007	15272.51
81	39.92	0.4660	70679.58
	40.06	0.0948	14383.30
	40.22	0.1003	15212.56
83	40.46	0.7732	117273.80
84	40.56	0.7577	114924.00
	40.76	0.1190	18046.88
85	40.88	1.2953	196467.90
	41.21	0.0677	10269.16
	41.84	0.1454	22049.41
	41.96	0.3485	52853.93
n-C11	42.27	0.2397	36351.31
87	42.60	0.6422	97413.62
88	42.78	0.8751	132734.40
	42.94	0.0782	11861.83
	43.66	0.5779	87656.77
	43.79	0.0606	9187.00
	44.02	0.2269	34419.97
	44.19	0.5010	75983.71
89	44.40	0.5125	77738.03
	44.71	0.2825	42853.67
	44.86	0.2487	37729.00
	45.09	0.1561	23680.56
	45.17	0.1923	29165.81
	45.52	0.2598	39404.87
90	45.68	0.8670	131505.00
	46.13	0.1004	15227.85
	46.38	0.1395	21163.33
	46.62	0.2120	32151.14
	47.08	0.0672	10193.18
	47.33	0.0567	8607.34
I-C13	47.79	0.2800	42473.29
	48.10	0.0799	12117.41
	48.33	0.0935	14175.81

Peak Name	Ret. Time	Area %	Area
	48.70	0.1899	28801.58
	49.20	0.1946	29512.47
	49.84	0.1782	27028.36
i-C14	49.94	0.3772	57212.59
91	50.14	1.1965	181487.00
	50.35	0.1144	17350.10
92	50.65	0.6244	94704.49
	51.12	0.1028	15589.41
	51.32	0.1432	21716.04
i-C15	52.96	0.4856	73650.41
	53.07	0.2067	31353.04
	53.36	0.1503	22790.86
	53.74	0.4009	60804.71
	53.83	0.3448	52303.62
	54.23	0.1314	19926.18
	54.59	0.0665	10091.26
i-C16	54.98	0.4998	75804.29
	55.35	0.1258	19076.89
	55.72	0.1759	26683.65
	56.18	0.0822	12465.91
	56.31	0.1467	22256.62
	56.62	0.0855	12966.58
	56.71	0.1083	16432.26
	56.86	0.1370	20772.96
	57.08	0.0878	13312.50
	57.30	0.0801	12156.70
	57.53	0.1088	16499.05
	57.63	0.1544	23416.29
i-C18	58.56	0.5505	83505.15
	58.98	0.0878	13310.68
	59.35	0.1236	18752.27
Pristane	59.53	0.7669	116327.30
	60.25	0.1073	16276.15
	60.78	0.0567	8602.07
Phytane	61.14	0.3827	58051.18
	62.33	0.1476	22384.89
IS #3	64.66	0.2088	31670.99

Total Area = 1.516788E+07 Total Height = 5878099 Total Amount = 0

ZymaX FORENSICS

2/15/2012

ZymaX ID	42542-5
Sample ID	MYTNN
Evaporation	
n-Pentane / n-Heptane	0.33
2-Methylpentane / 2-Methylheptane	0.57
Waterwashing	
Benzene / Cyclohexane	0.00
Toluene / Methylcyclohexane	2.17
Aromatics / Total Paraffins (n+iso+cyc)	7.25
Aromatics / Naphthenes	82.83
Biodegradation	
(C4 - C8 Para + Isopara) / C4 - C8 Olefins	163.91
3-Methylhexane / n-Heptane	1.79
Methylcyclohexane / n-Heptane	0.35
Isoparaffins + Naphthenes / Paraffins	2.30
Octane rating	
2,2,4,-Trimethylpentane / Methylcyclohexane	0.00
Relative percentages - Bulk hydrocarbon composition as PIANO	
% Paraffinic	3.67
% Isoparaffinic	7.38
% Aromatic	87.84
% Naphthenic	1.06
% Olefinic	0.05

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

2/15/2012

ZymaX ID		42542-5
Sample ID		MYTNN
		Relative Area %
1	Propane	0.00
2	Isobutane	0.15
3	Isobutene	0.00
4	Butane/Methanol	0.00
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	0.13
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.00
11	Pentane	0.08
12	trans-2-Pentene	0.00
13	cis-2-Pentene/t-Butanol	0.00
14	2-Methyl-2-butene	0.00
15	2,2-Dimethylbutane	0.00
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.00
18	2-Methylpentane	0.19
19	3-Methylpentane	0.19
20	Hexane	0.14
21	trans-2-Hexene	0.00
22	3-Methylcyclopentene	0.00
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.00
25	3-Methyl-trans-2-pentene	0.00
26	Methylcyclopentane	0.14
27	2,4-Dimethylpentane	0.07
28	Benzene	0.07
29	5-Methyl-1-hexene	0.05
30	Cyclohexane	0.00
31	2-Methylhexane/TAME	0.27
32	2,3-Dimethylpentane	0.18
33	3-Methylhexane	0.44
34A	1-trans-3-Dimethylcyclopentane	0.05
34B	1-cis-3-Dimethylcyclopentane	0.08
35	2,2,4-Trimethylpentane	0.00
I.S. #1	à,à,à-Trifluorotoluene	0.00

ZymaX FORENSICS

2/15/2012

ZymaX ID		42542-5
Sample ID		MYTNN
		Relative Area %
36	n-Heptane	0.25
37	Methylcyclohexane	0.08
38	2,5-Dimethylhexane	0.08
39	2,4-Dimethylhexane	0.17
40	2,3,4-Trimethylpentane	0.00
41	Toluene/2,3,3-Trimethylpentane	0.18
42	2,3-Dimethylhexane	0.12
43	2-Methylheptane	0.34
44	4-Methylheptane	0.20
45	3,4-Dimethylhexane	0.10
46A	3-Ethyl-3-methylpentane	0.00
46B	1,4-Dimethylcyclohexane	0.44
47	3-Methylheptane	0.00
48	2,2,5-Trimethylhexane	0.00
49	n-Octane	0.47
50	2,2-Dimethylheptane	0.00
51	2,4-Dimethylheptane	0.15
52	Ethylcyclohexane	0.27
53	2,6-Dimethylheptane	0.42
54	Ethylbenzene	0.50
55	m+p Xylenes	5.05
56	4-Methyloctane	0.69
57	2-Methyloctane	0.69
58	3-Ethylheptane	0.25
59	3-Methyloctane	0.95
60	o-Xylene	1.95
61	1-Nonene	0.00
62	n-Nonane	1.20
I.S.#2	p-Bromofluorobenzene	0.00
63	Isopropylbenzene	0.23
64	3,3,5-Trimethylheptane	0.20
65	2,4,5-Trimethylheptane	0.51
66	n-Propylbenzene	0.90
67	1-Methyl-3-ethylbenzene	6.92
68	1-Methyl-4-ethylbenzene	3.24
69	1,3,5-Trimethylbenzene	6.22
70	3,3,4-Trimethylheptane	0.82

ZymaX FORENSICS

2/15/2012

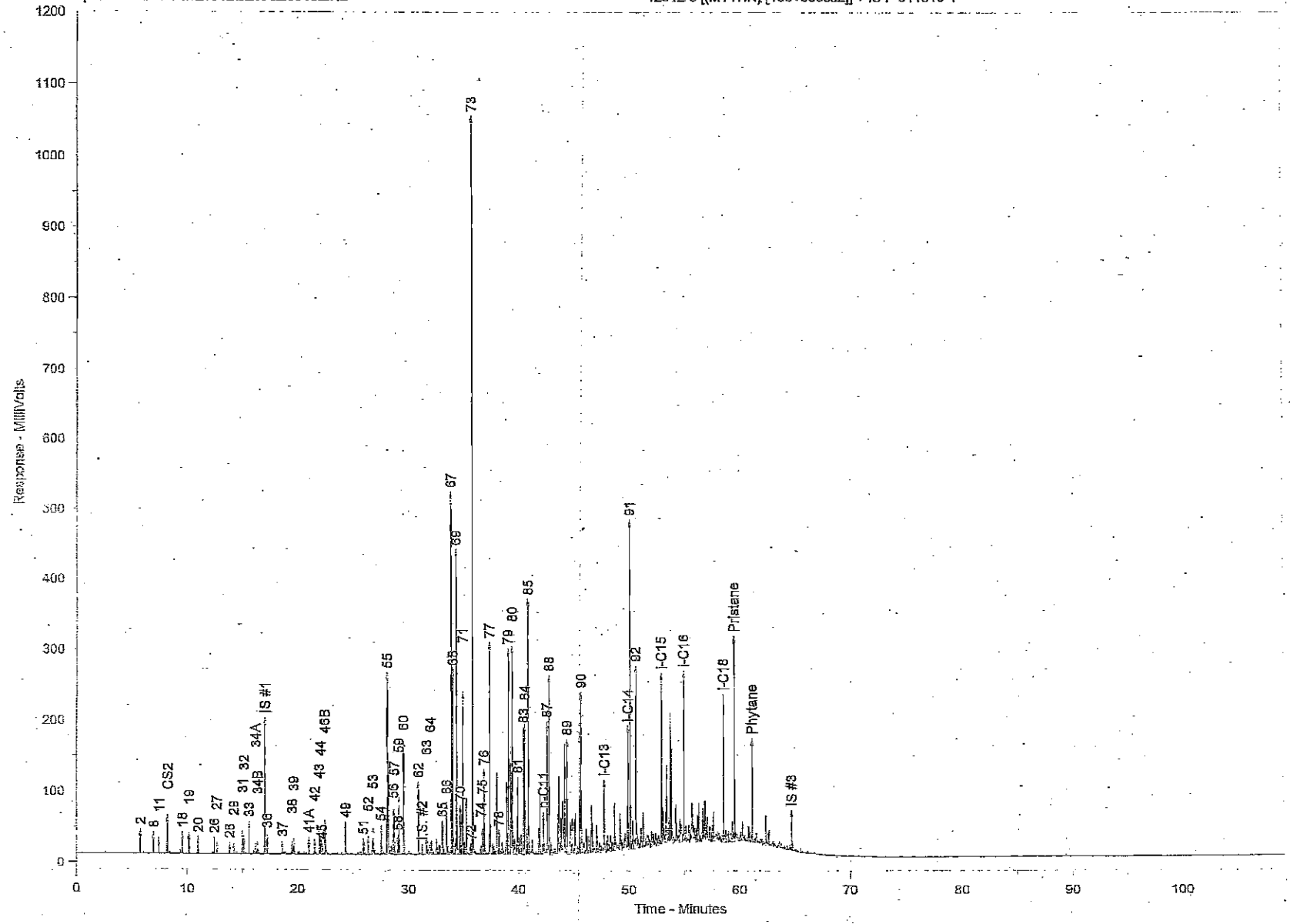
ZymaX ID		42542-5
Sample ID		MYTNN
		Relative Area %
71	1-Methyl-2-ethylbenzene	2.91
72	3-Methylnonane	0.07
73	1,2,4-Trimethylbenzene	15.55
74	Isobutylbenzene	0.04
75	sec-Butylbenzene	0.38
76	n-Decane	1.54
77	1,2,3-Trimethylbenzene	4.32
78	Indan	0.37
79	1,3-Diethylbenzene	4.03
80	1,4-Diethylbenzene	3.86
81	n-Butylbenzene	1.57
82	1,3-Dimethyl-5-ethylbenzene	0.00
83	1,4-Dimethyl-2-ethylbenzene	2.75
84	1,3-Dimethyl-4-ethylbenzene	2.63
85	1,2-Dimethyl-4-ethylbenzene	4.74
86	Undecene	0.00
87	1,2,4,5-Tetramethylbenzene	2.57
88	1,2,3,5-Tetramethylbenzene	3.51
89	1,2,3,4-Tetramethylbenzene	2.19
90	Naphthalene	2.94
91	2-Methyl-naphthalene	5.14
92	1-Methyl-naphthalene	3.10

ZymaX FORENSICS

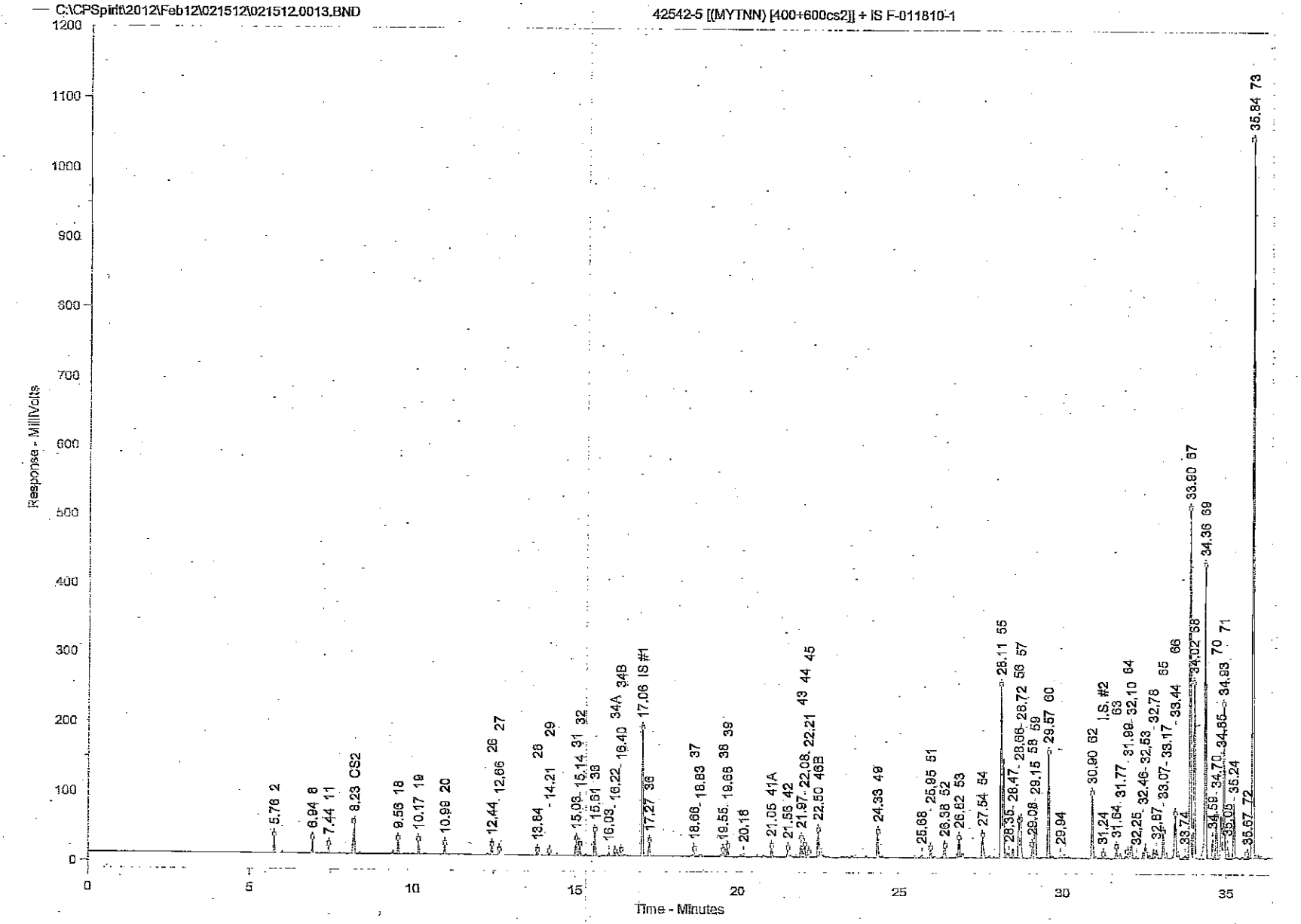
Chrom Perfect Chromatogram Report

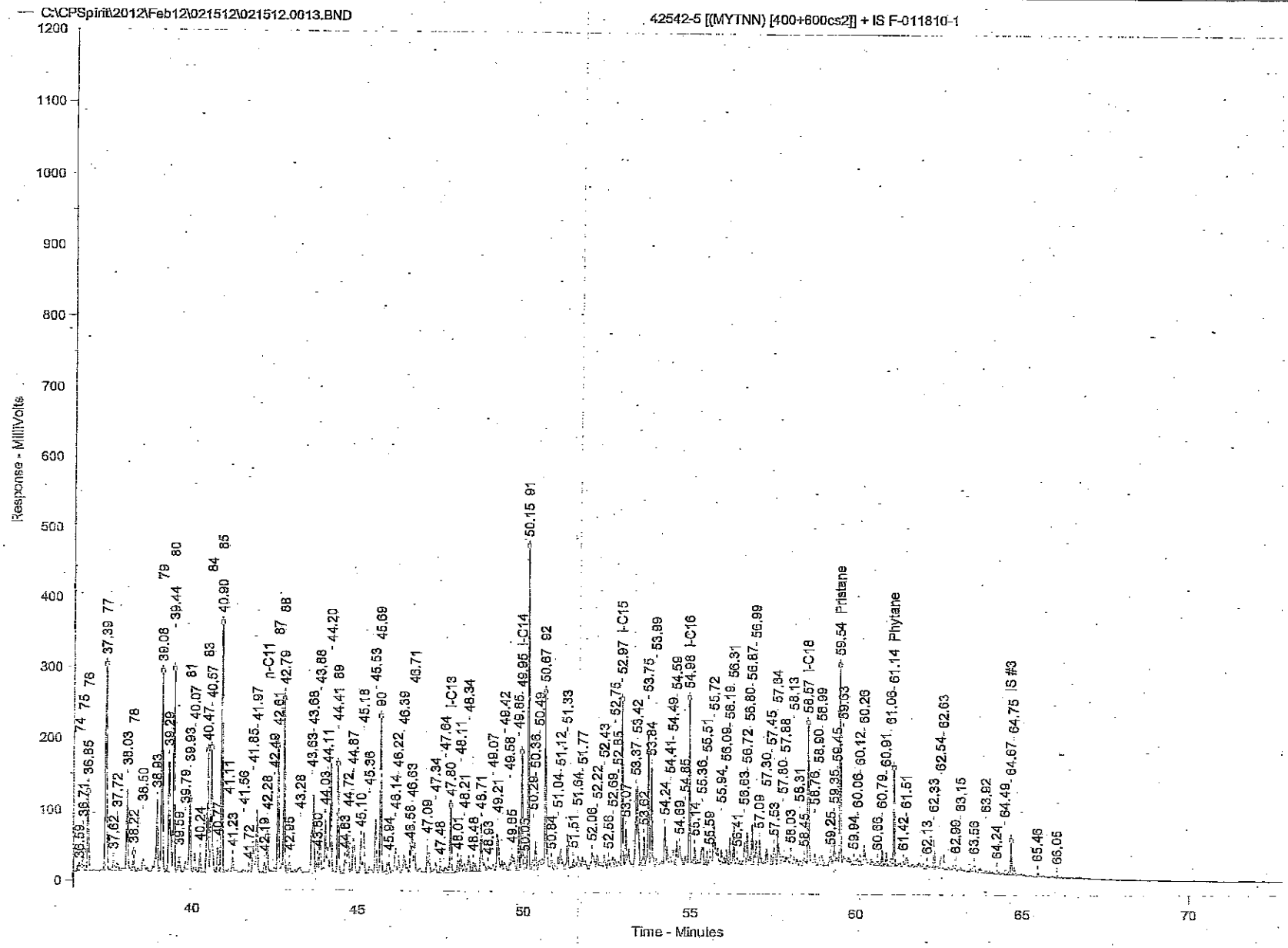
C:\CPSprint\2012\Feb12\021512\021512.0013.BND

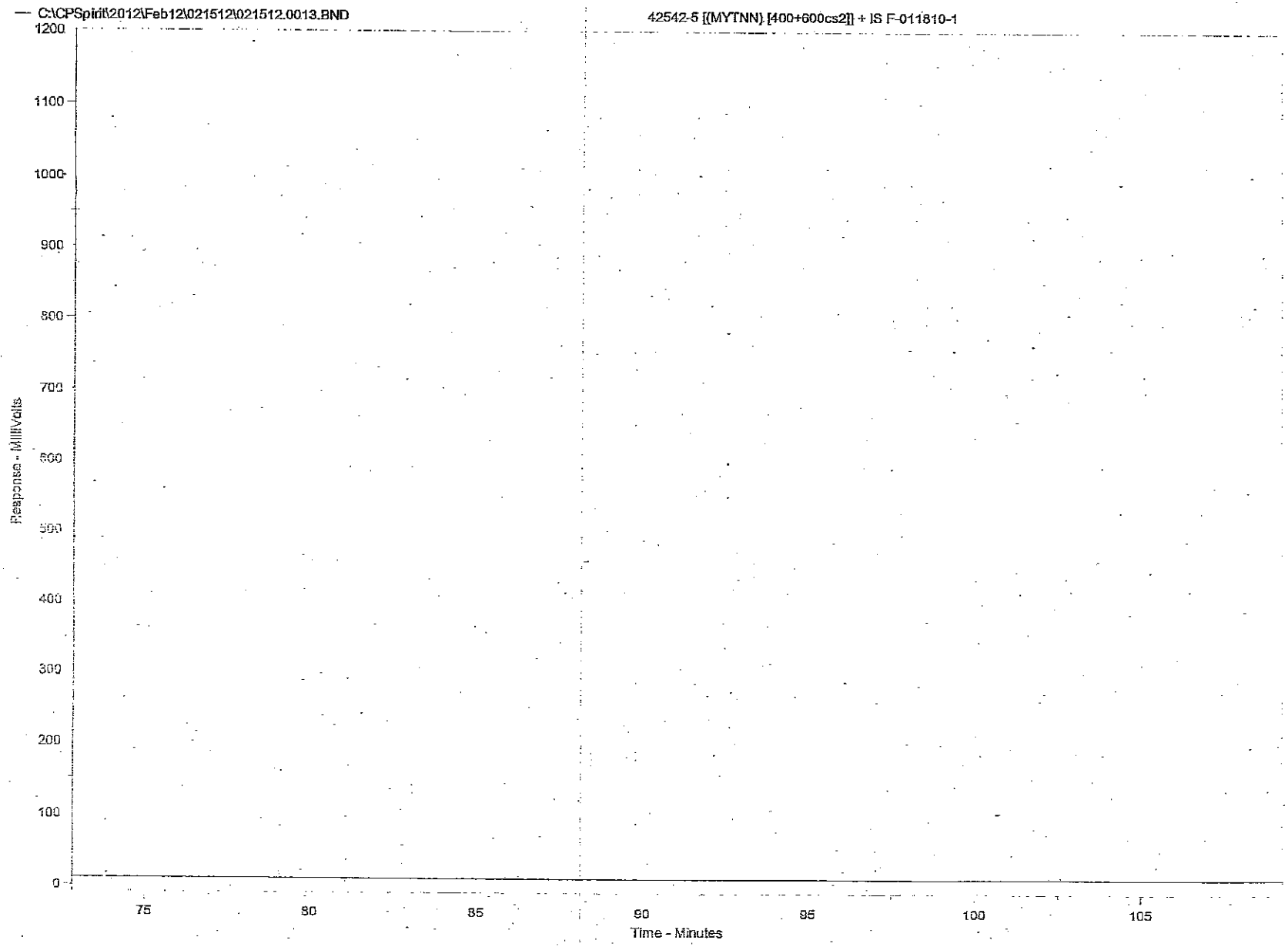
42542-5 [(MYTNN) [400+600cs2]] + IS F-011810-1



ZymaX FORENSICS




C:\CPSpirit\2012\Feb12\021512\021512.0013.BND
42542-5 [(MYTNN) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
n-C11
i-C13
i-C14
i-C15
i-C16
i-C18
Pristane
Phytane
IS #3


C:\CPSpirit\2012\Feb12\021512\021512.0013.BND
42542-5 [(MYTNN) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
75
80
85
90
95
100
105
Time - Minutes

Sample Name = **42542-5 [(MYTNN) [400+600cs2]] + IS F-011810-1**

Instrument = Instrument 1
Heading 1 =
Heading 2 =

Acquisition Port = DP#

Raw File Name = **C:\CPSpirit\2012\Feb12\021512\021512.0013.RAW**
Method File Name = C:\CPSpirit\C344.met
Calibration File Name = C:\CPSpirit\021212.cal

Date Taken (end) = 2/16/2012 10:12:14 PM
Method Version = 44
Calibration Version = 7

Peak Name	Ret. Time	Area %	Area
2	5.76	0.0781	29443.55
8	6.94	0.0690	26032.10
11	7.44	0.0416	15693.71
CS2	8.23	0.3691	139166.70
18	9.56	0.0995	37534.66
19	10.17	0.0997	37592.11
20	10.99	0.0716	27005.79
26	12.44	0.0738	27843.15
27	12.66	0.0345	13019.40
28	13.84	0.0343	12915.80
29	14.21	0.0264	9942.70
31	15.03	0.1417	53438.63
32	15.14	0.0918	34622.67
33	15.61	0.2284	86118.98
	16.03	0.0274	10320.86
34A	16.22	0.0243	9157.16
34B	16.40	0.0413	15559.91
IS #1	17.06	1.1899	448643.60
36	17.27	0.1276	48099.64
37	18.66	0.0442	16674.66
	18.83	0.0338	12727.50
38	19.55	0.0418	15763.65
39	19.68	0.0876	33021.40
	20.18	0.0296	11161.19
41A	21.05	0.0958	36111.18
42	21.56	0.0647	24378.44
43	21.97	0.1748	65915.87
44	22.08	0.1062	40055.16
45	22.21	0.0512	19310.85
46B	22.60	0.2265	85415.81
49	24.33	0.2422	91324.07
	25.68	0.0379	14307.08
51	25.96	0.0801	30189.22
52	26.38	0.1416	53371.57
53	26.82	0.2181	82238.84
54	27.54	0.2592	97733.27
55	28.11	2.6272	990599.30
	28.35	0.0190	7164.72
	28.47	0.0897	33836.00
56	28.66	0.3596	135590.80
57	28.72	0.3574	134744.30
58	29.08	0.1295	48841.13
59	29.15	0.4963	187137.80
60	29.57	1.0168	383398.70
	29.94	0.0251	9471.71
62	30.90	0.6245	235484.00
I.S. #2	31.24	0.0291	10968.80
63	31.64	0.1183	44609.37
	31.77	0.0614	23148.00
64	31.99	0.1033	38934.39
	32.10	0.1616	60928.07
	32.25	0.0360	13588.41
	32.46	0.0627	23651.60
	32.53	0.2246	84675.84
	32.78	0.0973	36689.75

Peak Name	Ret. Time	Area %	Area
	32.87	0.1095	41305.83
65	33.07	0.2635	99350.60
	33.17	0.0581	21919.53
66	33.44	0.4663	175812.80
	33.74	0.0869	32765.85
67	33.90	3.6017	1358041.00
68	34.02	1.6840	634962.50
69	34.36	3.2352	1219852.00
	34.59	0.2066	77890.59
70	34.70	0.4282	161466.30
	34.85	0.4407	166150.50
71	34.93	1.5137	570751.70
	35.05	0.1262	47570.78
	35.24	0.5337	201242.90
72	35.67	0.0343	12926.66
73	35.84	8.0892	3050058.00
74	36.59	0.0200	7534.86
75	36.71	0.1952	73602.81
76	36.85	0.8031	302807.80
77	37.39	2.2465	847046.00
	37.62	0.1043	39329.68
	37.72	0.1321	49815.32
	38.03	0.9734	367010.00
78	38.22	0.1901	71666.16
	38.50	0.1644	61979.55
	38.93	0.9181	346170.30
79	39.08	2.0949	789874.50
	39.29	1.5315	577469.40
80	39.44	2.0068	756667.70
	39.59	0.2000	75399.37
	39.79	0.1169	44061.79
81	39.93	0.8150	307288.40
	40.07	0.1973	74379.12
	40.24	0.2117	79809.77
83	40.47	1.4331	540355.40
84	40.57	1.3702	516636.20
	40.77	0.2566	96760.63
85	40.90	2.4655	929612.80
	41.11	0.0290	10931.17
	41.23	0.1345	50703.17
	41.56	0.0623	23486.56
	41.72	0.0401	15128.44
	41.85	0.3061	115404.70
	41.97	0.7081	267001.90
	42.19	0.1177	44388.09
n-C11	42.28	0.4029	151905.40
	42.49	0.0717	27023.99
87	42.61	1.3384	504641.10
88	42.79	1.8256	688332.20
	42.95	0.1791	67523.73
	43.28	0.1447	54555.24
	43.63	0.4315	162693.50
	43.68	0.8110	305796.80
	43.80	0.2085	78605.80
	43.88	0.3965	149497.50
	44.03	0.6050	228114.20
	44.11	0.3040	114625.00
	44.20	1.1193	422018.80
89	44.41	1.1412	430276.20
	44.63	0.1616	60919.73
	44.72	0.4522	170518.30
	44.87	0.5751	216852.00
	45.10	0.3693	139246.00
	45.18	0.4409	166246.70
	45.36	0.1193	44981.79
	45.53	0.6292	237250.50
90	45.69	1.5281	576167.00

Peak Name	Ret. Time	Area %	Area
	45.94	0.2253	84954.49
	46.14	0.3081	116169.70
	46.22	0.1743	65733.78
	46.39	0.3284	123831.10
	46.58	0.1942	73208.44
	46.63	0.4743	178845.80
	46.71	0.2702	101891.00
	47.09	0.4543	171301.60
	47.34	0.1503	56669.91
	47.48	0.1068	40084.82
	47.64	0.1004	37874.63
i-C13	47.80	0.7098	267648.70
	48.01	0.0965	36400.89
	48.11	0.2077	78304.43
	48.21	0.1073	40445.17
	48.34	0.2359	88960.65
	48.48	0.1667	62867.23
	48.71	0.5555	209442.40
	48.93	0.0941	35489.66
	49.07	0.0938	35383.96
	49.21	0.5961	224765.40
	49.42	0.1126	42462.25
	49.58	0.1135	42806.55
	49.65	0.3331	125589.50
	49.85	0.4828	182021.30
i-C14	49.95	0.9488	357733.00
	50.05	0.0686	25869.58
91	50.15	2.6722	1007550.00
	50.29	0.1475	55628.68
	50.36	0.2771	104477.70
	50.49	0.1674	63128.44
92	50.67	1.6129	608140.30
	50.84	0.1167	44001.07
	51.04	0.0803	30271.18
	51.12	0.1912	72102.27
	51.33	0.3627	136740.50
	51.51	0.0611	23028.22
	51.64	0.1883	71016.18
	51.77	0.0826	31127.86
	52.06	0.3354	126480.70
	52.22	0.1208	45533.48
	52.43	0.1239	46708.26
	52.56	0.0962	36255.43
	52.69	0.1707	64360.40
	52.75	0.0770	29037.11
	52.85	0.0587	22125.59
i-C15	52.97	1.2189	459591.70
	53.07	0.2451	92403.92
	53.37	0.6709	252945.20
	53.42	0.8405	316904.10
	53.62	0.2814	106115.40
	53.75	1.0238	386031.70
	53.84	0.8222	310004.20
	53.99	0.0761	28707.42
	54.24	0.4877	183889.20
	54.41	0.1006	37942.89
	54.49	0.1524	57457.21
	54.59	0.2305	86891.67
	54.69	0.3196	120499.30
	54.85	0.0697	26266.67
i-C16	54.98	1.2627	476117.80
	55.14	0.1366	51512.74
	55.36	0.2863	107940.40
	55.51	0.1232	46441.40
	55.59	0.1696	63935.67
	55.72	0.6115	230568.30
	55.94	0.1421	53593.57

Peak Name	Ret. Time	Area %	Area
	56.09	0.1330	50150.98
	56.19	0.1855	69957.30
	56.31	0.3377	127334.90
	56.41	0.0849	31994.59
	56.63	0.2620	98791.65
	56.72	0.2664	100446.00
	56.80	0.0840	31667.16
	56.87	0.3611	136163.20
	56.99	0.3560	134246.10
	57.09	0.2853	107572.50
	57.30	0.1687	63598.32
	57.45	0.0673	25358.87
	57.53	0.2423	91360.54
	57.64	0.3712	139956.50
	57.80	0.0794	29934.46
	57.88	0.0260	9790.71
	58.03	0.0934	35215.41
	58.13	0.0524	19772.88
	58.31	0.0562	21186.61
	58.45	0.1481	55858.06
i-C18	58.57	1.2891	486051.00
	58.76	0.1364	51413.42
	58.90	0.1082	40797.59
	58.99	0.0737	27796.29
	59.25	0.1684	63511.26
	59.35	0.2175	82025.08
	59.45	0.0839	31646.37
Pristane	59.54	1.6468	620926.00
	59.63	0.2163	81570.19
	59.94	0.0358	13513.44
	60.06	0.0795	29957.28
	60.12	0.1058	39877.50
	60.26	0.2179	82160.24
	60.66	0.0619	23347.90
	60.79	0.1004	37873.26
	60.91	0.1171	44149.88
	61.06	0.0783	29522.83
Phytane	61.14	0.7649	288415.70
	61.42	0.0504	18999.75
	61.51	0.1609	60669.92
	62.13	0.0560	21116.06
	62.33	0.2763	104187.40
	62.54	0.1200	45257.17
	62.63	0.1054	39731.45
	62.99	0.0311	11742.59
	63.15	0.1146	43193.78
	63.56	0.0738	27808.01
	63.92	0.0244	9213.85
	64.24	0.0703	26504.03
	64.49	0.0421	15882.25
IS #3	64.67	0.2242	84518.66
	64.75	0.0824	31070.69
	65.46	0.0334	12586.29
	66.05	0.0264	9960.39

Total Area = 3.770508E+07 Total Height = 1.341313E+07 Total Amount = 0

ZymaX FORENSICS

2/15/2012

ZymaX ID	42542-8
Sample ID	STF-16
Evaporation	
n-Pentane / n-Heptane	0.06
2-Methylpentane / 2-Methylheptane	0.24
Waterwashing	
Benzene / Cyclohexane	1.03
Toluene / Methylcyclohexane	1.03
Aromatics / Total Paraffins (n+Iso+cyc)	3.73
Aromatics / Naphthenes	29.29
Biodegradation	
(C4 - C8 Para + Isopara) / C4 - C8 Olefins	111.55
3-Methylhexane / n-Heptane	1.37
Methylcyclohexane / n-Heptane	0.37
Isoparaffins + Naphthenes / Paraffins	3.76
Octane rating	
2,2,4,-Trimethylpentane / Methylcyclohexane	3.31
Relative percentages - Bulk hydrocarbon composition as PIANO	
% Paraffinic	4.42
% Isoparaffinic	13.94
% Aromatic	78.58
% Naphthenic	2.68
% Olefinic	0.38

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

2/15/2012

ZymaX ID		42542-8
Sample ID		STF-16
		Relative Area %
1	Propane	0.00
2	Isobutane	0.10
3	Isobutene	0.00
4	Butane/Methanol	0.00
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	0.04
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.00
11	Pentane	0.05
12	trans-2-Pentene	0.00
13	cis-2-Pentene/t-Butanol	0.00
14	2-Methyl-2-butene	0.00
15	2,2-Dimethylbutane	0.01
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.06
18	2-Methylpentane	0.25
19	3-Methylpentane	0.24
20	Hexane	0.34
21	trans-2-Hexene	0.00
22	3-Methylcyclopentene	0.00
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.00
25	3-Methyl-trans-2-pentene	0.06
26	Methylcyclopentane	0.30
27	2,4-Dimethylpentane	0.26
28	Benzene	0.09
29	5-Methyl-1-hexene	0.09
30	Cyclohexane	0.09
31	2-Methylhexane/TAME	0.84
32	2,3-Dimethylpentane	0.72
33	3-Methylhexane	1.19
34A	1-trans-3-Dimethylcyclopentane	0.12
34B	1-cis-3-Dimethylcyclopentane	0.17
35	2,2,4-Trimethylpentane	1.06
I.S. #1	à,à,à-Trifluorotoluene	0.00

ZymaX FORENSICS

2/15/2012

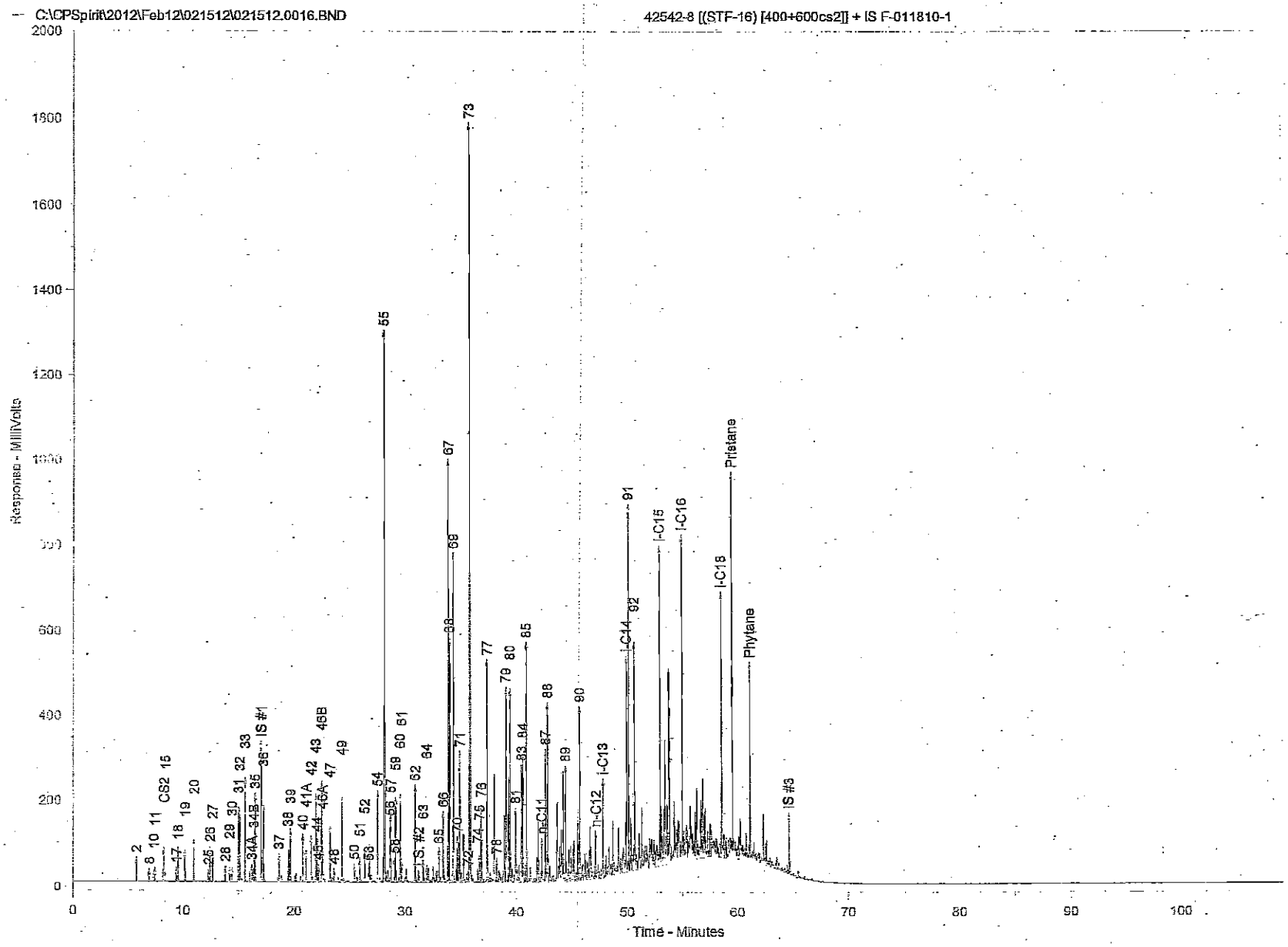
ZymaX ID		42542-8
Sample ID		STF-16
		Relative Area %
36	n-Heptane	0.87
37	Methylcyclohexane	0.32
38	2,5-Dimethylhexane	0.11
39	2,4-Dimethylhexane	0.63
40	2,3,4-Trimethylpentane	0.55
41	Toluene/2,3,3-Trimethylpentane	0.33
42	2,3-Dimethylhexane	0.52
43	2-Methylheptane	1.04
44	4-Methylheptane	0.49
45	3,4-Dimethylhexane	0.22
46A	3-Ethyl-3-methylpentane	0.45
46B	1,4-Dimethylcyclohexane	1.26
47	3-Methylheptane	0.66
48	2,2,5-Trimethylhexane	0.09
49	n-Octane	0.99
50	2,2-Dimethylheptane	0.14
51	2,4-Dimethylheptane	0.22
52	Ethylcyclohexane	0.42
53	2,6-Dimethylheptane	0.11
54	Ethylbenzene	1.20
55	m+p Xylenes	13.24
56	4-Methyloctane	0.72
57	2-Methyloctane	0.79
58	3-Ethylheptane	0.25
59	3-Methyloctane	1.03
60	o-Xylene	1.04
61	1-Nonene	0.23
62	n-Nonane	1.20
I.S.#2	p-Bromofluorobenzene	0.00
63	Isopropylbenzene	0.23
64	3,3,5-Trimethylheptane	0.18
65	2,4,5-Trimethylheptane	0.36
66	n-Propylbenzene	0.89
67	1-Methyl-3-ethylbenzene	6.13
68	1-Methyl-4-ethylbenzene	3.04
69	1,3,5-Trimethylbenzene	4.92
70	3,3,4-Trimethylheptane	0.53

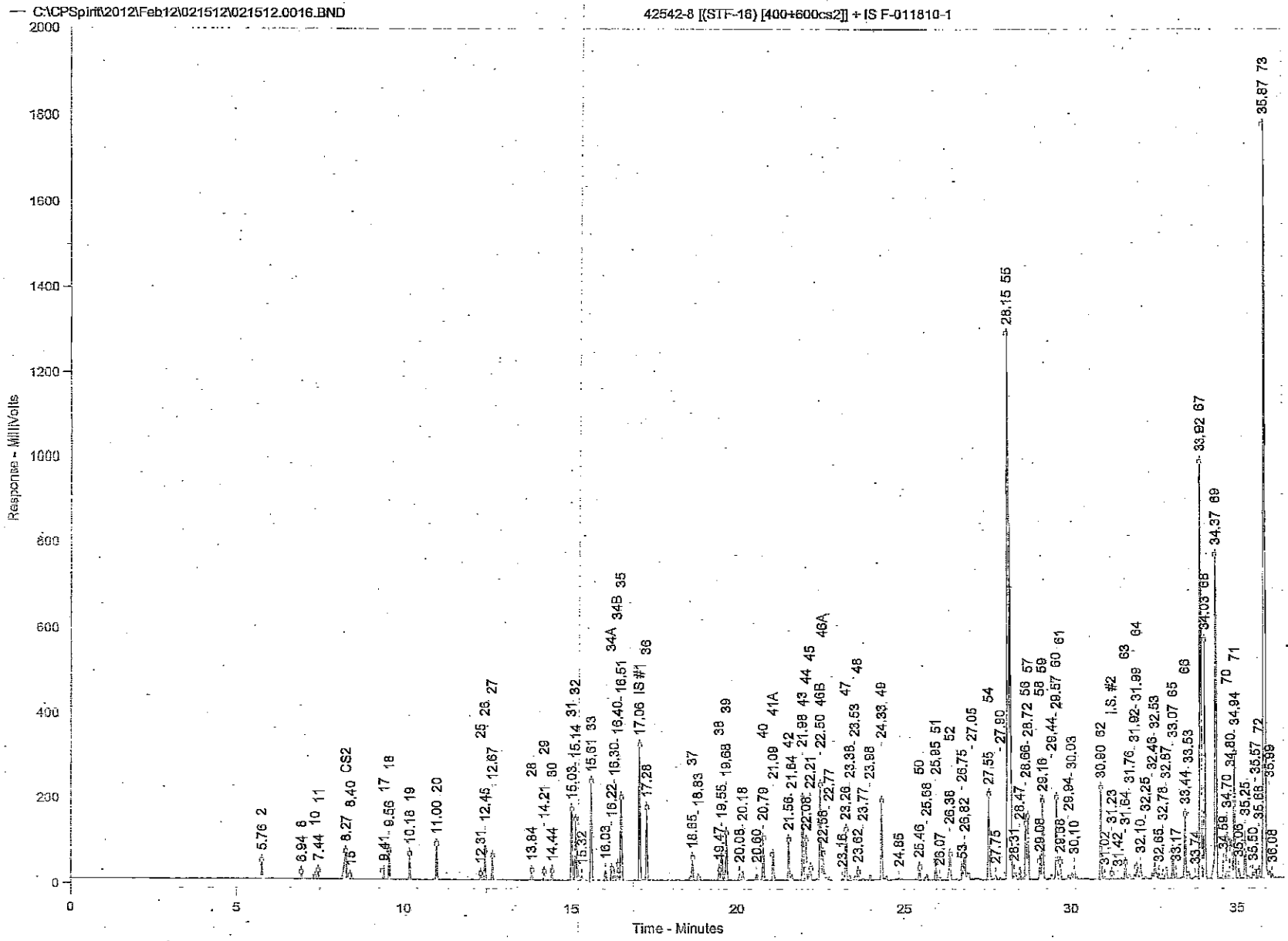
ZymaX FORENSICS

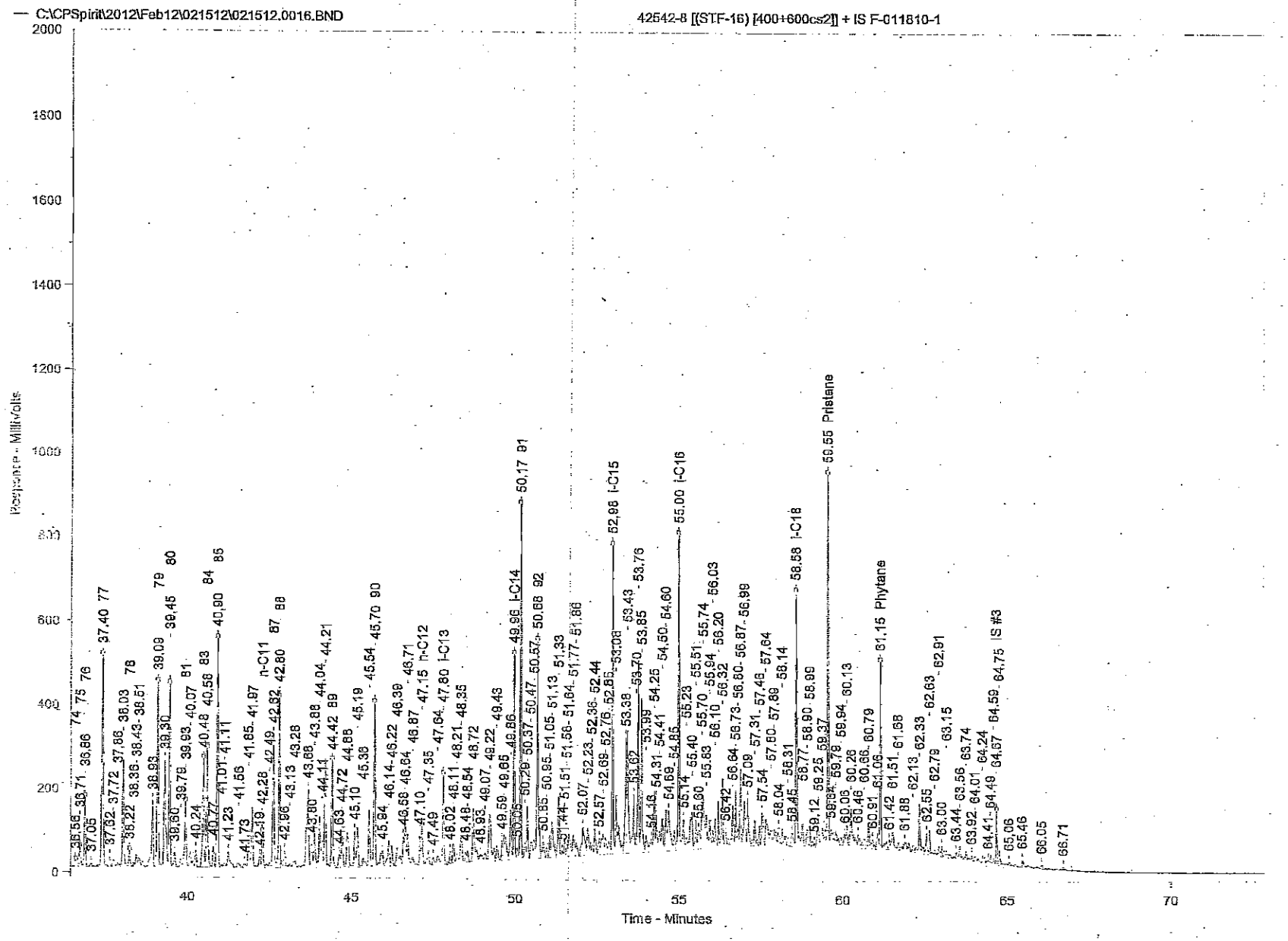
2/15/2012

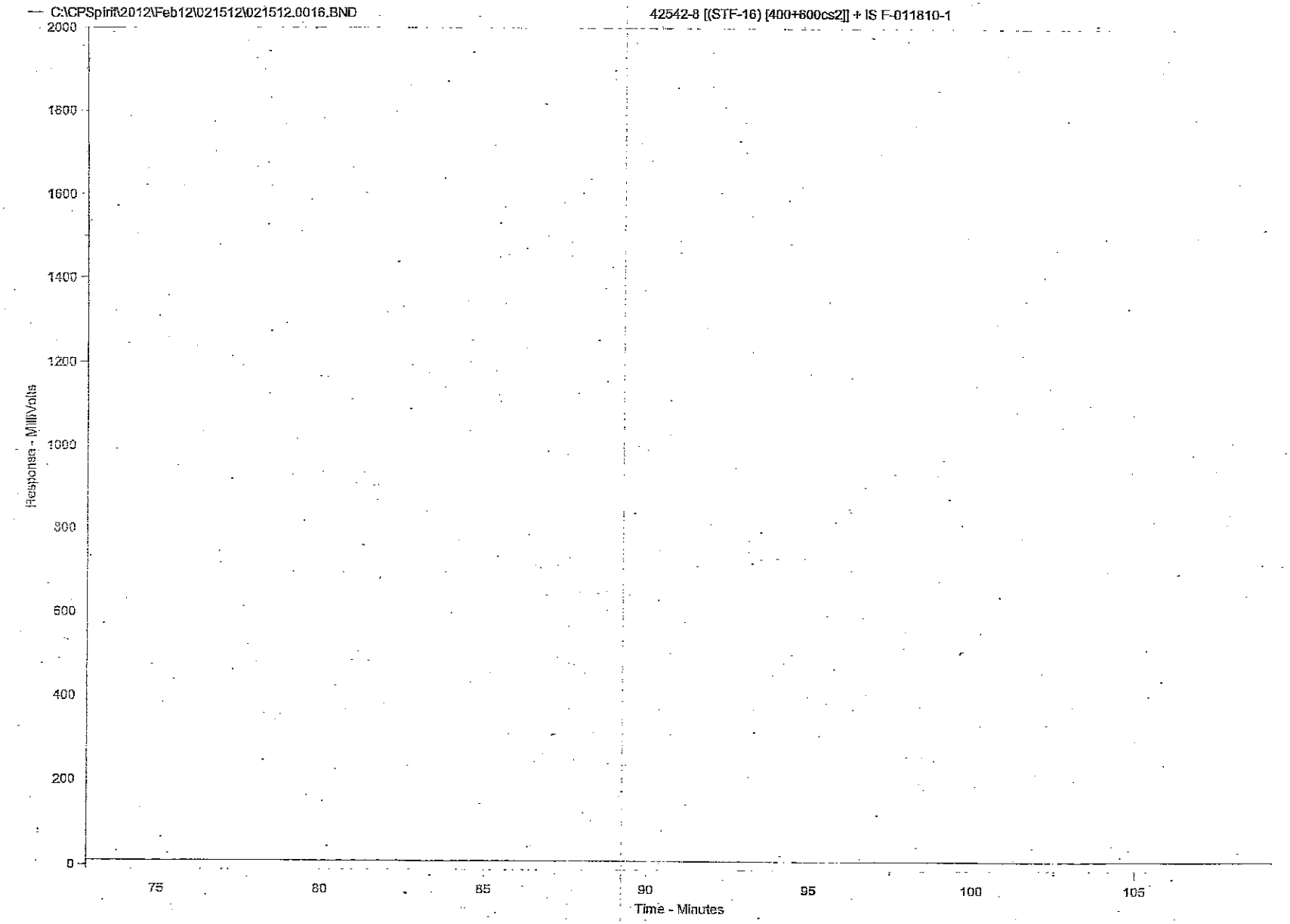
ZymaX ID	42542-8
Sample ID	STF-16

		Relative Area %
71	1-Methyl-2-ethylbenzene	1.63
72	3-Methylnonane	0.08
73	1,2,4-Trimethylbenzene	13.33
74	Isobutylbenzene	0.10
75	sec-Butylbenzene	0.34
76	n-Decane	0.98
77	1,2,3-Trimethylbenzene	3.24
78	Indan	0.27
79	1,3-Diethylbenzene	2.68
80	1,4-Diethylbenzene	2.51
81	n-Butylbenzene	1.08
82	1,3-Dimethyl-5-ethylbenzene	0.00
83	1,4-Dimethyl-2-ethylbenzene	1.77
84	1,3-Dimethyl-4-ethylbenzene	1.84
85	1,2-Dimethyl-4-ethylbenzene	3.17
86	Undecene	0.00
87	1,2,4,5-Tetramethylbenzene	1.82
88	1,2,3,5-Tetramethylbenzene	2.48
89	1,2,3,4-Tetramethylbenzene	1.56
90	Naphthalene	2.29
91	2-Methyl-naphthalene	4.39
92	1-Methyl-naphthalene	2.95


C:\CPSpirit\2012\Feb12\021512\021512.0016.BND
42542-8 [(STF-16) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
CS2
IS #1
IS #2
IS #3
n-C11
n-C12
i-C13
i-C14
i-C15
i-C16
i-C18
Phytane
Pristane


C:\CPSpirit\2012\Feb12\021512\021512.0016.BND
42542-8 [(STF-16) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
5
10
15
20
25
30
35
5.76 2
6.94 8
7.44 10 11
8.27 8.40 CS2
9.41 9.56 17 18
10.18 19
11.00 20
12.31 12.45 12.87 25 26 27
13.84 28
14.21 29
14.44 30
15.03 15.14 31 32
15.32
15.61 33
16.09 16.22 16.30 16.40 16.51 34A 34B 35
17.06 IS #1 36
17.28
18.65 18.83 37
19.47 19.55 19.68 38 39
20.08 20.18
20.60 20.79 21.09 40 41A
21.56 21.64 42
21.98 43 44 45
22.08 22.21 22.50 46B 46A
22.58 22.77
23.16 23.26 23.38 23.53 47 48
23.62 23.77 23.88
24.33 49
24.65
25.46 25.68 50
25.85 51
26.07 26.38 52
26.75 27.05
26.82 53
27.55 54
27.75
27.90
28.15 55
28.31 28.47 28.66 28.72 56 57
29.08 29.16 58 59
28.44 28.57 60 61
28.58 29.84 30.03
30.10
30.80 62
31.02 31.23 I.S. #2
31.42 31.64 31.76 31.92 31.99 63 64
32.10 32.25 32.46 32.53
32.66 32.78 32.87 33.07 65
33.17 33.44 33.53
33.74
33.92 67
34.03 68
34.37 69
34.58 34.70 34.80 34.94 70 71
35.05 35.25 35.57 72
35.50 35.68 35.89
35.87 73
36.08


C:\CPSpirit\2012\Feb12\021512\021512.0016.BND
42542-8 [(STF-16) [400+600cs2]] + IS F-011810-1
Response - Millivolts
Time - Minutes
Pristane
Phytane
n-C11
n-C12
n-C13
i-C14
i-C15
i-C16
i-C18
IS #3


C:\CPSprint\2012\Feb12\021512\021512.0016.BND
42542-8 [(STF-16) [400+600cs2]] + IS F-011810-1
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Response - MilliVolts
75
80
85
90
95
100
105
Time - Minutes

Sample Name = 42542-8 [(STF-16) [400+600cs2]] + IS F-011810-1

Instrument = Instrument 1
Heading 1 =
Heading 2 =

Acquisition Port = DP#

Raw File Name = C:\CPSpirit\2012\Feb12\021512\021512.0016.RAW
Method File Name = C:\CPSpirit\C344.met
Calibration File Name = C:\CPSpirit\2012\Feb12\021512\021512.0016.BND

Date Taken (end) = 2/17/2012 4:47:31 AM
Method Version = 44
Calibration Version = 7

Peak Name	Ret. Time	Area %	Area
2	5.76	0.0478	47337.22
8	6.94	0.0168	16621.25
11	7.44	0.0234	23169.38
CS2	8.27	0.2679	265446.10
15	8.40	0.0070	6956.68
17	9.41	0.0278	27592.07
18	9.56	0.1191	118055.60
19	10.18	0.1144	113327.10
20	11.00	0.1625	160984.30
25	12.31	0.0271	26885.73
26	12.45	0.1410	139743.00
27	12.67	0.1224	121286.90
28	13.84	0.0445	44141.43
29	14.21	0.0415	41091.03
30	14.44	0.0431	42722.06
31	15.03	0.3951	391467.80
32	15.14	0.3421	338962.80
	15.32	0.0238	23569.86
33	15.61	0.5633	558220.20
	16.03	0.0555	54997.88
34A	16.22	0.0573	56786.56
	16.30	0.0669	66257.59
34B	16.40	0.0822	81493.77
35	16.51	0.4991	494609.40
IS #1	17.06	0.7811	773988.80
36	17.28	0.4097	405998.60
37	18.65	0.1506	149242.60
	18.83	0.0657	65151.13
38	19.47	0.0525	52063.82
	19.55	0.1921	190372.70
39	19.68	0.2968	294082.30
	20.08	0.0386	38290.59
	20.18	0.0563	55791.61
	20.60	0.0368	36483.28
40	20.79	0.2616	259268.50
41A	21.09	0.1554	153949.40
42	21.56	0.2439	241652.50
	21.64	0.0472	46780.52
43	21.98	0.4909	486456.30
44	22.08	0.2324	230267.10
45	22.21	0.1045	103542.50
46B	22.50	0.5942	588824.40
46A	22.58	0.2150	213017.30
	22.77	0.0229	22650.36
	23.16	0.0104	10285.96
47	23.26	0.3104	307580.80
	23.38	0.0315	31239.33
	23.53	0.0287	28475.03
48	23.62	0.0402	39802.80
	23.77	0.0153	15200.77
	23.98	0.0336	33264.75
49	24.33	0.4672	462988.20
	24.85	0.0122	12112.75
50	25.46	0.0673	66733.80
	25.68	0.0498	49344.72

Peak Name	Ret. Time	Area %	Area
51	25.95	0.1063	105360.60
	26.07	0.0298	29492.77
52	26.38	0.2000	198177.10
53	26.75	0.0522	51740.00
	26.82	0.2249	222901.50
	27.05	0.0081	8032.89
54	27.55	0.5667	561583.80
	27.75	0.0325	32180.63
	27.90	0.0152	15025.99
55	28.15	6.2596	6202828.00
	28.31	0.0157	15552.78
	28.47	0.0739	73221.95
56	28.66	0.3393	336202.50
57	28.72	0.3732	369816.30
58	29.08	0.1161	115042.60
59	29.16	0.4852	480847.10
	29.44	0.0434	43024.62
60	29.57	0.4936	489147.00
61	29.68	0.1110	109954.10
	29.94	0.0311	30827.44
	30.03	0.0383	37923.71
	30.10	0.0789	78209.97
62	30.90	0.5655	560326.60
	31.02	0.0278	27548.19
I.S. #2	31.23	0.0344	34105.75
	31.42	0.0115	11418.16
63	31.64	0.1086	107596.70
	31.76	0.0402	39805.15
	31.92	0.0318	31527.66
64	31.99	0.0863	85540.72
	32.10	0.1114	110419.70
	32.25	0.0240	23745.83
	32.46	0.0362	35863.39
	32.53	0.1435	142196.00
	32.65	0.0330	32681.29
	32.78	0.0613	60747.63
	32.87	0.0863	85505.26
65	33.07	0.1717	170155.20
	33.17	0.0353	34940.27
66	33.44	0.4201	416291.80
	33.53	0.0637	63096.68
	33.74	0.0525	52036.71
67	33.92	2.8993	2873051.00
68	34.03	1.4352	1422149.00
69	34.37	2.3257	2304594.00
	34.59	0.1230	121866.30
70	34.70	0.2509	248611.50
	34.80	0.5009	496384.10
71	34.94	0.7716	764599.00
	35.06	0.0762	75539.09
	35.25	0.3239	320971.30
	35.50	0.0426	42173.21
	35.57	0.0606	60046.11
72	35.68	0.0376	37212.96
73	35.87	6.3021	6244940.00
	35.99	0.0522	51697.35
	36.08	0.0378	37478.36
74	36.56	0.0495	49084.96
75	36.71	0.1626	161138.90
76	36.86	0.4635	459337.90
	37.05	0.0300	29738.90
77	37.40	1.5332	1519339.00
	37.62	0.0649	64355.39
	37.72	0.0770	76331.63
	37.86	0.0421	41674.11
	38.03	0.7324	725802.20
78	38.22	0.1288	127608.20

Peak Name	Ret. Time	Area %	Area
	38.36	0.0247	24475.12
	38.43	0.0756	74873.71
	38.51	0.0778	77117.43
	38.93	0.5373	532386.30
79	39.09	1.2654	1253946.00
	39.30	0.9382	929730.90
80	39.45	1.1882	1177430.00
	39.60	0.1146	113603.80
	39.79	0.0567	56198.49
81	39.93	0.5089	504284.80
	40.07	0.1130	111998.90
	40.24	0.1137	112647.40
83	40.48	0.8389	831320.50
84	40.58	0.8684	860534.00
	40.77	0.1390	137745.20
85	40.90	1.4994	1485848.00
	41.01	0.0189	18713.08
	41.11	0.0462	45773.88
	41.23	0.2004	198548.50
	41.56	0.0582	57640.03
	41.73	0.0439	43474.64
	41.85	0.1884	186731.50
	41.97	0.4416	437560.80
	42.19	0.0837	82924.27
n-C11	42.28	0.2746	272146.50
	42.49	0.0419	41517.21
87	42.62	0.8606	852816.90
88	42.80	1.1739	1163297.00
	42.96	0.1522	150793.70
	43.13	0.0361	35755.20
	43.28	0.1029	102015.20
	43.68	0.8125	805103.20
	43.80	0.2168	214854.60
	43.88	0.2410	238828.90
	44.04	0.3741	370682.20
	44.11	0.2095	207623.10
	44.21	0.7145	708048.80
89	44.42	0.7397	732943.70
	44.63	0.1074	106460.50
	44.72	0.2711	268642.80
	44.88	0.3649	361550.30
	45.10	0.2466	244343.10
	45.19	0.2789	276402.20
	45.36	0.0667	66098.90
	45.54	0.4196	415794.40
90	45.70	1.0806	1070823.00
	45.94	0.2247	222700.50
	46.14	0.2556	253247.20
	46.22	0.1391	137825.30
	46.39	0.2855	282903.00
	46.58	0.1829	181276.70
	46.64	0.3579	354660.30
	46.71	0.2161	214134.40
	46.87	0.1146	113598.10
	47.10	0.1697	168190.00
n-C12	47.15	0.2591	256720.10
	47.35	0.1614	159965.40
	47.49	0.0820	81283.38
	47.64	0.1037	102783.80
i-C13	47.80	0.6302	624518.40
	48.02	0.0687	68086.62
	48.11	0.1642	162739.10
	48.21	0.0934	92525.53
	48.35	0.2797	277143.50
	48.48	0.0576	57053.89
	48.54	0.0799	79212.36
	48.72	0.5301	525245.60

Peak Name	Ret. Time	Area %	Area
	48.93	0.1056	104662.50
	49.07	0.0855	84735.48
	49.22	0.6128	607283.70
	49.43	0.1243	123219.80
	49.59	0.1284	127196.60
	49.65	0.3808	377385.50
	49.86	0.4046	400908.10
I-C14	49.96	1.1091	1099052.00
	50.05	0.0698	69165.59
91	50.17	2.0752	2056392.00
	50.29	0.1468	145456.30
	50.37	0.3268	323861.80
	50.47	0.1944	192625.20
	50.57	0.1356	134388.60
92	50.68	1.3940	1381348.00
	50.85	0.1686	167117.60
	50.95	0.0619	61327.31
	51.05	0.1218	120698.60
	51.13	0.4001	396491.60
	51.33	0.4359	431985.90
	51.44	0.0508	50332.45
	51.51	0.1062	105214.30
	51.58	0.0905	89697.51
	51.64	0.2537	251378.80
	51.77	0.1956	193782.00
	51.86	0.1191	118003.70
	52.07	0.4559	451750.30
	52.23	0.2998	297112.30
	52.36	0.0822	81466.49
	52.44	0.1948	193074.80
	52.57	0.1326	131351.60
	52.69	0.2605	258133.80
	52.76	0.1469	145579.50
	52.85	0.1493	147944.00
I-C15	52.98	1.5955	1581005.00
	53.08	0.6459	640087.20
	53.38	0.7942	787003.70
	53.43	0.8555	847746.80
	53.62	0.4905	486065.00
	53.70	0.1209	119821.60
	53.76	0.9759	967083.50
	53.85	0.9222	913837.10
	53.99	0.1542	152818.20
	54.16	0.1740	172415.40
	54.25	0.3974	393814.30
	54.31	0.2325	230413.30
	54.41	0.1944	192649.60
	54.50	0.2592	256804.70
	54.60	0.3008	298028.40
	54.69	0.5130	508380.10
	54.85	0.1460	144669.30
I-C16	55.00	1.6730	1657805.00
	55.14	0.2964	293727.90
	55.23	0.0876	86795.87
	55.40	0.4353	431335.20
	55.51	0.1975	195713.10
	55.60	0.2638	261454.00
	55.70	0.1952	193463.40
	55.74	0.4211	417323.50
	55.83	0.3066	303861.20
	55.94	0.1958	194035.50
	56.03	0.1022	101284.60
	56.10	0.1916	189902.30
	56.20	0.2214	219373.30
	56.32	0.4129	409187.60
	56.42	0.1959	194133.90
	56.64	0.3376	334563.70

Peak Name	Ret. Time	Area %	Area
	56.73	0.3000	297282.60
	56.80	0.1192	118103.00
	56.87	0.4469	442883.60
	56.99	0.4415	437535.50
	57.09	0.3719	368502.80
	57.31	0.2179	215944.90
	57.46	0.0870	86250.05
	57.54	0.2777	275179.30
	57.64	0.2979	295224.70
	57.80	0.0900	89199.61
	57.89	0.0287	28485.10
	58.04	0.1084	107409.90
	58.14	0.0654	64802.60
	58.31	0.0689	68258.55
	58.45	0.1758	174215.80
I-C18	58.58	1.5466	1532576.00
	58.77	0.1769	175259.60
	58.90	0.1441	142790.60
	58.99	0.0923	91445.60
	59.12	0.0263	26019.35
	59.25	0.2293	227221.10
	59.37	0.3601	356838.60
Pristane	59.55	2.0102	1991997.00
	59.64	0.3087	305892.10
	59.79	0.2036	201768.60
	59.94	0.0750	74367.39
	60.06	0.1342	132956.00
	60.13	0.1705	168917.10
	60.26	0.4018	398185.70
	60.46	0.1834	181701.80
	60.66	0.0937	92807.78
	60.79	0.1568	155401.80
	60.91	0.1075	106542.00
	61.06	0.1221	120961.30
Phytane	61.15	1.0102	1001050.00
	61.42	0.1077	106685.70
	61.51	0.1848	183169.00
	61.68	0.0475	47077.21
	61.88	0.0788	78070.55
	62.13	0.0671	66453.99
	62.33	0.2820	279481.10
	62.55	0.1495	148131.80
	62.63	0.1373	136056.40
	62.79	0.0437	43279.69
	62.91	0.0708	70151.12
	63.00	0.0496	49026.92
	63.15	0.1449	143590.90
	63.44	0.0473	46883.92
	63.56	0.0919	91031.08
	63.74	0.0654	64817.26
	63.92	0.0322	31905.40
	64.01	0.0250	24745.99
	64.24	0.0235	23288.95
	64.41	0.0191	18954.69
	64.49	0.0375	37115.57
	64.59	0.0267	26499.09
IS #3	64.67	0.2322	230100.90
	64.75	0.0983	97366.71
	65.06	0.0284	28113.34
	65.46	0.0342	33852.45
	66.05	0.0322	31876.97
	66.71	0.0119	11840.13

Total Area = 9.909314E+07 Total Height = 3.265592E+07 Total Amount = 0

REPORT OF ANALYTICAL RESULTS

Zymax FORENSICS

Client:	Paul Parmentier The Source Group 1962 Freeman Ave. Signal Hill, CA 90755
Project:	
Project Number:	
Collected by:	

Lab Number:	42542
Collected:	2/7/2012
Received:	2/9/2012
Matrix:	Product
Sample Description:	See Below
Analyzed:	2/22/2012
Method:	GC/ECD

EDB and ORGANIC LEAD SPECIATION

LAB NUMBER	SAMPLE DESCRIPTION	EDB mg/L	TML mg/L	TMEL mg/L	DMDEL mg/L	MTEL mg/L	TEL mg/L	MMT mg/L
42542-6	B-16	<0.5	<5	8.7	19	29	68	<5
42542-7	PO-16	<0.5	<5	5.8	12	39	94	<5
Detection Limit:		0.5	5.0	5.0	5.0	5.0	5.0	5.0
Method Blank:		<0.5	<5	<5	<5	<5	<5	<5

EDB: Ethylene Dibromide
TML: Tetramethyl Lead
TMEL: Trimethylethyl Lead
DMDEL: Dimethyldiethyl Lead
MTEL: Methyltriethyl Lead
TEL: Tetraethyl Lead
MMT: Methylcyclopentadienyl Manganese Tricarbonyl

Submitted by,
Zymax Forensics, A DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

42542e-c.xls
STL

QUALITY ASSURANCE REPORT

Zymax FORENSICS

Client:	Lab Number:	42542
The Source Group	Analyzed:	2/22/2012
1962 Freeman Ave.	Method:	GC/ECD
Signal Hill, CA 90755		

QA DATA FOR EDB and TEL

ANALYTES	RF	RF_D	%D	ACCEPTANCE LIMIT %
EDB	0.684	0.68	0.50	± 15
TEL	0.038	0.033	13.50	± 15

EDB: Ethylene Dibromide
TEL: Tetraethyl Lead
RF = Mean response factor from 3 point calibration
RF_D= Daily calibration standard response factor
% D = % Difference
Calibration file: ORG07168.M / MMT07168.M

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

42542e-c.xls
STL

EXHIBIT 3

To: Project File

From: Adnan Siddiqui

Date: June 12, 2012

Subject: Golden West Refinery site (SCP 0227A) Meeting

Meeting Attendees:

Name	Representing
Mr. Chris Panaitescu	Golden West Refinery Company (GWRC)
Mr. Simon Tregurtha	GWRC
Mr. Larry Higinbotham	GWRC
Mr. Neil Irish	(The Source Group-SGI) GWRC
Mr. Paul Parmentier	(The Source Group-SGI) GWRC
Ms. Paula Rasmussen	Regional Board
Dr. Arthur Heath	Regional Board
Mr. Adnan Siddiqui	Regional Board

After the introductions, Dr. Heath stated that the purpose of the meeting is to discuss remaining requirements under the cleanup and abatement order (CAO) and the current status of the site to ensure CAO requirements are met by the Golden West Refinery (GWRC).

Mr. Siddiqui provided the current work status, which includes: 1) continuous operation of multiple soil vapor extraction (SVE) systems at the site; 2) removal of LNAPL from on-site and off-site Semi-Perched and Artesia aquifer wells; 3) LNAPL and water level gauging; and 4) sampling and analyses of selected Artesia wells. Regional Board staff stated that based on the CAO requirements, at the present time, there is a need for offsite soil vapor data as well as dissolved phase groundwater monitoring for Semi-Perched and Artesia aquifers. Regional Board is especially concerned about the approximately 3000 feet long plume that occurs at shallow depth and extends into a residential area. There is no offsite soil vapor data and Regional Board would like GWRC to conduct a soil vapor survey from offsite locations.

Mr. Panaitescu provided the site history and stated that all environmental work related to the release from the site had been conducted under the regulatory oversight and approval of the Regional Board. The impacted soil at the site was remediated up to 20-foot depth, with 270,000 tons of soil removed and hauled for treatment or disposal. A human health risk evaluation/assessment was also carried out under the City of Santa Fe Springs Fire Department (SFSFD), DTSC, OEHHA, and the Regional Board and an independent certified toxicologist selected by SFSFD and RWQCB, prior to the redevelopment of the site into a business park. The Regional Board executed multiple prospective purchase agreements (PPAs) and covenants not sue for various portions of the site to support site redevelopment. GWRC installed six soil vapor extraction (SVE) systems and over 200

SVE wells across the site to address the residual contamination in deeper soil. The SVE systems continue to operate to the present day. Mr. Panaitescu believes that GWRC met and exceeded all requirements in addressing the assessment and cleanup of contaminants released from the site to achieve the goal of site redevelopment. Mr. Panaitescu stated that he believes that the GWRC redevelopment can be considered the most responsive cleanup among the area's refineries. Mr. Panaitescu also referred to present day poor economy, due to which GWRC has limited finances available for conducting additional work related to addressing off-site environmental conditions which are caused by others in his opinion. He said that he is wondering why the current staff is asking for past human health reports from the site, when this issue has been already addressed before. He explained that there is a very large amount of reports for the site, which is stored in a warehouse. He requested that in the future, Regional Board staff contact him directly for the information to ensure that the information would be provided, but he also encouraged Mr. Siddiqui to contact any GWRC or SGI person if needed.
Mr. Siddiqui mentioned that he also has many GWRC file boxes in his office to review, and Dr. Heath encouraged GWRC to help Mr. Siddiqui, and GWRC agreed.

Mr. Panaitescu addressed the Regional Board's CAO requirement to collect soil vapor data from offsite locations. Mr. Panaitescu indicated that the GWRC team has recently concluded that the light non-aqueous phase liquid (LNAPL) plume in the Semi-perched Aquifer originating from the site does not extend to well PO-16 located approximately 3000 feet downgradient from the site in a residential area. For more information, GWRC team made reference to the March 2012 report prepared by SGI and submitted to the Regional Board. GWRC team also brought vials of LNAPL samples collected from various wells located along the Semi-perched LNAPL plume that SGI laid on the map. According to the GWRC team, based on the visual appearance and other aspects such as weathering of product, fingerprinting results, the layered lithology, and comparison with other refineries, the LNAPL plume originating from the site does not extend beyond few hundred feet downgradient (southwest) from the site. The rest of the plume appears to have been generated by other off-site sources. Mr. Parmentier also showed the apparently fresher characteristic of the LNAPL sample from the leading edge of the plume compared to the degraded product at the edge of the refinery, and this pattern would be expected to be reversed if GRWC were the source of the LNAPL. Discussions followed regarding the commingling of the plume and GWRC pointed to an area northwest of B13 as the likely edge of the GWRC plume. GWRC team also mentioned that in the SGI report they have identified other potential sources in the area that are sources of the LNAPL downgradient from the site. In response to Dr Heath's question on pipeline ownerships, GWRC responded that GWRC had owned some of the pipelines, and that some were owned by others, and that GWRC had recently filed with the RWQCB a report on the integrity of its pipelines in response to a RWQCB inquiry regarding an ARCO UST site located on Rosecrans about half a mile west of Carmenita where apparently jet fuel had been identified.

Mr. Paul Parmentier gave the example that there were 88 above ground tanks at the former Chemcentral site. Mr. Siddiqui informed GWRC team that former Chemcentral

site is also managed by Mr. Siddiqui and those 88 tanks contained chemicals and did not store gasoline, diesel, aviation fuels and crude oil.

GWRC team provided the following arguments for other sources downgradient from the former refinery::

- Differences in the color, weathering and chemical composition (as reported by a fingerprinting specialty lab) of LNAPL samples from wells. GWRC team also referred to the SGI report for more information.
- Presence of other underground and aboveground storage tank sites and pipelines that are potential sources of the LNAPL plume. GWRC described that the UST closures mostly occurred in the late 1980's and early 1990's, that these off-site USTs were built as single wall steel tanks, and that these UST sites appeared to have been rapidly closed by attributing contamination at the UST site to GWRC. As an illustration to handling of UST sites near refineries, Mr. Panaitescu related the investigations that have been required from Thrifty Oil by the RWQCB at a UST site in Carson (Thrifty Oil No.73) although the UST site is surrounded by two refineries, one of them being located approximately 500 feet from the subject UST site.
- GWR team also referred to the SGI report for more information.
- According to GWRC team, the LNAPL plumes released from a site are usually limited to only few hundred feet in length from the site and therefore a 3000 feet long plume is unlikely to be from the site. Mr. Irish mentioned that SGI had worked at other refineries and contacted other consultants and no case of a 3,000 feet long LNAPL plume was identified in California through this inquiry, and it appeared that a 3,000 ft long LNAPL plume from single source did not pass the reasonableness test. Mr. Siddiqui indicated that he has been reviewing the UST cases listed by GWRC and has not yet completed its review.
- The nature of the semi-Perched Aquifer and discontinuous layers subsurface conditions are unlikely to allow migration of LNAPL to 3000 feet or more from the source. The GWRC team also pointed out that a line of extraction wells has operated at the southern edge of the refinery since the early 1990's, and that the Carmenita sump operated by the City of Santa Fe Springs (with treatment by GWRC) also provides effective control of groundwater and LNAPL along the southern edge of the refinery.
- The off-site investigation was conducted in the 1980's with limited understanding of plumes, as shown by the drilling of a monitoring well as far away as 1.5 miles from the refinery.

The GWRC team and Mr. Panaitescu stated that GWRC is not willing to conduct a soil vapor survey downgradient from the site as far as well PO-16 based on the likelihood of other sources' contribution, as concluded in the March 2012 Report prepared by SGI. Mr. Panaitescu stated that GWRC would address the potential soil vapor concerns south of the refinery within the footprint of the plume portion interpreted as originating from the refinery.

Dr. Heath requested that GWRC address the potential vapor concerns for another residential area located southwest and adjacent to the west tank farm. Mr. Siddiqui indicated that well A-4A had reported LNAPL. Mr. Tregurtha explained that the product in well A-4 was due to a recent pipeline failure caused by Kinder Morgan, as had been reported in semi-annual reports from 2004 to 2009. SGI indicated the absence of a semi-perched groundwater zone in that area, and that this area is a 100-ft deep upgradient portion of the Artesia groundwater zone. Mr. Panaitescu agreed to address concerns of soil vapor in that residential area by providing supporting existing technical data or performing a soil gas survey.

Mr. Siddiqui stated that according to his review of the data contained in the project file at this time, the primary source for the LNAPL plume in the Semi-Perched Aquifer is GWRC site. Mr Siddiqui continue to state that the evidence based on comaprision of LNAPL samples from various wells does not conclusively eliminate GWRC as the source of the LNAPL and GWRC should be conducting the soffsite survey over the plume. The GWRC team pointed out again to the arguments against such conclusion, and expressed concerns that such conclusion was made prior to a complete review of the SGI March report. Dr. Heath interrupted the discussion to state that the RWQCB will prepare a technical response to the SGI March document.

GWRC and SGI have also proposed in the March 2012 SGI report the removal of some wells from groundwater monitoring. GWRC team asked Mr. Siddiqui about monitoring the dissolved phase plume. Mr. Siddiqui stated that there are sentry wells located in the downgradient direction at a long distance from the leading edge of the LNAPL and dissolved plumes in the Semi-perched and Artesia aquifers. He added that it is also important to regularly monitor the concentrations in the dissolved phase. Mr. Parmentier pointed out that many on-site wells were within known plumes of LNAPL or previous LNAPL, and that additional costly sampling of such wells would not provide valuable information. Some wells were destroyed and then replaced with well with improperly placed screen intervals. Mr. Siddiqui provided the example of well B-18 screened in the Semi-Perched Aquifer, which contained a few feet of LNAPL (1986-1989). After GWR was unable to locate and/or access the B-18 well, a replacement well AO-16 was installed in its vicinity but this new well is screened in the Artesia Aquifer and as expected it is free of LNAPL and exhibit non-detect concentrations for dissolved phase petroleum related compounds.
[Note by GWRC June 18 2012: although the well AO-16 drilling (1992) occurred after access to well B-18 was lost (1989), the installation of that Artesia well was completed with RWQCB approval several years after the initial investigation, and there was clear understanding that two distinct groundwater zones exist at the site, and well AO-16 was not meant as a replacement for well B-18]

Regional Board staff is conducting its review to evaluate the wells at the site and upon its conclusion will provide a response.

Dr. Heath also informed Mr. Panaitescu that USEPA is also interested and inquiring about the site because the GWR is/was a RCRA site and a former Tank Farm. Mr.

Panaitescu stongly stated that GWRC will be willing to challenge any requirement for it to condcurt sampling related to the entire footprint of the LANPL plume. Dr. Heath stated that it would be preferable that GWRC cooperate with the Regional Board to conduct any work that is required under the Cleanup and Abatement Order.

The meeting concluded by a review of the 3 next step items listed on the agenda:

- On-site and off-site groundwater monitoring – GWRC indicated that this task is complete. Regional Board will provide a response to SGI report.
- Off-site vapor survey
- Public Participation. Dr. Heath indicated that public participation is becoming an increasingly important aspect of RWQCB cases.

EXHIBIT 4

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

1124033
RECEIVED
JUN 25 2012 FILE
ENVIRONMENTAL
SCH GWRC

June 21 2012

Mr. Chris Panaitescu
Golden West Refining Company
13116 Imperial Highway
Santa Fe Springs, CA 90670

Certified Mail
Return Receipt Requested
Claim No. 7009 2820 0001 6537 5104

SUBJECT: REQUIREMENT FOR SOIL VAPOR ASSESSMENT PURSUANT TO CLEANUP AND ABATEMENT ORDER NO. R4-2004-0020

SITE: GOLDEN WEST REFINING COMPANY – 13539 FOSTER ROAD, SANTA FE SPRINGS, CALIFORNIA (SCP NO. 0227A, SITE ID NO. 2040073)

Dear Mr. Panaitescu:

The California Regional Water Quality Control Board (Regional Board), Los Angeles Region, is the State regulatory agency with primary responsibility for the protection of groundwater and surface water quality for all beneficial uses within major portions of Los Angeles and Ventura Counties, including the referenced site. To accomplish this, the Regional Board issues investigative orders authorized by the Porter Cologne Water Quality Control Act (California Water Code [CWC], Division 7).

The former Golden West Refining Company (site) located in Santa Fe Springs is a former refinery and petroleum storage facility. Beginning in the 1920's, until 1997, Golden West Refining Company (GWRC) and its predecessors conducted refining, blending and storage of crude oil and finished products at the site. The dismantling of the site structures and redevelopment activities began in 1997. GWRC also conducted excavation of impacted soil approximately to 10-foot depth so that site redevelopment could take place. The site is now completely redeveloped into a business park for commercial/industrial use.

During a road grading project in 1979, light non-aqueous phase liquid (LNAPL) was discovered floating over the shallow Semi-perched Aquifer, which occurs at an approximate depth of 20 feet below ground surface (bgs) beneath the site and its vicinity. Since the discovery of LNAPL, a number of environmental investigations have been conducted at the site. The results of these investigations confirm the following:

a) The discharged wastes primarily consist of petroleum hydrocarbons, volatile organic compounds (VOCs) and metals impacting the underlying soil and groundwater;

b) There is a soil vapor plume consisting of petroleum hydrocarbons and VOCs including benzene within the unsaturated zone beneath the site that requires active remediation;

c) There is a LNAPL plume present in both the shallow Semi-perched Aquifer and the deeper Artesia Aquifer, and the plume extends off-site;

d) In the Semi-Perched Aquifer, the LNAPL occurs at approximately 20 feet bgs;

e) The LNAPL plume in the Semi-Perched Aquifer laterally extends approximately 3000 feet from the site in a southwest direction and the dissolved phase plume is larger in extent.

The Regional Board has issued cleanup and abatement orders to the refinery operators and owners for conducting the assessment and cleanup of soil and groundwater, beginning in 1985. The Regional Board issued the latest Cleanup and Abatement Order No. R4-2004-0020 (CAO) on August 24, 2004 to the GWRC. The CAO requires that GWRC conduct assessment and cleanup of waste in the unsaturated zone as well as in groundwater. Since becoming the owner and operator of the refinery in 1983, GWRC has collected data for the assessment of waste in soil and groundwater and performed remedial excavation of shallow impacted soils, generally to 10-foot depth prior to the site redevelopment. As required by the CAO, GWRC is currently operating six on-site soil vapor extraction systems to remediate the petroleum hydrocarbons and VOCs in the unsaturated zone. GWRC is also removing LNAPL from on-site and off-site wells screened within the Semi-Perched and Artesia aquifers. In addition, GWRC is gauging water levels in the Semi-Perched and Artesia aquifers and also conducting semi-annual groundwater monitoring at the selected Artesia Aquifer wells.

Upon review of the ongoing activities documented in the semiannual groundwater monitoring reports and quarterly remediation progress reports, as well as the data presented in other technical reports contained in the project file, Regional Board staff has concluded that there are data gaps in the delineation of contaminant plume(s) in the unsaturated zone and in groundwater. Therefore, to comply with the CAO, additional information is required. At this time, the following area of immediate concern is identified:

a) The LNAPL plume in the shallow Semi-Perched Aquifer extends off-site into a residential area near well PO-16. The nature of the vadose zone and depth to the LNAPL in the residential area is similar to that found beneath the site where soil vapor extraction systems are being operated for the cleanup of VOCs present in the vadose zone. There is no off-site soil vapor data available to evaluate vapor intrusion.

GWRC has been only gauging depth to groundwater and/or LNAPL in the Semi-Perched Aquifer wells. The dissolved-phase groundwater plume in the Semi-Perched Aquifer also needs to be sampled regularly for analyses to determine the nature and type of the contaminants in the dissolved phase groundwater plume. In the March 2012 SGI report, GWRC has included a proposed modification to the existing groundwater monitoring program. A response will be provided after Regional Board staff completes its evaluation of the proposed program.

Pursuant to the Cleanup and Abatement Order No. R4-2004-0020, you are required to conduct the following task:

1. Conduct an off-site soil vapor survey; determine and complete the nature and extent of the soil vapor plume; and perform a vapor intrusion evaluation. A work plan for a soil vapor survey is due to the Regional Board by **August 15, 2012**.

The due date of **August 15, 2012** is an amendment to Attachment A (enclosed) of the existing Cleanup and Abatement Order No. R4-2004-0020 dated August 24, 2004. Failure to comply with the terms or conditions of this Order may result in imposition of civil liabilities, imposed

either administratively by the Regional Board or judicially by the Superior Court in accordance with sections 13268, 13304, 13308, and/or 13350 of the California Water Code, and/or referral to the Attorney General of the State of California.

If you have any questions, please contact Mr. Adnan Siddiqui (project manager) at (213) 576-6812 (asiddiqui@waterboards.ca.gov) or Dr. Arthur Heath, Section Chief at (213) 576-6725 (aheath@waterboards.ca.gov).

Sincerely,

Samuel Unger

Samuel Unger, PE
Executive Officer

Enclosed: Amended Attachment A: Cleanup and Abatement Schedule

CC: Steve Armann, USEPA (via e-mail)
Katherine Baylor, USEPA (via e-mail)

Amended Attachment A

Cleanup and Abatement Schedule

Activity	Due Date
Subsurface Investigation, Soil Vapor Survey	August 15, 2012

EXHIBIT 5

OFF-SITE SOIL VAPOR SURVEY WOKPLAN

Former Golden West Refinery
Santa Fe Springs, California

04-GWRC

Prepared For:

Golden West Refining Company
13116 Imperial Hwy
Santa Fe Springs, CA 90670

Prepared By:

THE SOURCE GROUP, INC.
1962 Freeman Avenue
Signal Hill, CA 90755

August 2012

Prepared By:

Paul Parmentier
Principal Hydrogeologist

REGISTERED GEOLOGIST
Paul Parmentier
No. 3915
STATE OF CALIFORNIA

Reviewed By:

Neil Irish
Principal Geologist

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

On behalf of the Golden West Refining Company (GWRC), The Source Group, Inc (SGI) conducted a review of the previous data on subsurface site conditions under the former Golden West Refinery (Refinery), located in the city of Santa Fe Springs, California (Figure 1).

On June 21, 2012, the Los Angeles Regional Water Quality Control Board (RWQCB) issued to GWRC a requirement for soil vapor assessment pursuant to Cleanup and Abatement Order (CAO) No. R4-2004-0020 (RWQCB, 2012). This requirement followed a meeting held on June 12, 2012, at the RWQCB between RWQCB, GWRC, and SGI to discuss a report prepared in March 2012 by SGI proposing a revised groundwater monitoring program (SGI, 2012). During that meeting, RWQCB expressed concerns that the investigation of vadose zone hydrocarbons, particularly in residential areas, remained an incomplete requirement from the 2004 CAO. At the meeting, GWRC committed to review the existing information on soil gas under the refinery and the hydrogeologic setting and committed to further address data gaps on soil gas in residential areas mentioned above.

From 1997 to 2010, the Refinery was dismantled and redeveloped into commercial and light industrial facilities. Following multiple investigations and remediation activities required by and reported to the LARWQCB, successive portions of the Refinery were redeveloped and additional in-situ remediation and monitoring are on-going. The investigation and remediation of the Refinery have been conducted under the oversight of the RWQCB as the lead agency and other agencies including the City of Santa Fe Springs Fire Department, Department of Toxic Substances Control (DTSC) and Office of Environmental Human Health Assessment (OEHHA). Current groundwater monitoring is conducted in compliance with CAO R4-2004-0020.

This Work Plan is written to document the existing data on soil gas concentrations associated with the Refinery, to identify data gaps, and to propose a soil gas investigation.

1.1 Site Background

The former Golden West Refinery property is located in the city of Santa Fe Springs, California, near crude oil-producing fields, but no oil and gas drilling activities are reported to have occurred on this site. In 1925, Wilshire Oil Company ("Wilshire") purchased the Refinery Property and built storage facilities with more than seven (7) million barrels capacity. In 1936, Wilshire constructed an oil refinery located east of Carmenita Road and north of East Foster Road, where gasoline and other finished petroleum products were manufactured. In 1960, Gulf Oil Corporation ("Gulf) purchased the Refinery Property from Wilshire. Gulf refined crude oil into finished gasoline, heavy fuel oils, diesel fuel and asphalt. In 1983, GWRC purchased the Refinery Property from Gulf. GWRC operated the refinery process unit until February 1992, when crude oil processing operations were suspended. Only fuel transport operations were conducted by GWRC at the Refinery Property from February 1992 to August 1997, when all petroleum storage operations

ceased (GWRC, 2011a). The refinery facility was formerly divided into four areas (Figure 1) that included:

- Process Unit Area (PUA);
- West Tank Farm (WTF);
- South Tank Farm (STF); and
- Marketing Area (MA).

The former PUA, located in the northeastern part of the former refinery property, was utilized as the main processing area. The former STF and WTF areas were used for storage and blending of crude oil, intermediate products, and finished products and an asphalt plant temporarily operated in the WTF. The finished fuel products were then loaded and distributed in the MA.

Starting in 1997, the WTF, STF, PUA, and MA were successively dismantled and redeveloped into light manufacturing industrial and commercial warehouse facilities. During each phase of site redevelopment, all primary potential contaminant sources (storage tanks, piping, processing units, etc) were removed, along with secondary sources of contamination (impacted shallow soils). These remediation tasks were conducted under oversight of the RWQCB, the City of Santa Fe Springs Fire Department, DTSC and OEHHA.

1.2 Site Geology and Hydrogeology

The geology, lithology and hydrogeology of the Site have been documented through multiple phases of site investigations, evaluations and studies that have included soil borings, cone penetrometer testing (CPT) soundings, well installations, vertical groundwater contamination assessments, aquifer tests, groundwater modeling, and evaluation of natural attenuation. A significant network of monitoring wells, composed of over 130 wells, exists at the site and extends off-site.

Two shallow groundwater zones have been identified under the site. The uppermost water-bearing zone, the Semi-Perched zone, is found locally at depths ranging from 20 to 50 feet below ground surface (bgs) in the Bellflower Formation. This laterally discontinuous Semi-Perched zone is unconfined and occurs both on and off GWRC property. The soils in this zone are composed of clay and silt, with lenticular sand and gravel layers. The sand and gravel layers are water-saturated in some areas within and south of the GWRC property and these saturated sediments form the Semi-Perched zone. Where these lenticular sands and gravel layers are not underlain by less-permeable clay and silt layers, the Semi-Perched zone is absent (TriHydro, 1991).

The Semi-Perched zone exists in the southern part of the STF and extends off site to the southwest, with a general southwesterly gradient direction. Drilling in the northern part of the STF and at the MA did not encounter the Semi-Perched zone, providing confirmation of the limited northern lateral extent of that zone. The figures depicting groundwater information also display the interpreted outline of the Semi-Perched groundwater zone. Groundwater elevations and southwestern gradient in the Semi-perched zone measured during groundwater monitoring events

conducted since the 1980's have been reported to be consistent, with a groundwater gradient to the southwest and an average hydraulic gradient of approximately 0.005 ft/ft.

The Semi-Perched groundwater zone is also locally influenced by the continuous groundwater extraction conducted by the City of Santa Fe Springs to maintain dewatering of the Carmenita Road Underpass. This dewatering-related groundwater extraction conducted since the 1980's has been creating a constant sink in groundwater levels centered at the Carmenita/railroad intersection. All groundwater and occasional free phase hydrocarbons removed by City dewatering operations have been treated by GWRC at a treatment system located in the MA.

The Artesia Aquifer is found at a depth of approximately 65 to110 ft bgs under the Refinery and off-site. The Artesia Aquifer is the first groundwater encountered under most of the Refinery area. In the southern part of the site and off-site southwest of the refinery, the Artesia Aquifer occurs under the Semi-Perched zone and in these areas approximately 20-30 feet of unsaturated sediments underlie the low-permeable perching layer that forms the base of the Semi-Perched zone.

The Artesia Aquifer is composed of fluvial sediments of gravel, fine to coarse sand, and interbedded silt and clay. The lithology of the upper portion of the Artesia Aquifer, where most of the Artesia monitoring wells are completed, is irregular and reflects a complex sequence of interbedded and laterally discontinuous layers of sand, silt, and clay (TriHydro, 1991). Vertically, the Artesia aquifer extends to depths of at least 200 feet and consists of sand and gravel with localized fine grain layers.

Groundwater gradient and direction in the Artesia zone varies throughout the Site and surrounding areas with localized mounding, however, in general, the groundwater flow has been reported to the east-northeast and southeast. Groundwater mounding occurs in the area of the intersection of Foster Road and Carmenita Road and has been consistently reported in groundwater monitoring reports since 1986. As depicted in the First Semi-Annual 2011 groundwater monitoring report (GWRC, 2011-Figure 5), the mounded groundwater occurs in an area approximately 1,000 feet in diameter, where the wells exhibit groundwater at elevations approximately 10 feet higher than the piezometric surface in the surrounding Artesia groundwater zone.

In 1990-1991, TriHydro conducted a series of extensive groundwater investigations including lithology investigation on-site and off-site by cone penetrometer testing (CPT) and aquifer testing in both the Semi-Perched zone and the Artesia aquifer. The CPT investigation included a 110-location lithology investigation south of the GWRC site. The investigation resulted in confirmation of the occurrence of the Semi-Perched groundwater in a sand/silty sand unit, underlain by a clay/silty clay perching layer. According to TriHydro's interpretation, the lateral extent of that Semi-Perched zone is limited areally for two principal reasons: (1) where the finer-grained deeper unit is not present, there is no longer any support for the overlying perched zone, and (2) where the permeable unit hosting the semi-perched layer pinches out between two lower-permeability units, the fluid cannot accumulate in the tighter pore spaces of these less permeable units and the zone disappears (TriHydro, 1991b).

1.3 LNAPL Fingerprinting Results and Identification of Off-Site Sources

As described in the March 2012 SGI Report (SGI, 2012), SGI conducted a petroleum hydrocarbon fingerprinting investigation which concluded that the LNAPL found in the Semi-Perched wells from the STF to Rosecrans Avenue consists of three types related to at least three separate sources: the product in STF wells, the product in the area of wells B-13 and MYTNN, and the product in the vicinity of Rosecrans Avenue.

The LNAPL fingerprinting analyses and the physical character of the LNAPL support the interpretation that the product found in the Cambridge Court/ Rosecrans Avenue area in wells B-13, MYTNN, B-16 and PO-16 is attributable to non-Refinery sources. The March 2012 SGI report presented further evidence of local hydrocarbons contamination at several former off-site USTs and aboveground storage tanks (ASTs) sites in the vicinity of these wells; none of these off-site USTs or ASTs were owned or operated by GWRC. The locations of these off-site petroleum hydrocarbon potential sources are illustrated on Figure 2.

Rose diagrams summarizing the direction of historical Semi-Perched and Artesia groundwater gradients for each part of the Refinery were included in the March 2012 SGI report (SGI, 2012), and these document the consistency of the historical Semi-Perched groundwater gradient direction to the southwest and Artesia groundwater gradient direction to the northeast and east.

Testing in the 1990's of deeper Artesia groundwater monitoring wells and of on-site groundwater production wells at the Refinery indicated no impact to deep groundwater by hydrocarbons or MtBE from the Refinery.

1.4 Distribution of LNAPL

The distribution of LNAPL under the Refinery has been delineated since the 1990s and monitored since then to be stable. The presence of LNAPL has been reported in the Semi-Perched and Artesia groundwater zones. In the Artesia zone, LNAPL is mainly found under the footprint of the Refinery, with one well off site well (AO-14) containing LNAPL. All monitoring wells along the western, northern, eastern and southeastern boundaries of the refinery contain no LNAPL.

The Semi-Perched groundwater zone is present beneath the STF and extends limitedly off-Site to the southwest. LNAPL has been found to be present on the Semi-Perched groundwater zone both under the STF and in locations up to 2,500 feet from the southern edge of the STF.

However, SGI concluded that the Semi-Perched LNAPL plume previously considered and reported as solely originating from the STF is actually the result of the contribution of fuel released from a number of distinct sources, with GWRC's STF only contributing to LNAPL found off-site in the immediate vicinity of the former refinery. This conclusion was based on:

(1) The unusually long lateral extent of LNAPL,

(2) The fingerprinting distinctions between product types, and

(3) The presence of other former USTs and hydrocarbon pipeline in the footprint of the Semi-Perched LNAPL plume.

1.5 Summary of Previous Site Remediation

During the redevelopment of the Refinery, source removal was conducted under RWQCB and other agencies' directives and oversight. These considerable source removal efforts included the dismantling and removal of all primary sources of contamination (tanks, pipelines, refining equipment, etc) and the excavation and removal of secondary sources (shallow contaminated soil).

In addition to multiple remediation activities conducted by GWRC since 1983, during the redevelopment project initiated in 1997, a total of 271,018 tons (180,679 cubic yards) of impacted soils were excavated and transported offsite to licensed soil disposal or recycling facilities between 1997 and 2006.

Fate and Transport Modeling was conducted by TRC in 2002. The TRC findings indicated that the hydrocarbon plumes were stable under 2002 remedial conditions in both the Semi-Perched zone and Artesia aquifer and that biodegradation was actively occurring.

In addition to the completed removal of primary and secondary containment sources, GWRC is also conducting active vadose zone remediation, with the on-going operation of six soil vapor extractions (SVE) systems, with an installed network of 251 SVE wells. This active remedial activity has removed a significant mass of VOCs from the vadose zone, resulting in much decreased concerns of potential vapor intrusion due to vadose zone contamination.

The GWRC plume stability is further supported by the operation of the Carmenita Underpass Sump and barrier wells located on the southern edge of the STF which reduce the plume migration from the Refinery.

1.6 Residential Areas Adjoining the Refinery

The Refinery is surrounded by commercial or industrial facilities except for two residential areas, (Figure 1), located east of the PUA and south of and adjacent to the WTF. The eastern part of the Refinery's PUA included an area of limited use (Area Q) that was sampled and was granted regulatory closure and authorization to construct by the RWQCB, (RWQCB 2003). East of Area Q, across Marquardt Street, are a park and residences.

The southwestern corner of the WTF is bordered by a railroad and, further to the south, a residential area that is part of the City of Norwalk and is located in a triangular section east of Shoemaker (Figure 1).

2.0 EVALUATION OF POTENTIAL SOIL VAPOR INTRUSION IN OFF SITE AREAS

The evaluation of soil vapor conditions under the Refinery and adjacent areas included:

- the identification of residential areas bordering the Refinery,
- a review of the distribution of hydrocarbons in shallow groundwater and potential associated migration as LNAPL or as dissolved hydrocarbons towards off-site areas, and
- a review of existing soil gas survey data.

2.1 Adjacent Residential Areas

Two residential areas are adjacent to the Refinery (See Section 1.6). The eastern residential area located east of Marquardt Street is adjacent to the former Refinery Area Q which was given regulatory closure and authorization to construct by the RWQCB, as mentioned in Section 1.6. In former Area Q, GWRC also has monitored groundwater quality from two Artesia groundwater zone sentinel well (A38/A-38A and A39/A39A), sampled since 1990, with no LNAPL and no detectable dissolved benzene concentrations. These observations indicate that the above-mentioned residential area east of the Refinery is not a concern for potential vapor intrusion.

The potential concern for vapor intrusion in the residential area south of the WTF will be addressed in this Work Plan.

2.2 Extents of Groundwater Contamination Plumes in Areas Adjacent to the Refinery

As described in Section 1.4, groundwater monitoring wells in the western, northern, eastern and southeastern edges of the Refinery intersected Artesia zone groundwater at depths of 60 to 100 feet below grade, and all Refinery boundary wells in these areas contain no LNAPL. Based on the depth to groundwater and the absence of LNAPL, areas adjacent to the Refinery west, north, east and southeastern of the Refinery are not considered of concern for potential vapor intrusion. The off-site area south of the MA and STF is addressed in Section 2.3. The off-site area southwest of the Refinery is addressed in Section 2.4.

2.3 Off-Site Areas South of the MA/STF

The evaluation of potential vapor intrusion concerns south of the Refinery included a review of Semi-Perched groundwater conditions and previous soil gas surveys.

The area southwest of the STF and south of the MA includes the presence of LNAPL in the off-site Semi-Perched groundwater wells. Investigations of this Semi-Perched groundwater have included groundwater monitoring well installation and monitoring since the 1980s, hydropunch® sampling in 1991, sampling for evaluation of natural attenuation in 2001, localized groundwater sampling by GWRC in 2007 (GWRC. 2007), periodic groundwater monitoring by ChemCentral (ChemCentral, 2010-2011), and fingerprinting of LNAPL by SGI in 2012 (SGI, 2012).

The previous soil gas data include the results of soil gas surveys conducted by GWRC prior to the construction of Buildings R and S in the STF and prior to the construction of Building I in the MA.

Groundwater conditions and soil gas survey data in the MA/STF area are discussed in the following sections to present the technical background for the evaluation of potential vapor intrusion risk concerns to residences south of the Refinery' s MA/STF.

2.3.1 Semi-Perched Groundwater Conditions South of the MA/STF

The information on the presence of hydrocarbons in the Semi-Perched groundwater zone includes a comprehensive off-site CPT and Hydropunch® investigation conducted in 1991 (Tri-Hydro, 1991), and multiple episodes of groundwater well sampling reports. SGI prepared three figures illustrating the findings from these investigations (Figures 3, 4 and 5).

Figure 3 presents the results of the 76 locations where Hydropunch® groundwater samples were collected, as tabulated also on Table 1A. The Tri-Hydro report on this investigation (Tri-Hydro,1991) concluded that "there are localized hydrocarbon sources in these areas (i.e. leaking underground storage tanks or pipelines) which may not be refinery related" (Tri-Hydro, 1991, page IV-1).

The Tri-Hydro data are illustrated on Figure 3, and are interpreted to indicate the following:

- The lateral hydrogeologic extent of the Semi-Perched zone was delineated by CPT soundings that did not encounter shallow groundwater,
- The Hydropunch® benzene data depicts the influence of multiple off-site sources contributing to the contamination of the Semi-Perched groundwater benzene (green, purple, blue, yellow, and red solid dots),
- The LNAPL samples in the vicinity of Rosecrans Avenue (red square with black star-insert symbols) were interpreted as less weathered (I.e. "fresher") than LNAPL samples closer to GWR, and,
- The two Hydropunch® samples (E1 and E2) collected just south of the MA and 4 samples (E-9, E-11, E-13 and E) collected in Cambridge Court contained no detectable hydrocarbons, strongly indicating that the no Semi-Perched groundwater contamination has migrated south of the MA.

Figure 4 illustrates the data also listed on Tables 1B and 1C on dissolved benzene concentrations from investigations conducted by GWRC in 2001 (TRC, 2002) and in 2007 (GWRC 2007), and the results of sampling at the ChemCentral facility located south of the STF (Rubicon 2011).

Figure 5 presents a combination of previously summarized data (Figures 2 and 3, SGI, 2012) and provides an interpretation of the data:

- The higher dissolved benzene/LNAPL plume located near Rosecrans has been described as less weathered than the LNAPL found at the Refinery, and the LNAPL fingerprinting analyses confirm that this portion of the Semi-Perched LNAPL plume is due to a release distinct from the Refinery,
- The hydrocarbon plume extending from the vicinity of well B-13 to well MYTNN has also been characterized by fingerprinting analysis to be due to a separate release than the STF,
- The groundwater wells associated with the ChemCentral facility contain high concentrations of benzene and other hydrocarbons and of chlorinated hydrocarbons, including vinyl chloride, which may present a more significant vapor intrusion concern than petroleum hydrocarbons, and,
- LNAPL is present in the STF, including along the southern boundary of the site, where a network of 30 extraction wells have been operating since 1995, along with active SVE.

The interpretation of existing information indicates that the LNAPL found along the southern edge of the STF in the Semi-Perched zone represents a separate release of hydrocarbons, distinct and not related to the LNAPL plumes found further to the southwest and away from the Refinery.

Based on the data collected during the previous investigations as summarized above, at least four distinct plumes originating from different sources can be identified, as plotted on Figure 5.

2.3.2 Soil Gas Data, MA and STF

To further evaluate the potential for off-site vapor intrusion concerns, SGI reviewed the existing on-site soil gas survey data. As part of the site redevelopment, GWRC conducted three soil gas surveys along the southern edge of the Refinery, including one soil gas survey in the MA and two soil gas surveys in the STF. These soil gas surveys were each conducted following a RWQCB-approved work plan that had been prepared based on very detailed site investigations and post-excavation confirmation sampling, and designed to include sampling locations in areas of suspected high contamination levels. The results were submitted to RWQCB which subsequently authorized building construction. The soil gas benzene concentrations reported in the soil gas samples for each of the three surveys are illustrated on Figure 6 and listed on Table 2.

In the MA, 10 locations (SG-1 to SGI-10) were sampled, with soil gas benzene concentrations reported at 0.1 to 0.6 µg/L (Mactec 2006). In the STF, under the footprint of Building R, 12 locations were sampled, with benzene concentrations reported at non-detected to 0.4 µg/L (Mactec 2005). In the southeastern part of the STF, under the Building S extension footprint, 15 locations were found to contain benzene concentrations from non-detectable to 0.14 µg/L (GWRC 2009).

Evaluation of potential human health risks to site receptors from these soil gas concentrations reported no significant concerns for vapor intrusion, and RWQCB approved the soil gas reports and authorized building construction.

It should be noted that these soil gas surveys were conducted on-site, over areas presumed to be the sources of hydrocarbons or areas of known or suspected highest concentrations, and that therefore off-site areas located further from suspected source areas would be expected to have

much lower soil gas concentrations. In addition, the STF and MA have been under active vapor extraction for several years, including SVE from shallow wells, which have since removed significant amounts of residual vadose zone VOCs.

2.3.3 Summary of Potential Vapor Intrusion Issues, MA-STF

The soil gas benzene values in on-site areas of highest suspected hydrocarbon contamination were found to be below human health risks for redevelopment, and therefore, off-site areas further from the STF/MA hydrocarbon source areas would also be expected to present no vapor intrusion concerns. The ChemCentral facility, located south of the STF, has reported impacts to soil and groundwater by benzene and other hydrocarbons, and by chlorinated hydrocarbons that could represent a distinct vapor intrusion concern.

In the residential area south of Rosecrans Avenu, the presence of less weathered, high-benzene concentrations hydrocarbon plumes more than 2,000 feet southwest of the STF and ChemCentral facility have been interpreted to be from separate sources than the Refinery. The potential vapor intrusion concerns in this residential area are not considered to be related to contamination from the Refinery, and therefore a soil gas survey south of Rosecrans Avenue is not proposed in this workplan.

2.4 WTF

The WTF is a former area of petroleum product storage, and a former asphalt plant. The southern edge of the WTF is bordered by the railroad, and a residential area that is part of the city of Norwalk is found south of the railroad.

2.4.1 Groundwater Conditions, WTF

Semi-perched groundwater has not been reported in the southern and western parts of the WTF, and all groundwater monitoring wells in the southwestern parts of the WTF are screened in the Artesia groundwater zone, which is found at a depth of approximately 70 feet below grade. The groundwater gradient in this part of the Site, as monitored since 1985, has been consistently measured to be east/northeasterly (See SGI March 2012 report, Fig. 6), and therefore the residential area south of the WTF is considered to be cross-gradient and up-gradient of the WTF.

In 2003, as part of the re-installation of groundwater monitoring wells in the WTF, the southwestern well A-4A was installed by GWRC. After completion, it was discovered that the well drilling operations had nicked a mis-marked, buried active jet fuel line operated by Kinder Morgan, and that the pipeline had leaked petroleum product which subsequently entered the monitoring well. Consequently, LNAPL was recorded in well A-4A until 2010. In 2003, following the discovery of the fuel leak, the State Fire Marshall inspected the site of the drilling, and determined that Kinder Morgan had not adequately marked the location of the pipeline prior to GWRC drilling, and Kinder Morgan was fined for its error. In groundwater monitoring reports following the incident, GWRC

repeatedly reported that the LNAPL found in well A-4A was attributed to Kinder Morgan. Although the reported Kinder Morgan jet fuel product does not contain as high volatile concentrations as gasoline or other products, the recent (post 2003) presence of LNAPL in this part of the site may represent a gap in vadose soil gas data.

2.4.2 Soil Gas Data, WTF

In the WTF, GWRC conducted prior to redevelopment a soil gas survey that included 19 sampling locations in the southern part of the WTF. These locations, and the resulting benzene concentrations in soil gas, are illustrated on Figure 7 and listed on Table 2. The data indicates that only two locations (SG57 and SG-60) contained detectable benzene, with concentrations of 4.6 and 25.2 ug/L, respectively. It should be noted that these soil gas concentrations were measured in 1996) prior to the remediation of all shallow soil in the WTF associated with the RWQCB-approved Waste Discharge Requirements (WDRs), and therefore, these areas with reported higher benzene concentrations have been further addressed as part of the WTF remediation.

All southernmost soil gas locations contained no detectable benzene concentrations, indicating that the concerns for potential vapor intrusion in residential areas south of the WTF are not significant.

2.4.3 Summary of Potential Vapor Intrusion Issues, WTF

Residential areas border the southwestern edge of the Refinery's WTF, where petroleum storage operations were conducted. Soil gas surveys in 1996 indicated that the soil gas probes along the southern edge of the WTF did not have detectable benzene concentrations. However, in 2003, a leak of LNAPL to the subsurface was caused by Kinder-Morgan and the potential impact to soil gas from that LNAPL release has not been assessed.

Based on the presence of residential areas south of the WTF and the reported previous Kinder Morgan LNAPL in the southwestern part of the WTF, in response to the RWQCB June 2012 request (RWQCB, 2012), GWRC is proposing to conduct a soil gas survey south of the WTF as described in the following section.

3.0 SOIL VAPOR SAMPLING WORKPLAN

A soil vapor survey will be completed in the southwestern part of the WTF and in offsite areas south of the West Tank Farm. The north and east offsite areas are considered to be unaffected so will not be studied.

3.1 Sampling Locations

Soil gas samples will be collected from five locations in the residential area south of the WTF and one on-site location (Figure 7). The proposed off-site locations (Soil Gas Norwalk-SGN-1 to SGN-5) are in street areas, and access will be requested from the City of Norwalk.

The locations were selected to provide soil gas concentrations near the Kinder-Morgan caused LNAPL leak area and in the residential area parallel to the southwestern boundary of the WTF. Based on the potential presence of utilities or reduced access, the final locations for the soil gas sampling may be modified, and the RWQCB will be notified of any major scope modifications.

3.2 Methodology

3.2.1 Pre-field Activities

The following pre-field activities will be completed prior to mobilization to the field:

- An encroachment permit will be secured from the City of Norwalk for all off-site soil gas sampling locations.
- The proposed sampling locations will be cleared of underground utilities by Underground Service Alert and a utility locating service.

All field activities will be completed with safety as a foremost concern. In accordance with 40 CFR 1910.120, a Site-specific health and safety plan (HASP) will be prepared for the soil gas survey activities. All involved personnel, including onsite subcontractors and regulatory personnel, will be required to familiarize themselves with and sign the HASP in an attempt to minimize safety hazards. The HASP will identify the specific chemical compounds that may be encountered at the Site (BTEX and oxygenates), and present the chemical properties and a task-specific health and safety risk analysis.

3.2.2 Soil Gas Probe Installation

Methodologies used for the soil gas survey will be consistent with the April 2012 Active Soil Gas Advisory published by CalEPA. Using a geoprobe rig, a dual soil gas probe will be installed at each location at 5 ft and 10 feet below grade, resulting in a total of 12 probes. The probes will be labeled and temporarily protected by a traffic cone during the one-day soil gas survey.

The lithology of the borings will be noted to support evaluation of the soil gas data. To minimize the potential for cross-contamination between sampling locations, soil gas sampling equipment will be decontaminated prior to initiating work at each drilling location. The drop off point, 1/8-inch tubing, and sampling syringes are all disposable, and new ones will be used for each sample. The threaded point holder will be decontaminated by an Aquanox or equivalent wash and potable water rinse.

3.2.3 Soil Gas Sampling and Analysis

After a minimum two-hour period following probe installation, soil gas samples will be collected at each of the locations shown on Figure 7. In addition, two purge and one duplicate soil gas sample will be collected. One event of soil gas sampling is proposed.

Soil gas samples will be collected through the polyethylene tubing using a calibrated syringe connected to a sampling port. Prior to sample collection, a purge test will be conducted at the on-site location to determine the optimum purge volumes for the remaining of the sampling probes. The purging procedures (vacuum, flow rates and purge volume testing) will follow the 2012 Advisory.

The sample syringes will be labeled with sample-point identification, date, and time of collection. Soil gas samples will be taken to an onsite mobile laboratory where they will be logged onto the chain-of-custody form and assigned a laboratory identification number. The soil gas samples will be analyzed onsite by a California state-certified mobile laboratory by EPA Method 8260B for BTEX and oxygenates at a method detection limit target below the analytes' California Human Health Screening Levels (CHHSLs). The field work and data interpretation will be supervised by a Professional Geologist or Professional Engineer.

3.2.4 Soil Gas Probe Abandonment

After completion of the soil gas analyses, each probe will be removed from the ground and the sampling hole will be sealed with cement slurry, and the surface will be restored with concrete or asphalt to be consistent with initial and surrounding site surface conditions and as may be required by the city permit.

4.0 SCHEDULING AND REPORTING

Permitting from the City of Norwalk will be requested within two weeks of RWQCB approval of this Workplan. The utility clearing and field sampling will be implemented within three weeks of City permit approval, and the RWQCB will be notified at least three days prior to the proposed sampling, which will be conducted within one field day.

The report on the soil gas survey will be submitted to the RWQCB within 60 days of the field sampling completion. The report will present the results of the soil gas investigation and will document the methodologies and results from soil gas sample collection, and laboratory analyses. The report will present the findings of the investigations and interpretations. Analytical data will be presented in tabular format and annotated on the appropriate figures. Figures will include a site location map, site map showing the sample locations, and a site map showing annotated VOC concentrations. The report will contain all pertinent documentation such as permits, laboratory reports, survey data, and chain-of-custody forms. The final report will include a comparison of the results with residential CHHSLs and may include additional risk discussions or interpretations.

5.0 LIMITATIONS

This document was prepared for the exclusive use of the Golden West Refining Company (GWRC) and the Regional Water Quality Control Board (RWQCB) for the express purpose of complying with a client- or regulatory directive for a proposed workplan for an off-site soil vapor survey. Any re-use of this work product in whole or in part for a different purpose or by others must be approved by SGI and GWRC in writing. If any such unauthorized use occurs, it shall be at the user's sole risk without liability to SGI or GWRC. To the extent that this workplan is based on information provided to SGI by third parties, including GWRC, their direct contractors, previous workers, and other stakeholders, SGI cannot guarantee the completeness or accuracy of this information, even where efforts were made to verify third-party information. SGI has exercised professional judgment to collect and present findings and opinions of a scientific and technical nature. The opinions expressed are based on the conditions of the Site existing at the time of the field investigation, current regulatory requirements, and any specified assumptions. The recommendations presented in this report are intended to be taken in their entirety to assist GWRC and RWQCB personnel in applying their own professional judgment in making decisions related to the property. SGI cannot provide conclusions on environmental conditions outside the completed scope of work. SGI cannot guarantee that future conditions will not change and affect the validity of the presented conclusions and recommended work. No warranty or guarantee, whether expressed or implied, is made with respect to the data or the reported findings, observations, conclusions, and recommendations.

6.0 REFERENCES

CAPE Environmental

GWRC, 2007. Letter to RWQCB on ChemCentral Contamination Plume. July 3

GWRC, 2009 Soil Gas Survey Results Report and Request For Authorization to Construct, Former GWRC STF Building S Southern Extension, September 29

Mactec, 2005. Risk-Based Evaluation of Soil Vapor Survey Results, STF Area 6, Proposed Building R, April 22

Mactec, 2006. Risk-Based Evaluation of Soil Vapor Survey Results, Marketing Area. October 9

Rubicon, 2011, Subsurface Investigation Summary Report, Univar, 13900 Carmenita Road, Santa Fe Springs. July 15

RWQCB, 2003. Area Q Soil Closure and Authorization to Proceed with Well Development, GWRC. July 29

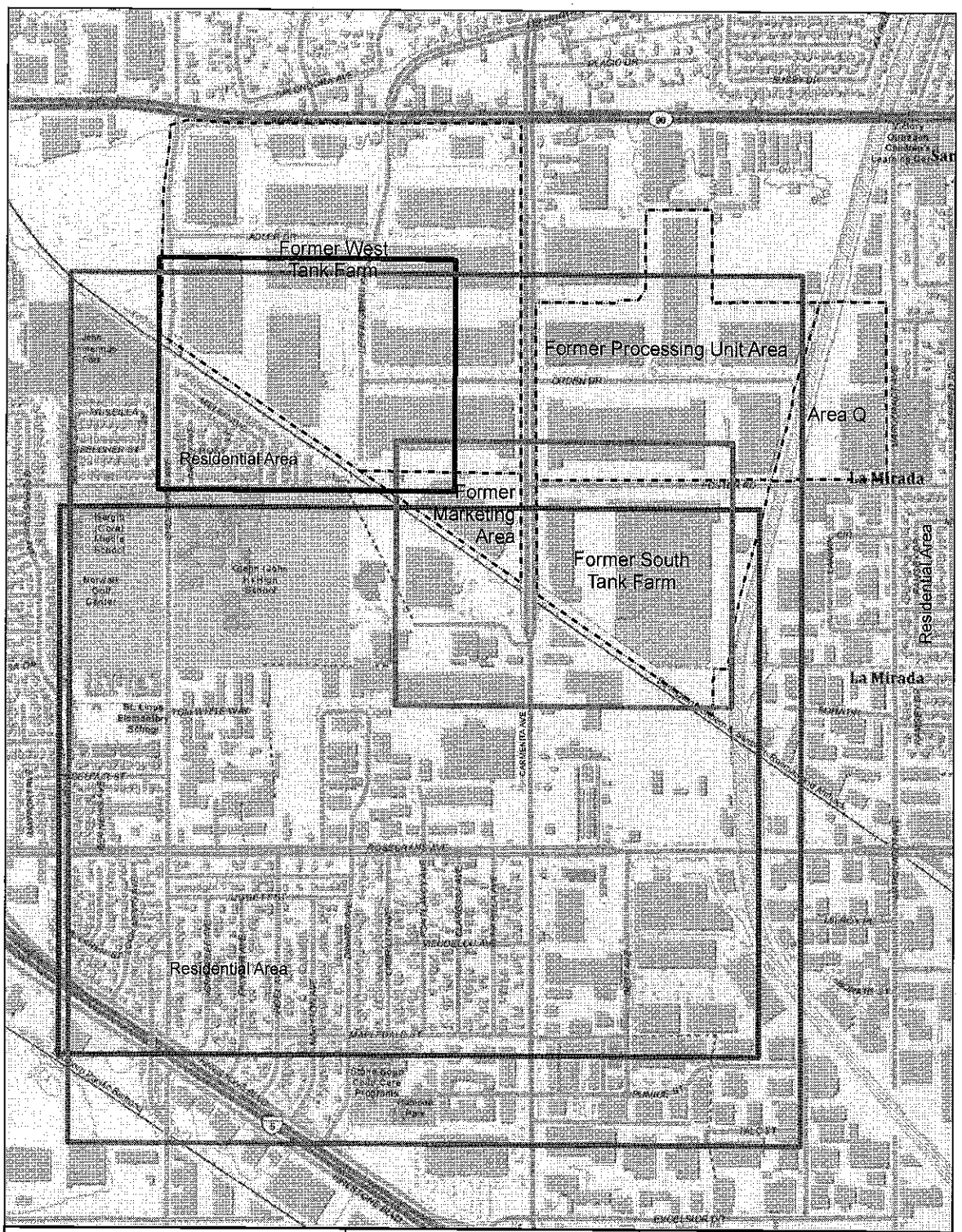
RWQCB, 2012. Requirement for Soil Vapor Assessment Pursuant to Cleanup and Abatement Order No. R4-2004-0020. June 21

TRC, 2002. Fate and Transport Modeling, Former Golden West Refinery, Santa Fe Springs, CA. September.

TriHydro, 1991. Off-site Semi-Perched Zone Cone Penetrometer/Hydropunch Sampling Investigation, GWRC. September 18.

The Source Group, Inc, 2012. Groundwater Monitoring Program Review, March.

FIGURES



Legend

- Figure 2
- Figures 3, 4 and 5
- Figure 6
- Figure 7
- Former Refinery Area

Santa Fe Springs, CA

GWRC Site Map

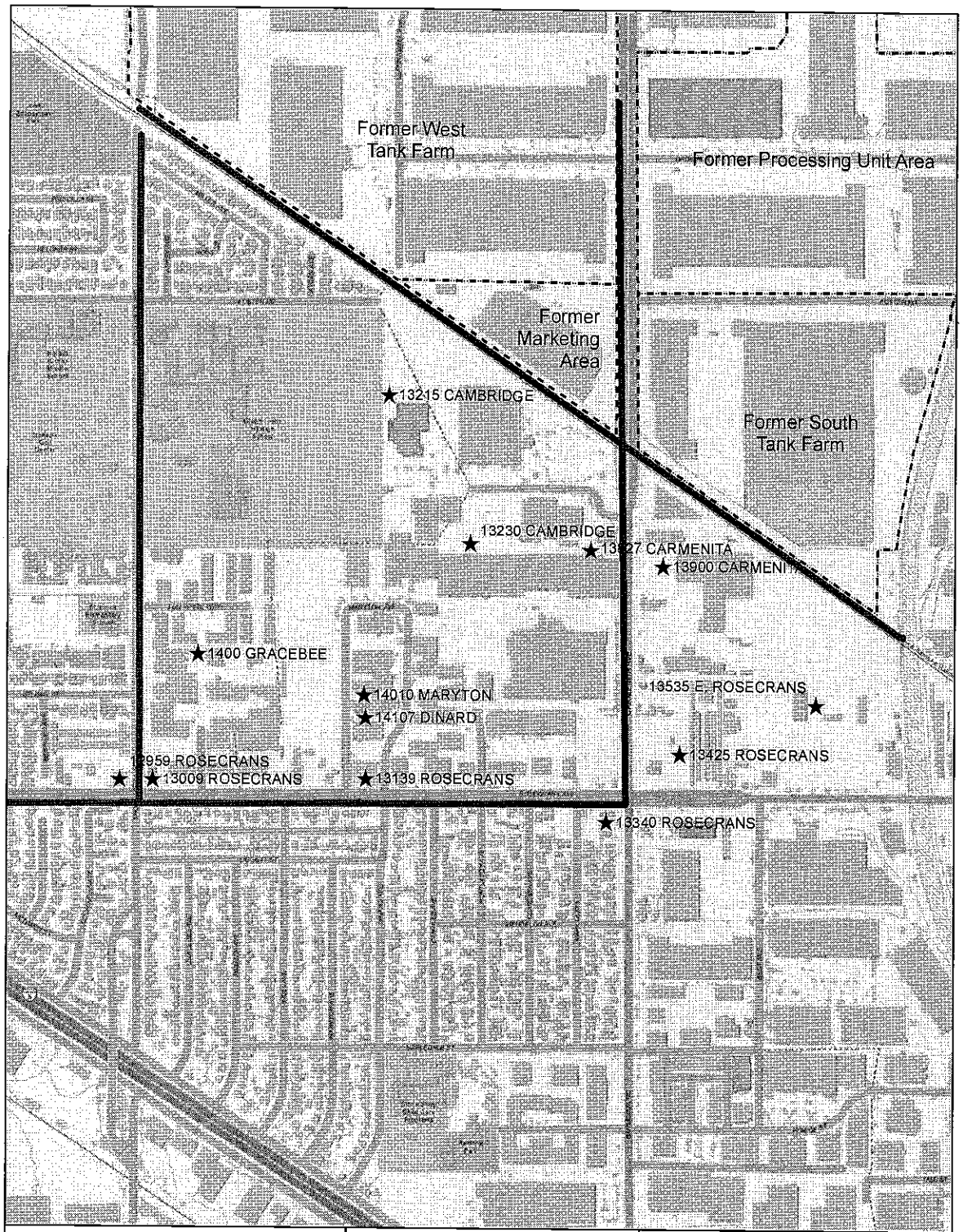
PROJECT NO.	DATE:	DR.BY:	APP. BY:

0 250 500 1,000 1,500 Feet

SGI environmental THE SOURCE GROUP, INC.
1962 FREEMAN AVE.
SIGNAL HILL, CA 90755
(562) 679-1055

N

FIGURE 1



Legend

- Pipelines
- ★ Hydrocarbon Storage Tank Site
- Former Refinery Area

Santa Fe Springs, CA

Off-Site Petroleum Hydrocarbon Potential Sources South West of Former Golden West Refinery

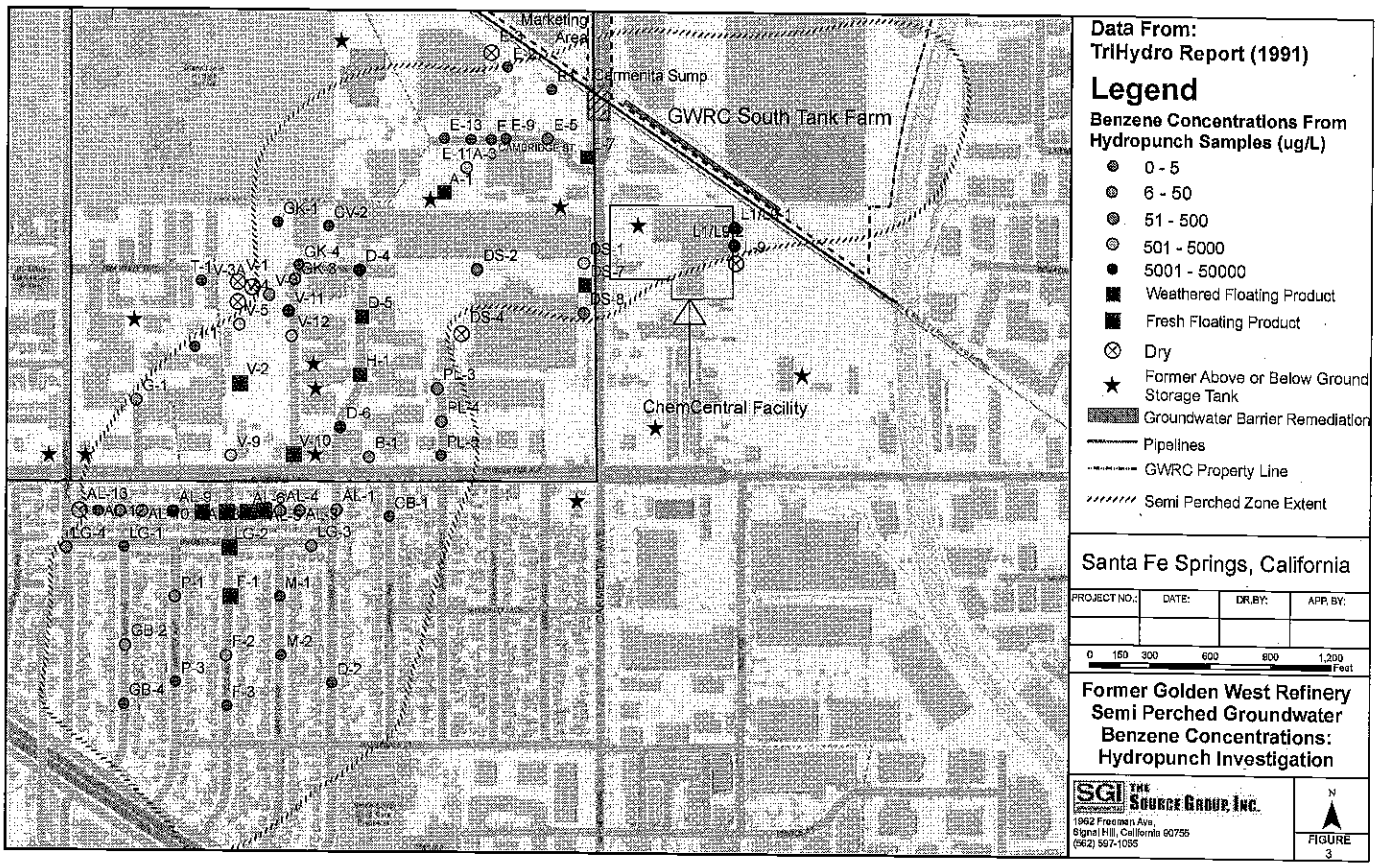
PROJECT NO.	DATE:	DR.BY:	APP. BY:

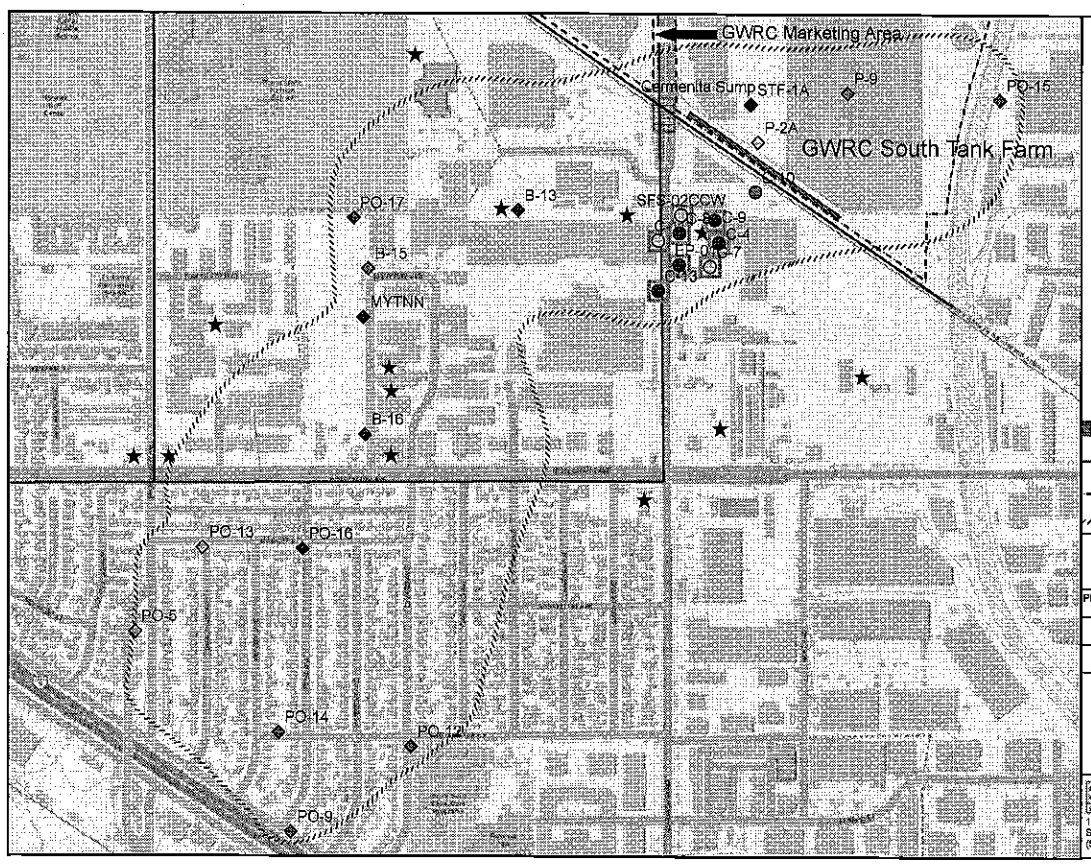
0 200 400 800 1,200 Feet

SGI environmental THE SOURCE GROUP, INC.
1962 FREEMAN AVE.
SIGNAL HILL, CA 90755
(562) 579-1055

N

FIGURE 2


Marketing Area
Carmenita Sump
GWRC South Tank Farm
ChemCentral Facility
Data From:
TriHydro Report (1991)
Legend
Benzene Concentrations From Hydropunch Samples (ug/L)
0 - 5
6 - 50
51 - 500
501 - 5000
5001 - 50000
Weathered Floating Product
Fresh Floating Product
Dry
Former Above or Below Ground Storage Tank
Groundwater Barrier Remediation
Pipelines
GWRC Property Line
Semi Perched Zone Extent
Santa Fe Springs, California
PROJECT NO.:
DATE:
DR.BY:
APP. BY:
0 150 300 600 900 1,200 Feet
Former Golden West Refinery
Semi Perched Groundwater
Benzene Concentrations:
Hydropunch Investigation
SGI THE SOURCE GROUP, INC.
1962 Freeman Ave,
Signal Hill, California 90755
(562) 597-1055
N
FIGURE
3



Data From:

TRC Report (2002) GWRC Report (2007)	◇
Rubicon Engineering Report (2010)	○

Legend

Benzene Concentrations (ug/L)

- 0 - 5
- 6 - 50
- 51 - 500
- 501 - 5000
- 5001 - 20000
- Well With CVOCs
- Former Storage Tank
- Groundwater Barrier Remediation
- Semi Perched Zone Extent
- GWRC Property Line
- Pipelines

Santa Fe Springs, California

PROJECT NO.:	DATE:	DR.BY:	APP. BY:

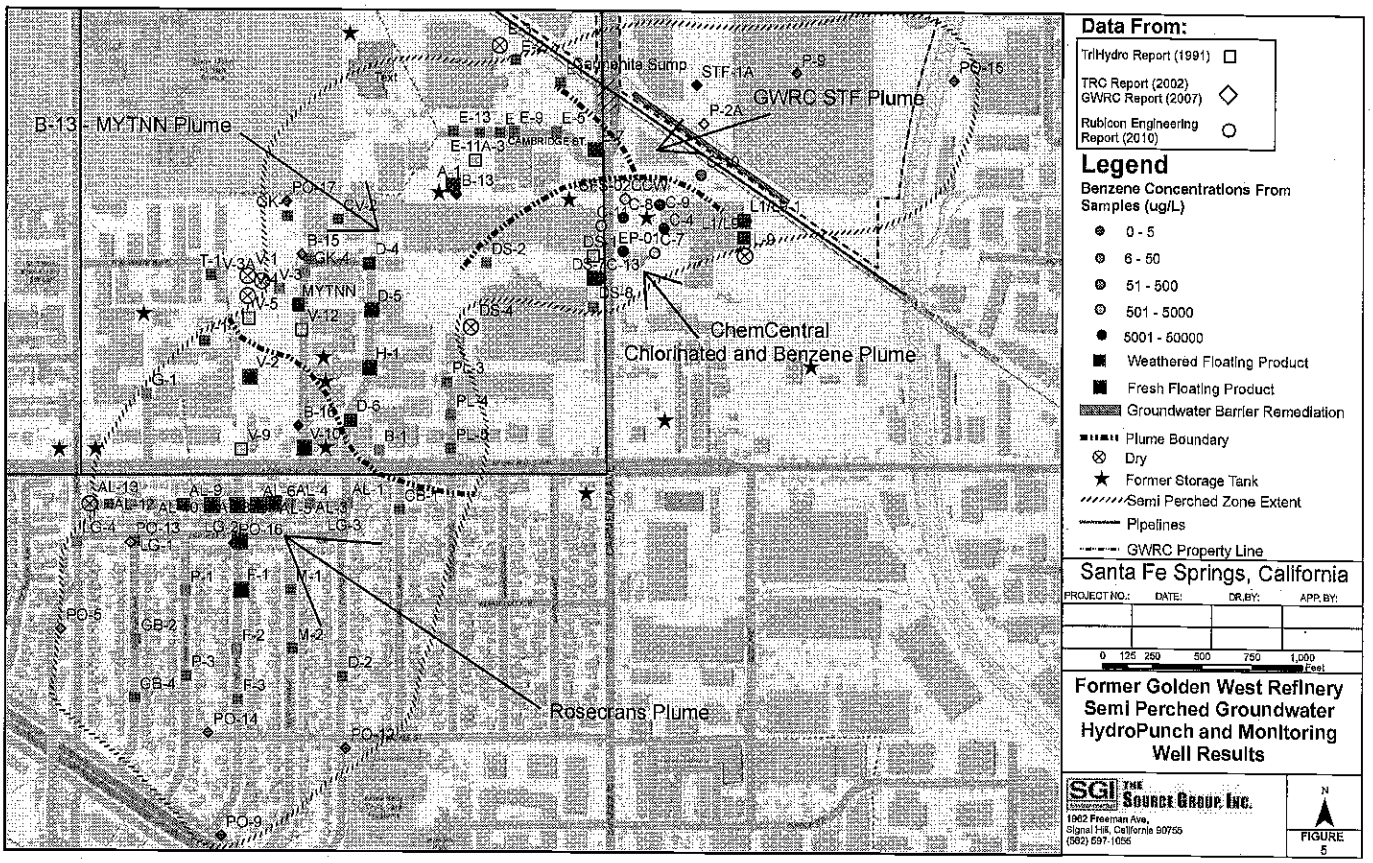
0 100 200 400 600 800 Feet

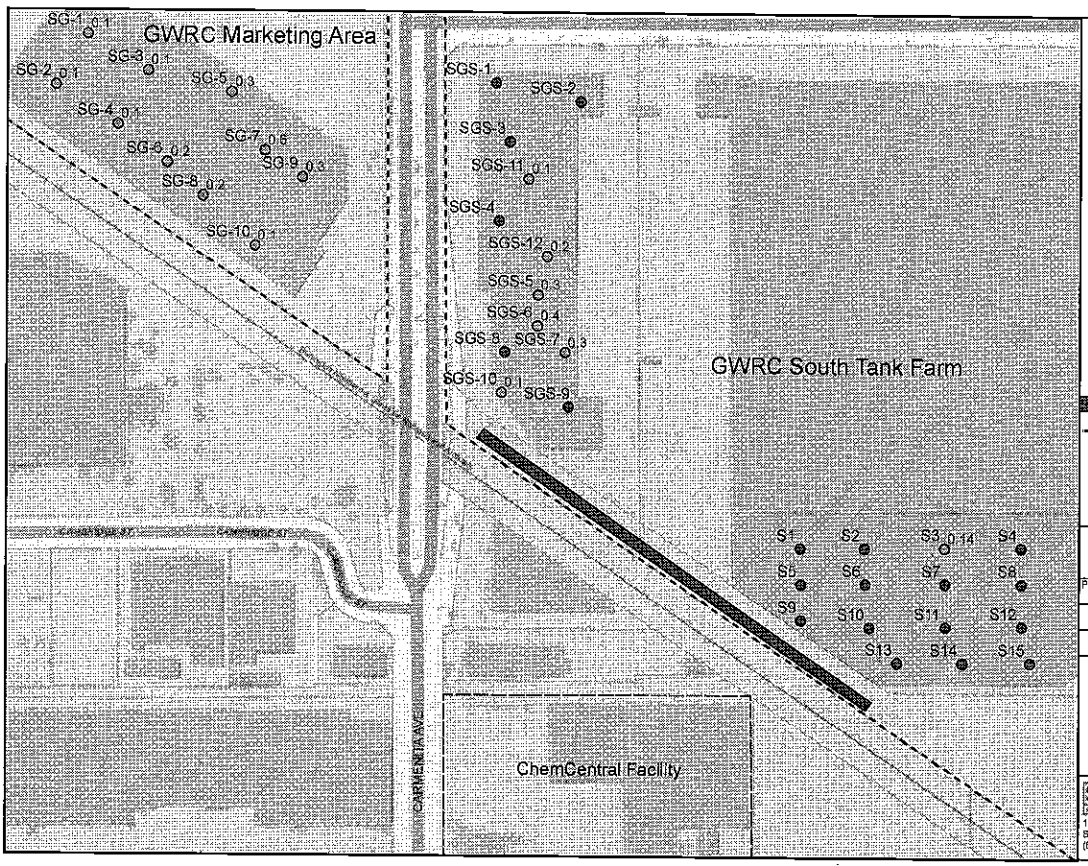
Former Golden West Refinery Semi Perched Groundwater Benzene Concentrations: Well Sampling Results

SGI THE SOURCE GROUP INC.
1962 Freeman Ave,
Signal Hill, California 90755
(562) 597-1055

N

FIGURE 4


B-13 - MYTNN Plume
GWRC STF Plume
ChemCentral
Chlorinated and Benzene Plume
Rosecrans Plume
Cambrehita Sump
CAMBRIDGE ST
MYTNN
Data From:
TriHydro Report (1991)
TRC Report (2002)
GWRC Report (2007)
Rubicon Engineering Report (2010)
Legend
Benzene Concentrations From Samples (ug/L)
0 - 5
6 - 50
51 - 500
501 - 5000
5001 - 50000
Weathered Floating Product
Fresh Floating Product
Groundwater Barrier Remediation
Plume Boundary
Dry
Former Storage Tank
Semi Perched Zone Extent
Pipelines
GWRC Property Line
Santa Fe Springs, California
PROJECT NO.:
DATE:
DR.BY:
APP. BY:
0 125 250 500 750 1,000
Feet
Former Golden West Refinery
Semi Perched Groundwater
HydroPunch and Monitoring
Well Results
SGI THE SOURCE GROUP, INC.
1962 Freeman Ave,
Signal Hill, California 90755
(562) 597-1055
N
FIGURE
5



Data From:
MACTEC (2005 and 2006)
and Golden West Refining (2009)

Legend

Benzene Concentrations in Soil-Gas (ug/L)

- Non Detect (<0.1)
- Benzene Detected
- **Groundwater Barrier Remediation**
- GWRC Property Line

Santa Fe Springs, California

PROJECT NO.:	DATE:	DR.BY:	APP. BY:

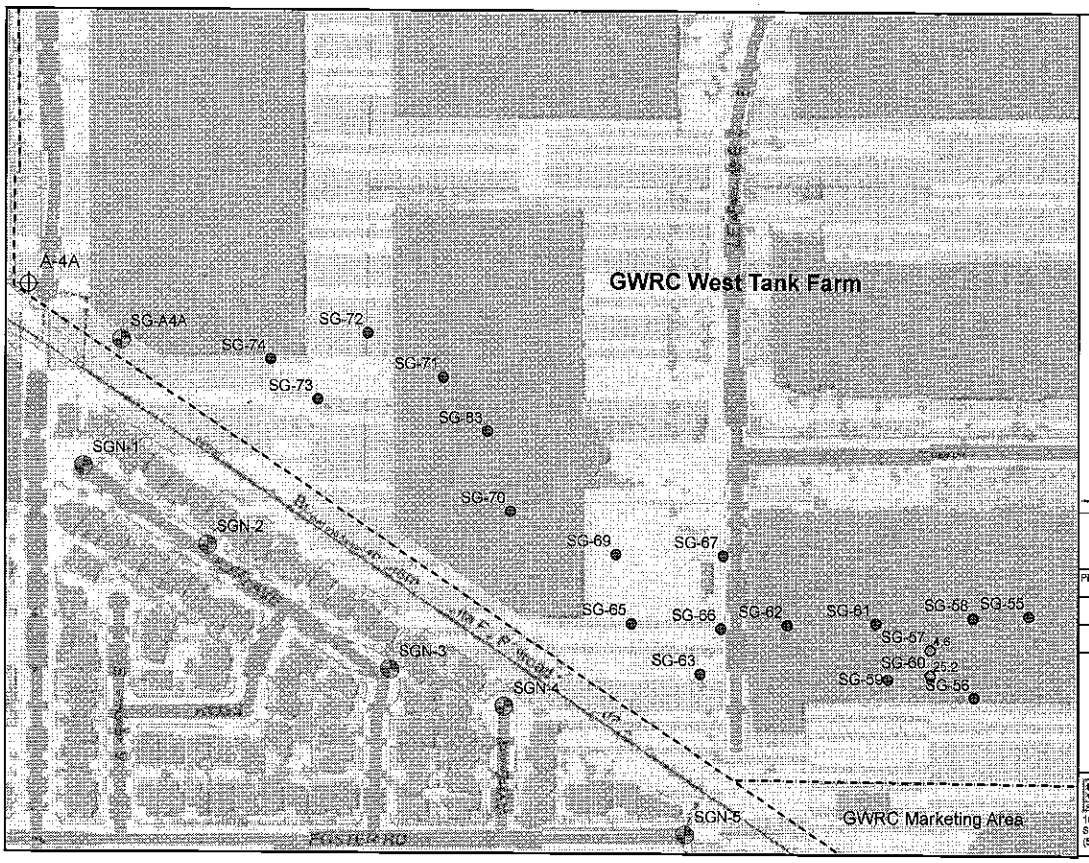
0 50 100 200 300 400 Feet

Former Golden West Refinery
Marketing Area / South Tank Farm
Soil-Gas Benzene Concentrations

SGI THE SOURCE GROUP, INC.
1992 Freeman Ave,
Signal Hill, California 90755
(562) 597-1055

N

FIGURE 6



Data From:
CET Environmental (1996)

Legend

Benzene Concentrations in Soil-Gas (ug/L)

- Non Detect (<1)
- Benzene Detected
- Proposed Soil-Gas Survey Location
- A-4A, Monitoring Well with Kinder Morgan LNAPL
- GWRC Property Line

Santa Fe Springs, California

PROJECT NO.:	DATE:	DR.BY:	APP. BY:

0 60 100 200 300 400 Feet

Former Golden West Refinery
West Tank Farm
Previous Soil-Gas Benzene Concentrations and Proposed Soil-Gas Survey Locations

SGI THE SOURCE GROUP, INC.
1962 Freeman Ave,
Signal Hill, California 90755
(562) 597-1055

N

FIGURE 7

TABLES

Table 1A
Dissolved Benzene Concentrations Data From TriHydro Report 1991
Site Name
City, State

Name	LNAPL	Dissolved Benzene (mg/L)	Latitude	Longitude
A-1	Y-WEATHERED		33.906205	-118.0492
A-3		0.76	33.90654	-118.0488
AL-1		0.015	33.901908	-118.0509
AL-10		0.039	33.901874	-118.0541
AL-11		0.035	33.901874	-118.0545
AL-12		0	33.901874	-118.0548
AL-3		0.088	33.901891	-118.0515
AL-4		0.366	33.901891	-118.0519
AL-5	Y-FRESHER		33.901891	-118.0521
AL-6	Y-FRESHER		33.901874	-118.0524
AL-7	Y-FRESHER		33.901874	-118.0527
AL-8	Y-FRESHER		33.901874	-118.0531
AL-9		12	33.901874	-118.0536
B-1		0.03	33.902629	-118.0504
C-1		0.006	33.914492	-118.0465
CB-1		0	33.901824	-118.0501
CV-2		0.0004	33.905741	-118.0511
D-2		0	33.899577	-118.051
D-4		29	33.90515	-118.0506
D-5	Y-WEATHERED		33.904527	-118.0505
D-6		6	33.903031	-118.0509
DS-1		1.1	33.905262	-118.0469
DS-2		0.5	33.905166	-118.0487
DS-7	Y-WEATHERED		33.904974	-118.0469
DS-8		0.065	33.904591	-118.0469
E		0	33.906923	-118.0484
E1		0	33.90761	-118.0475
E-11		0	33.906923	-118.0488
E-13		0	33.906939	-118.0492
E-2		0	33.907913	-118.0482
E-5		0.078	33.906939	-118.0475
E-7	Y-WEATHERED		33.9067	-118.0469
E-9		0	33.906939	-118.0482
F-1	Y-FRESHER	0.76	33.900734	-118.0527
F-2		0.026	33.899929	-118.0527
F-3		0.005	33.899259	-118.0527
G-1		0.011	33.903383	-118.0542
GB-2		0.034	33.900063	-118.0544
GB-4		0	33.899275	-118.0544
GK-1		0	33.905788	-118.0519
GK-3		0.047	33.905022	-118.0516
GK-4		0	33.905214	-118.0516
H-1	Y-WEATHERED	27	33.903745	-118.0506
I-1		0.0004	33.904104	-118.0533

Table 1A
Dissolved Benzene Concentrations Data From TriHydro Report 1991
Site Name
City, State

Name	LNAPL	Dissolved Benzene (mg/L)	Latitude	Longitude
L1/L9-1		6.1	33.905758	-118.0444
L1/L9-2		9.4	33.905519	-118.0444
LG-1		0.0021	33.901187	-118.0544
LG-2	Y-FRESHER		33.901153	-118.0527
LG-3		0.032	33.901136	-118.0513
LG-4		0.007	33.901103	-118.0554
M-1		0	33.900734	-118.0519
M-2		0	33.899946	-118.0518
P-1		0.012	33.900717	-118.0536
P-3		0	33.899577	-118.0535
P-6		0	33.914642	-118.0471
PL-3		0.14	33.903426	-118.0495
PL-4		0.09	33.903115	-118.0494
PL-5		0.0008	33.902662	-118.0494
T-1		0	33.904993	-118.0532
V-10	Y-FRESHER		33.902662	-118.0516
V-11		15	33.904591	-118.0517
V-12		2.3	33.904255	-118.0517
V-2	Y-FRESHER	22	33.903618	-118.0525
V-3		0.036	33.904809	-118.0521
V-5		3.6	33.904406	-118.0525
V-9		2.4	33.902629	-118.0527

Table 1B
Dissolved Benzene Concentrations from GWRC Report
Site Name
City, State

Well ID	Sample Date	Dissolved Benzene (µg/L)	Latitude	Longitude	Reference
B-13	August 2002	9100	33.906087	-118.04916	TRC,_2002
B-15	August 2002	140	33.905267	-118.051684	TRC,_2002
B-16	August 2002	8700	33.902955	-118.051731	TRC,_2002
CCW	August 2002	630	33.906039	-118.046383	TRC,_2002
GW-3	August 2002	9.8	33.913355	-118.045557	TRC,_2002
MYTNN	August 2002	8700	33.904591	-118.051763	TRC,_2002
NW-3	August 2002	1.7	33.913375	-118.041636	TRC,_2002
PO-5	August 2002	13	33.900195	-118.05559	TRC,_2002
PO-9	August 2002	0	33.897413	-118.05297	TRC,_2002
PO-12	August 2002	0	33.898605	-118.050943	TRC,_2002
PO-13	August 2002	8.5	33.901367	-118.054459	TRC,_2002
PO-14	August 2002	2.3	33.898802	-118.053184	TRC,_2002
PO-15	August 2002	0	33.907662	-118.041008	TRC,_2002
PO-16	August 2002	18000	33.901355	-118.052782	TRC,_2002
PO-17	August 2002	3.1	33.90598	-118.051932	TRC,_2002
P-9	August 2002	220	33.907746	-118.043581	TRC,_2002
P-2A	June 2007	595	33.907058	-118.045101	GWRC 2007
STF-1A	June 2007	11600	33.907584	-118.045225	GWRC 2007

Table 1C
Dissolved Benzene Concentrations from ChemCentral Reports
Site Name
City, State

Well ID	Sample Date	Dissolved Benzene (µg/L)	Latitude	Longitude	Reference
C-10	October 2010	89	33.90636	-118.04514	Rubicon Engineering 2010
C-13	October 2010	6700	33.90497	-118.04678	Rubicon Engineering 2010
C-11	October 2010	560	33.90567	-118.04678	Rubicon Engineering 2010
SFS-02	October 2010	860	33.90603	-118.04639	Rubicon Engineering 2010
C-8	October 2010	7600	33.90578	-118.04642	Rubicon Engineering 2010
EP-01	October 2010	5100	33.90533	-118.04642	Rubicon Engineering 2010
C-7	October 2010	680	33.90531	-118.0459	Rubicon Engineering 2010
C-4	October 2010	17000	33.90564	-118.04575	Rubicon Engineering 2010
C-9	October 2010	7800	33.90596	-118.04582	Rubicon Engineering 2010

Table 2
Soil-Gas Benzene Data From GWRC Soil Gas Investigations
Site Name
City, State

Area	Probe	Date	Depth (ft)	Benzene (ug/L)
Marketing Area	SG-1	9/18/2006	5	0.1
	SG-2	9/18/2006	5	0.1
	SG-3	9/18/2006	5	0.1
	SG-4	9/18/2006	5	0.1
	SG-5	9/18/2006	5	0.3
	SG-6	9/18/2006	5	0.2
	SG-7	9/18/2006	5	0.6
	SG-8	9/18/2006	5	0.2
	SG-9	9/18/2006	5	0.3
	SG-10	9/18/2006	5	0.1
South Tank Farm Building R	SGS-1	4/5/2005	5	ND
	SGS-2	4/5/2005	5	ND
	SGS-3	4/5/2005	5	ND
	SGS-4	4/5/2005	5	ND
	SGS-5	4/5/2005	5	0.3
	SGS-6	4/5/2005	5	0.4
	SGS-7	4/5/2005	5	0.3
	SGS-8	4/5/2005	5	ND
	SGS-9	4/5/2005	5	ND
	SGS-10	4/5/2005	5	0.1
	SGS-11	4/5/2005	5	0.1
	SGS-12	4/5/2005	5	0.2
South Tank Farm Building S Extension	S1	9/24/2009	5	ND
	S2	9/24/2009	5	ND
	S3	9/24/2009	5	0.14
	S4	9/24/2009	5	ND
	S5	9/24/2009	5	ND
	S6	9/24/2009	5	ND
	S7	9/24/2009	5	ND
	S8	9/24/2009	5	ND
	S9	9/24/2009	5	ND
	S10	9/24/2009	5	ND
	S11	9/24/2009	5	ND
	S12	9/24/2009	5	ND
	S13	9/24/2009	5	ND
	S14	9/24/2009	5	ND
	S15	9/24/2009	5	ND

Table 2
Soil-Gas Benzene Data From GWRC Soil Gas Investigations
Site Name
City, State

Area	Probe	Date	Depth (ft)	Benzene (ug/L)
West Tank Farm	SG-55	3/13/1996	6	ND
	SG-56	3/13/1996	5	ND
	SG-57	3/13/1996	8	4.6
	SG-58	3/13/1996	8	ND
	SG-59	3/13/1996	8	ND
	SG-60	3/13/1996	8	25.2
	SG-61	3/13/1996	6	ND
	SG-62	3/13/1996	9	ND
	SG-63	3/13/1996	8	ND
	SG-65	3/13/1996	9	ND
	SG-66	3/13/1996	9	ND
	SG-67	3/13/1996	9	ND
	SG-69	3/13/1996	9	ND
	SG-70	3/14/1996	9	ND
	SG-71	3/14/1996	9	ND
	SG-72	3/14/1996	9	ND
	SG-73	3/14/1996	9	ND
	SG-74	3/14/1996	9	ND
	SG-83	3/14/1996	7	ND

EXHIBIT 6

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

October 12, 2012

Mr. Chris Panaitescu
Golden West Refining Company
13116 Imperial Highway
Santa Fe Springs, CA 90670

Certified Mail
Return Receipt Requested
Claim No. 7011 3500 0003 5491 0957

SUBJECT: OFF-SITE SOIL VAPOR SURVEY WORKPLAN PURSUANT TO CLEANUP AND ABATEMENT ORDER NO. R4-2004-0020 AND JUNE 21, 2012, AMENDMENT

SITE: GOLDEN WEST REFINING COMPANY – 13539 FOSTER ROAD, SANTA FE SPRINGS, CALIFORNIA (SCP NO. 0227A, SITE ID NO. 2040073)

Dear Mr. Panaitescu:

The California Regional Water Quality Control Board (Regional Board), Los Angeles Region, is the State regulatory agency with primary responsibility for the protection of groundwater and surface water quality for all beneficial uses within major portions of Los Angeles and Ventura Counties, including the referenced site. To accomplish this, the Regional Board issues cleanup and investigative orders authorized by the Porter-Cologne Water Quality Control Act (California Water Code (Water Code), Division 7).

The Regional Board has completed its review of the *Off-site Soil Vapor Survey Work Plan* (Work Plan) dated August 2012 prepared by The Source Group, Inc. (SGI) on behalf of the Golden West Refining Company (Golden West). The Work Plan was submitted in response to Item No. 1 of the Regional Board letter dated June 21, 2012 (June 21 Letter) amending the existing Cleanup and Abatement Order No. R4-2004-0020 dated August 24, 2004 (CAO).

The former Golden West Refining Company (site) located in Santa Fe Springs is a former refinery and petroleum storage facility. Based on site history and the data collected by Golden West and its predecessor since 1979, the presence of a light non-aqueous phase liquid (LNAPL) plume floating over the shallow Semi-perched Aquifer has been established. The LNAPL plume occurs at an approximate depth of 20 feet below ground surface (bgs) beneath the site. The plume extends approximately 3000 feet toward the southwest in the downgradient direction into a residential area located south of Rosecrans Avenue near well PO-16.

At the meeting with you on June 12, 2012, Regional Board staff expressed the need for soil vapor data over the entire LNAPL plume footprint and concern for possible vapor intrusion into area homes. The June 21 Letter required Golden West to submit an off-site soil vapor survey work plan for the entire off-site LNAPL plume, including the residential area near well PO-16, and to perform a vapor intrusion evaluation.

As proposed in the Work Plan submitted by Golden West, sampling will be conducted in accordance with the *Advisory Active Soil Gas Investigations* dated April 2012 by California

Environmental Protection Agency. According to Golden West, during the installation of Artesian Aquifer well A4-A in 2003, a subsurface pipeline belonging to Kinder Morgan carrying jet fuel was damaged. The damaged pipeline caused LNAPL to accumulate inside well A4-A. The shallow LNAPL plume is absent in this area and the first groundwater occurs at approximately 74 feet bgs in the Artesia Aquifer. Golden West proposes soil vapor sampling locations in this area to investigate potential soil vapor impacts due to the LNAPL release from the Kinder Morgan pipeline in 2003. The Work Plan proposes six (6) soil vapor sampling locations along the southern boundary of the West Tank Farm. The Work Plan does not address the investigation of soil vapor impact from the LNAPL plume in the shallow Semi-Perched Aquifer including in the residential area near well PO-16.

The June 21 Letter required Golden West to submit a workplan to implement an off-site soil vapor survey to determine the nature and extent of the LNAPL soil vapor plume, and to complete a vapor intrusion evaluation. The presence of LNAPL primarily consisting of gasoline and diesel at shallow depth in the residential area near well PO-16 necessitates that soil vapor data be collected immediately for the evaluation of potential vapor intrusion. As described above, Golden West did not address the LNAPL plume in the residential area or the potential for vapor intrusion in the Work Plan. Instead, Golden West states that vapor intrusion concerns for the residential area located south of Rosecrans Avenue were not considered because the former Golden West Refinery site is not the source of the Semi-perched Aquifer LNAPL plume in this area. To the contrary, the site history, hydrogeology, and data collected since early 1980s at the site indicate that the LNAPL plume in the Semi Perched Aquifer originated from the former refinery. Regional Board staff finds that the Work Plan is deficient because it fails to address the nature and extent of the soil vapor plume and vapor intrusion in the residential area near well PO-16.

Pursuant to the requirements of the June 21 Letter, which amend the CAO and the Board's authority under Water Code sections 13304 and 13267, you are required:

1. By **November 15, 2012,** to submit the work plan for a soil vapor survey that was originally due to the Regional Board by August 15, 2012, pursuant to the June 21 Letter. The work plan must address the nature and extent of the entire soil vapor plume and vapor intrusion in the residential area near well PO-16. While this letter does not extend the original deadline, if Golden West submits a complete work plan to the Regional Board by November 15, 2012, the Regional Board staff will not refer this matter to the Enforcement Unit for additional enforcement action.

2. Conduct the off-site soil vapor survey; determine and complete the nature and extent of the soil vapor plume; and perform a vapor intrusion evaluation.

The Board conditionally accepts that portion of the Work Plan which proposes to conduct soil vapor sampling in the area of the Kinder Morgan pipeline and well A4-A, with the following modifications:

1. Relocate SG-A4A at least 150 feet along the property line towards well A-4A. The proposed location of SG-A4A in the Work Plan is approximately 200 feet southeast of well A-4A.

2. In addition to the proposed analytical program, analyze samples for methane gas using Method ASTM D1946.

3. Upon implementation of the Work Plan, submit a report containing the results, conclusions and recommendations to the Regional Board by **December 15, 2012.**

4. All work must be conducted according to a Site-specific health and safety plan (HASP) in compliance with California Occupational Safety and Health Agency (Cal-OSHA), Health and Safety Code, Title 8, California Code of Regulations (CCR), Section 5192 and other appropriate sections.

5. Prior to starting field work; obtain all applicable permits from appropriate regulatory agencies as necessary.

6. Notify the Regional Board at least seven (7) days before the commencement of fieldwork.

Failure to comply with the terms or conditions of this Order may result in imposition of civil liabilities, imposed either administratively by the Regional Board or judicially by the Superior Court in accordance with sections 13268, 13304, 13308, and/or 13350 of the California Water Code, and/or referral to the Attorney General of the State of California.

If you have any questions, please contact Mr. Adnan Siddiqui (project manager) at (213) 576-6812 (asiddiqui@waterboards.ca.gov) or Dr. Arthur Heath, Section Chief at (213) 576-6725 (aheath@waterboards.ca.gov).

Sincerely,

Samuel Unger, PE
Executive Officer

CC: Steve Armann, USEPA (via e-mail)
Katherine Baylor, USEPA (via e-mail)

EXHIBIT 7

GOLDEN WEST REFINING COMPANY

January 21, 2013

O.127030

Mr. Arthur Heath and Mr. Adnan Siddiqui
Los Angeles Regional Water Quality Control
Board 320 W. 4th Street, Suite 200
Los Angeles, CA 90013

Global ID No. **SL373412444**

RE: FORMER GOLDEN WEST REFINERY
SLIC No. 227: Submission in Compliance with CAO R4-2004-0020
Vapor Survey Workplan
Vicinity South of the Intersection of Rosecrans and Fidel Avenues

Dear Mr. Heath and Mr. Siddiqui:

Enclosed, please find a copy of the *Vapor Survey Workplan* (Workplan) prepared by The Source Group, Inc. (SGI) and dated January 21, 2013 for the former Golden West Refinery located in Santa Fe Springs, CA (the Site). The Workplan is being submitted in response to the October 12, 2012 letter (Letter) sent to the Golden West Refining Company (GWRC) by the Los Angeles Regional Water Quality Control Board (LARWQCB). The Letter required that GWRC submit an off-site soil vapor survey work plan for "*the residential area near well PO-16*", to the LARWQCB by November 15, 2012 but in a subsequent letter dated November 14, 2012, the LARWQCB granted a time extension for submission until January 30, 2013.

In their previous reports and correspondence, GWRC and its consultants demonstrated the limits of the GWRC plume and the location of other offsite sources. GWRC and our consultant, SGI, do not believe that the LNAPL contamination in the area of PO-16 or for that matter any of the LNAPL plume further than approximately 500-feet south of the boundary of the Golden West Refining property, is related to the former gasoline fuel refining and storage activities historically associated with the former Refinery. The March 12, 2012 *Groundwater Monitoring Program Review* (GWPR), prepared by SGI presented technical evidence and arguments to support our position relating to the size and migration (distance and pathways) of the LNAPL plume associated with the former Golden West Refinery. The GWPR also presented finger printing analytical results and documentation of several offsite USTs, ASTs and pipelines, which support the conclusion that the LNAPL found in the area of PO-16 is attributable to sources other than GWRC. We strongly believe that the evidence recently provided documented that GWRC is not responsible for the LNAPL detected in PO-16 located approximately 2,600 feet from the GWRC property boundaries, and consequently GWRC should not be held responsible for the presence of the LNAPL in this well or any other wells this far from the Site. As you well know, GWRC has worked extremely hard to maintain full compliance for the Site and has proposed and implemented numerous assessment activities and corrective actions to address the contamination that may have originated from the operation of the former Golden West Refinery. It appears that the LARWQCB misunderstood GWRC's good faith effort and took it as a willingness to take responsibility for the entire offsite plume, regardless of the documented presence of multiple other contributors.

13116 Imperial Highway, P.O. BOX 2128, Santa Fe Springs, CA 90670-0138
(562) 921-3581 • (562) 921-7510

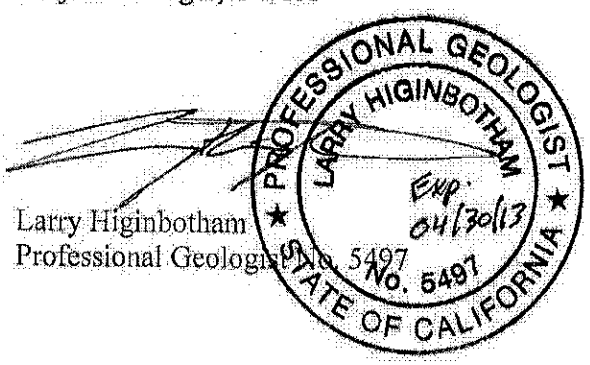
GWRC understands that we are legally obligated to submit this Workplan, but the submission of this Workplan is being done under strong protest and should not be construed as an admission of responsibility for the presence of LNAPL in well PO-16, but rather an intention to comply with the LARWQCB requirement.

If you should have any questions regarding this submission, please call Simon at (562) 921-3581, Ext. 260, or Chris at Ext. 390.

Respectfully submitted,

Simon Tregurtha
Project Manager, GWRC

Chris Panaitescu
General Manager, GWRC



Larry Higinbotham
Professional Geologist No. 5497

Cc: File
Moshe Sassover (GWRC)

VAPOR SURVEY WORK PLAN
VICINITY SOUTH OF INTERSECTION OF
ROSECRANS AND FIDEL AVENUES

Norwalk, California

Prepared For:

Golden West Refining Company
13116 Imperial Hwy
Santa Fe Springs, CA 90670

Prepared By:

SGI environmental THE SOURCE GROUP, INC.

1962 Freeman Avenue
Signal Hill, CA 90755

January 21 2013

Prepared By:

REGISTERED GEOLOGIST Paul Parmentier No. 3915 STATE OF CALIFORNIA

Paul Parmentier, CHg
Principal Hydrogeologist

Jennifer Kurashige
Staff Geologist

Reviewed By:

Neil Irish, P.G.
Principal Geologist

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

On behalf of the Golden West Refining Company (GWRC), The Source Group, Inc (SGI) prepared this soil vapor investigation work plan for the area south of the intersection of Rosecrans and Fidel Avenues in Norwalk, California.

During a June 12, 2012, meeting held between the Regional Water Quality Control Board (RWQCB), GWRC, and SGI, the RWQCB indicated that the investigation of vadose zone hydrocarbons in soil gas, particularly in residential areas south of the former refinery, is required by the 2004 clean up abatement order (CAO). At the meeting, GWRC committed to review the existing information on soil gas investigation previously conducted under the former refinery and the hydrogeologic setting, and committed to further address data gaps on soil gas in residential areas associated with GWRC contamination. During the meeting, GWRC and SGI provided technical documentation indicating that the hydrocarbon plume in the vicinity of well PO-16 was not associated with Refinery activities but was most likely the result of other off site sources described in the March 12, 2012 Groundwater Monitoring Program Review.

Following the June 2012 meeting, the RWQCB requested an off site soil vapor survey work plan, and GWRC subsequently prepared and submitted in August 2012 the *Off Site Soil Vapor Survey Work Plan* (SGI, 2012b) which proposed the installation and sampling of soil vapor points at the former refinery's West Tank Farm and in the off-site residential area south of the former West Tank Farm. Following a review of the August 2012 work plan, the RWQCB issued an October 12, 2012 correspondence, which directed GWRC to conduct an off-site soil vapor assessment in the residential area near well PO-16, located near Rosecrans Avenue and Fidel Avenue in Norwalk, California pursuant to Cleanup and Abatement Order (CAO) No. R4-2004-0020 (RWQCB, 2012b). This current work plan was prepared in response to that directive and describes the methods and procedures to be followed during the soil vapor sampling in the residential area in the vicinity of off-site well PO-16.

1.1 Site Background

The former Golden West Refinery property (Site) is located in the city of Santa Fe Springs, California (Figure1), near crude oil-producing fields; no oil and gas drilling activities are reported to have occurred on the Site. In 1925, Wilshire Oil Company ("Wilshire") purchased the Refinery Property and built storage facilities with more than seven (7) million barrels capacity. In 1936, Wilshire constructed an oil refinery located east of Carmenita Road and north of East Foster Road, where gasoline and other finished petroleum products were manufactured. From World War II to approximately 1968, the US Government produced aviation fuel in the southwestern part of the PUA refining operations. This aviation fuel was transferred by underground pipelines to the military fuel terminal in Norwalk, CA. In 1960, Gulf Oil Corporation ("Gulf) purchased the Refinery Property from Wilshire. Gulf refined crude oil into finished gasoline, heavy fuel oils, diesel fuel and asphalt. In 1983, GWRC purchased the Refinery property from Gulf. GWRC operated the refinery process

unit until February 1992, when crude oil processing operations were suspended. Only fuel transport operations were conducted by GWRC at the Refinery property from February 1992 to August 1997, when all petroleum storage operations ceased (GWRC, 2011a). While operational, the refinery facility was divided into four areas (Figure 1):

- Process Unit Area (PUA);
- West Tank Farm (WTF);
- South Tank Farm (STF); and
- Marketing Area (MA).

The former PUA, located in the northeastern part of the former refinery property, was utilized as the main processing area. The former STF and WTF areas were used for storage and blending of crude oil, intermediate products, and finished products and an asphalt plant temporarily operated in the WTF. The finished fuel products were then loaded and distributed in the MA.

Starting in 1997, the WTF, STF, PUA, and MA were successively dismantled and redeveloped into light manufacturing industrial and commercial warehouse facilities. During each phase of redevelopment, all primary potential contaminant sources (including storage tanks, piping, and processing units) were removed, along with secondary sources of contamination (impacted shallow soils). These remediation tasks were conducted under oversight of the RWQCB, the City of Santa Fe Springs Fire Department, the Department of Toxic Substances Control (DTSC), and the Office of Environmental Health Hazard Assessment (OEHHA).

1.2 Site Geology and Hydrogeology

The geology, lithology and hydrogeology of the Site and the vicinity have been documented through multiple phases of site investigations, evaluations and studies that have included soil borings, cone penetrometer testing (CPT) soundings, well installations, vertical groundwater contamination assessments, aquifer tests, groundwater modeling, and evaluation of natural attenuation. A significant network of monitoring wells, composed of over 130 wells, exists at the site and extends off-site.

Two shallow groundwater zones have been identified under the site. The uppermost water-bearing zone, the Semi-Perched zone, is found locally at depths ranging from 20 to 50 feet below ground surface (bgs) in the Bellflower Formation. This laterally discontinuous Semi-Perched zone is unconfined and occurs both on and off GWRC property. The soils in this zone are composed of clay and silt, with lenticular sand and gravel layers. The sand and gravel layers are water-saturated in some areas within and south of the GWRC property and these saturated sediments form the Semi-Perched zone. Where these lenticular sands and gravel layers are not underlain by less-permeable clay and silt layers, the Semi-Perched zone is absent (TriHydro, 1991).

The Semi-Perched zone exists in the southern part of the STF and extends off site to the southwest, with a general southwesterly groundwater gradient direction. Drilling in the northern part of the STF and at the MA did not encounter the Semi-Perched zone, providing confirmation of

the limited northern lateral extent of that zone. Groundwater elevations and southwestern gradient in the Semi-perched zone measured during groundwater monitoring events conducted since the 1980's have been reported to be consistent, with a groundwater gradient to the southwest and an average hydraulic gradient of approximately 0.005 ft/ft.

The Semi-Perched groundwater zone is also locally influenced by the continuous groundwater extraction conducted by the City of Santa Fe Springs to maintain dewatering of the Carmenita Road Underpass. This dewatering-related groundwater extraction conducted since the 1980's has been creating a constant sink in groundwater levels centered at the Carmenita/railroad intersection. All groundwater and occasional free phase hydrocarbons removed by City dewatering operations have been treated by GWRC at a treatment system located in the MA.

The Artesia Aquifer is found at a depth of approximately 65 to110 ft bgs under the Refinery and off-site. The Artesia Aquifer is the first groundwater encountered under most of the Refinery area. In the southern part of the site and off-site southwest of the refinery, the Artesia Aquifer occurs under the Semi-Perched zone and in these areas approximately 20-30 feet of unsaturated sediments underlie the low-permeable perching layer that forms the base of the Semi-Perched zone.

In 1990-1991, Tri-Hydrocarbon conducted an investigation of the semi-perched zone south of the former refinery, and concluded that the pattern of degree of product weathering suggested that there were localized hydrocarbon sources south of the refinery, and that off site sources not associated with the refinery, were suspected to be the source of the off-site un-weathered petroleum products.

In 2012, SGI conducted a petroleum hydrocarbon fingerprinting investigation which concluded that the LNAPL found in the Semi-Perched wells located between the STF and south of Rosecrans Avenue consists of three types originated from at least three separate sources: the product in STF wells, the product in the area of wells B-13 and MYTNN, and the product in the vicinity of Rosecrans Avenue.

The previous investigations and more recent LNAPL fingerprinting analyses, as well as the physical character of the LNAPL support the interpretation that the product found in the Cambridge Court/ Rosecrans Avenue area in wells B-13, MYTNN, B-16 and PO-16 is attributable to non-Refinery sources. In a March 2012 SGI report entitled *Groundwater Monitoring Program Review* (SGI, 2012a) the presence of former off-site USTs and ASTs and petroleum pipelines in the area south of the former refinery was documented as a potential source of the petroleum hydrocarbons present south of the Refinery. The report also summarized the locations of several former off-site USTs and aboveground storage tanks (ASTs) with documented petroleum hydrocarbon releases in the vicinity of these wells; none of these off-site USTs or ASTs were owned or operated by GWRC. A response from the RWQCB for the March 2012 report remains pending.

1.3 Distribution of LNAPL

The distribution of LNAPL under the Refinery has been delineated since the 1990s and long term monitoring has shown the distribution of the LNAPL to be stable. The presence of LNAPL has

been reported in the Semi-Perched and Artesia groundwater zones. In the Artesia zone, LNAPL is mainly found under the footprint of the Refinery, with one well off site well (AO-14) containing LNAPL. All Artesia monitoring wells along the western, northern, eastern and southeastern boundaries of the refinery contain no LNAPL.

The Semi-Perched groundwater zone is present beneath the STF and extends limitedly off-Site to the southwest. LNAPL has been found to be present on the Semi-Perched groundwater zone underlying the STF. Investigations conducted by GWRC and other investigators have documented the presence of LNAPL within the Semi-Perched groundwater zone in the area south of the Refinery, at locations up to 2,500 feet from the southern edge of the STF, without investigating and identifying all potential sources contributing to this large LNAPL plume.

Although many earlier reports attributed the extensive LNAPL plume south of and off-site of the Refinery to operations at the GWRC, the 1991 Tri Hydro report and the March 2012 report (SGI, 2012a) concluded that the Semi-Perched LNAPL plume is actually the result of the contribution of fuel released from a number of distinct sources, with GWRC's STF only contributing to LNAPL found off-site in the immediate vicinity of the former refinery. This conclusion was based on:

(1) The unusually long lateral extent of LNAPL,

(2) The fingerprinting distinctions between product types, and

(3) The presence of documented leaking former USTs and several hydrocarbon pipelines in the footprint of the Semi-Perched LNAPL plume.

1.4 Summary of Previous Site Remediation

During the redevelopment of the Refinery, source removal was conducted under RWQCB and other agencies' directives and oversight. These considerable source removal efforts included the dismantling and removal of all primary sources of contamination (including tanks, pipelines, and refining equipment) and the excavation and removal of secondary sources (shallow contaminated soil).

In addition to multiple remediation activities conducted by GWRC since 1983, during the redevelopment project initiated in 1997, a total of 271,018 tons (180,679 cubic yards) of impacted soils were excavated and transported offsite to licensed soil disposal or recycling facilities between 1997 and 2006.

Fate and Transport Modeling was conducted by TRC in 2002. The TRC findings indicated that the hydrocarbon plumes were stable under 2002 remedial conditions in both the Semi-Perched zone and Artesia aquifer and that biodegradation was actively occurring.

In addition to the completed removal of primary and secondary containment sources, GWRC is also conducting active vadose zone remediation, with the on-going operation of six soil vapor extractions (SVE) systems, with an installed network of 251 SVE wells. Groundwater treatment

using SVE on barrier well (STF), free product removal systems, and hand bailing of LNAPL are also part of the remedial actions currently conducted by GWRC.

Groundwater plumes have been demonstrated to be stable (SGI 2012a). The Semi-Perched GWRC plume stability is further supported by the operation of the Carmenita Underpass Sump and barrier wells located on the southern edge of the STF that reduce the plume migration from the former Refinery.

1.5 Off-Site Soil Gas Surveys

1.5.1 West Tank Farm Area

In accordance with the 2012 *Off-Site Soil Vapor Survey Work Plan* (SGI 2012b), in December 2012, SGI conducted a soil vapor survey of on-site and off-site soil gas probes located near the southwestern perimeter of the West Tank Farm. The investigation indicated no detectable BTEX or oxygenate concentrations in any of the soil gas probes (*West Tank Farm Soil Vapor Survey Report*, SGI 2012c).

1.5.2 Rosecrans and Fidel Avenues Area

The area in the vicinity of Rosecrans Avenue and Fidel Avenue (Rosecrans/Fidel area) in the city of Norwalk includes the well PO-16 cited by the RWQCB as the area of potential concern for vapor intrusion in residential areas. This Rosecrans/Fidel area is located approximately 2,500 feet from the southern edge of the former Santa Fe Springs Golden West refinery, and thus it is believed by GWRC and SGI that any petroleum hydrocarbons present this far from the Refinery are most likely associated with off site sources that were described in the March 12, 2012 Groundwater Monitoring Program Review and are not attributable to former operations at the Refinery. The LNAPL fingerprint analyses performed by Zymax Laboratories on February 2012 samples confirmed that the southern portion of the LNAPL plume originated from other off site sources.

Well PO-16 was installed by GWRC in 1992 as part of an off-site investigation that included the installation of monitoring wells as far as 7,400 feet southwest of the former refinery (See well location PO-7, Figure 1). Well PO-16, located south of Rosecrans and well B-16, located north of Rosecrans, contain visually similar free-phase hydrocarbons and exhibit similar hydrocarbon fingerprinting characteristics. The characteristics for these two wells are distinct from free phase product samples collected further north in the immediate vicinity of GWRC and from within the South Tank Farm area of the Refinery. In the vicinity of well B-16, and upgradient from well PO-16, three sites contained former gasoline or diesel USTs that have since been abandoned, and petroleum pipelines have also been documented under Rosecrans.

On October 12, 2012, the RWQCB directed that GWRC prepare and submit a work plan for a soil vapor survey to be conducted in the residential area near well PO-16. This work plan was prepared in response to the October 12, 2012, RWQCB directive.

2.0 SOIL VAPOR SAMPLING WORK PLAN

As directed by the RWQCB, a soil vapor survey work plan for activities proposed in the vicinity of PO-16, near Rosecrans Avenue and Fidel Avenue in Norwalk, California. However, it should be noted that GWRC and SGI believe that the data indicate that the contamination in this area is not associated with LNAPL found under the former Refinery. Further, it is our opinion that the soil vapor survey conducted in December 2012 in the residential area south of the West Tank Farm fulfilled the RWQCB request that a soil vapor investigation be conducted in residential areas potentially affected by past Refinery operations..

2.1 Sampling Locations

Soil gas samples will be collected from six locations in the residential area near well PO-16 (Figure 2). The proposed locations (Soil Gas locations RF-1 to RF-6) are in parkway areas between city streets and sidewalks or within sidewalks. Access will be coordinated and permitted through the City of Norwalk.

The locations were selected to provide soil gas concentrations in the residential area near well PO-16. Based on the potential presence of utilities or limited access, the final locations for the soil gas sampling may be slightly modified, and the RWQCB will be notified of any major scope modifications.

2.2 Methodology

The proposed soil vapor survey will follow the 2012 CalEPA Soil Gas Advisory (CalEPA, 2012).

2.2.1 Pre-field Activities

The following pre-field activities will be completed prior to mobilization to the field:

- An encroachment permit will be secured from the City of Norwalk.
- The proposed sampling locations will be cleared of underground utilities by Underground Service Alert and a utility locating service.

All field activities will be completed with safety as a foremost concern. In accordance with 40 CFR 1910.120, a site-specific health and safety plan (HASP) will be prepared for the soil gas survey activities. All involved personnel, including onsite subcontractors and regulatory personnel, will be required to familiarize themselves with, sign, and adhere to the HASP during the completion of all field activities. The HASP will identify the specific chemical compounds that may be encountered at the Site (BTEX and oxygenates), and present the chemical properties and a task-specific health and safety risk analysis. The HASP submitted as part of the West Tank Farm Soil Vapor Survey Report (SGI, 2012c) will be updated to include the proposed Rosecrans and Fidel investigation.

2.2.2 Soil Gas Probe Installation

Methodologies used for the soil gas survey will be consistent with the April 2012 Active Soil Gas Advisory published by CalEPA. Using a geoprobe rig, a single soil gas probe will be installed at each location at 5 feet below grade, resulting in a total of 6 probes. The probes will be labeled and temporarily protected by a traffic cone during the soil gas survey.

To minimize the potential for cross-contamination between sampling locations, soil gas sampling equipment will be decontaminated prior to initiating work at each drilling location. The drop off point, 1/8-inch tubing, and sampling syringes are all disposable, and new ones will be used for each sample. The threaded point holder will be decontaminated by an Aquanox or equivalent wash and a potable water rinse.

2.2.3 Soil Gas Sampling and Analysis

After a minimum two-hour period following probe installation, soil gas samples will be collected at each of the locations shown on Figure 1. In addition, two purge and one duplicate soil gas sample will be collected. One event of soil gas sampling is proposed.

Soil gas samples will be collected through the polyethylene tubing using a calibrated syringe connected to a sampling port. Prior to sample collection, a purge test will be conducted at the location nearest to PO-16 to determine the optimum purge volumes for the remaining of the sampling probes. The purging procedures (vacuum, flow rates and purge volume testing) will follow the 2012 Advisory.

The sample syringes will be labeled with sample-point identification, date, and time of collection. Soil gas samples will be taken to a mobile laboratory where they will be logged onto the chain-of-custody form and assigned a laboratory identification number. The soil gas samples will be analyzed by California state-certified mobile laboratory by EPA Method 8260B at a method detection limit target at or below the analytes' California Human Health Screening Levels (CHHSLs).

The fieldwork and data interpretation will be supervised by a Professional Geologist or Professional Engineer.

2.2.4 Soil Gas Probe Abandonment

Following the completion of the soil gas analyses, each probe will be removed from the ground and the sampling hole will be sealed with cement slurry, and where necessary, the surface will be restored with concrete or asphalt to be consistent with initial and surrounding site surface conditions and as may be required by the city permit.

3.0 SCHEDULING AND REPORTING

The following steps are required for implementation of the work plan: approval of the work plan by the RWQCB; selection by GWRC of a soil gas consultant; preparation of or update of the Health and Safety Plan; permitting (encroachment permit from the City of Norwalk); coordination/scheduling/notification of RWQCB; utility clearance, field work; data interpretation and report preparation. We propose the following schedule for implementation of this work plan.

Permitting from the City of Norwalk will be requested within two weeks of RWQCB approval of this work plan. The utility clearing and field sampling will be implemented within three weeks of City permit approval, and the RWQCB will be notified at least three days prior to the proposed sampling, which will be conducted within one field day.

The report on the soil gas survey will be submitted to the RWQCB within 60 days of the field sampling completion. The report will present the results of the soil gas investigation and will document the methodologies and results from soil gas sample collection and laboratory analyses. The report will present the findings of the investigations and interpretations. Analytical data will be presented in tabular format and annotated on the appropriate figures. Figures will include a site location map, site map showing the sample locations, and a site map showing annotated VOC concentrations. The report will contain all pertinent documentation such as permits, laboratory reports, survey data, and chain-of-custody forms. The final report will include a comparison of the results with residential CHHSLs and may include additional risk discussions or interpretations.

4.0 LIMITATIONS

This document was prepared for the exclusive use of the Golden West Refining Company (GWRC) and the Regional Water Quality Control Board (RWQCB) for the express purpose of complying with a client- or regulatory directive for a proposed work plan for an off-site soil vapor survey. Any re-use of this work product in whole or in part for a different purpose or by others must be approved by SGI and GWRC in writing. If any such unauthorized use occurs, it shall be at the user's sole risk without liability to SGI or GWRC. To the extent that this work plan is based on information provided to SGI by third parties, including GWRC, their direct contractors, previous workers, and other stakeholders, SGI cannot guarantee the completeness or accuracy of this information, even where efforts were made to verify third-party information. SGI has exercised professional judgment to collect and present findings and opinions of a scientific and technical nature. The opinions expressed are based on the conditions of the Site existing at the time of the field investigation, current regulatory requirements, and any specified assumptions. The recommendations presented in this report are intended to be taken in their entirety to assist GWRC and RWQCB personnel in applying their own professional judgment in making decisions related to the property. SGI cannot provide conclusions on environmental conditions outside the completed scope of work. SGI cannot guarantee that future conditions will not change and affect the validity of the presented conclusions and recommended work. No warranty or guarantee, whether expressed or implied, is made with respect to the data or the reported findings, observations, conclusions, and recommendations.

5.0 REFERENCES

CalEPA, 2012 Advisory Active Soil Gas Investigations. April

RWQCB, 2012a. *Requirement for Soil Vapor Assessment Pursuant to Cleanup and Abatement Order No. R4-2004-0020*, June 21.

RWQCB, 2012b. *Off-Site Soil Vapor Survey Workplan Pursuant to Clean Up and Abatement Order No. R4-2004-0020 and June 21, 2012, Amendment.* October 12.

TRC, 2002. *Fate and Transport Modeling, Former Golden West Refinery, Santa Fe Springs, CA*, September.

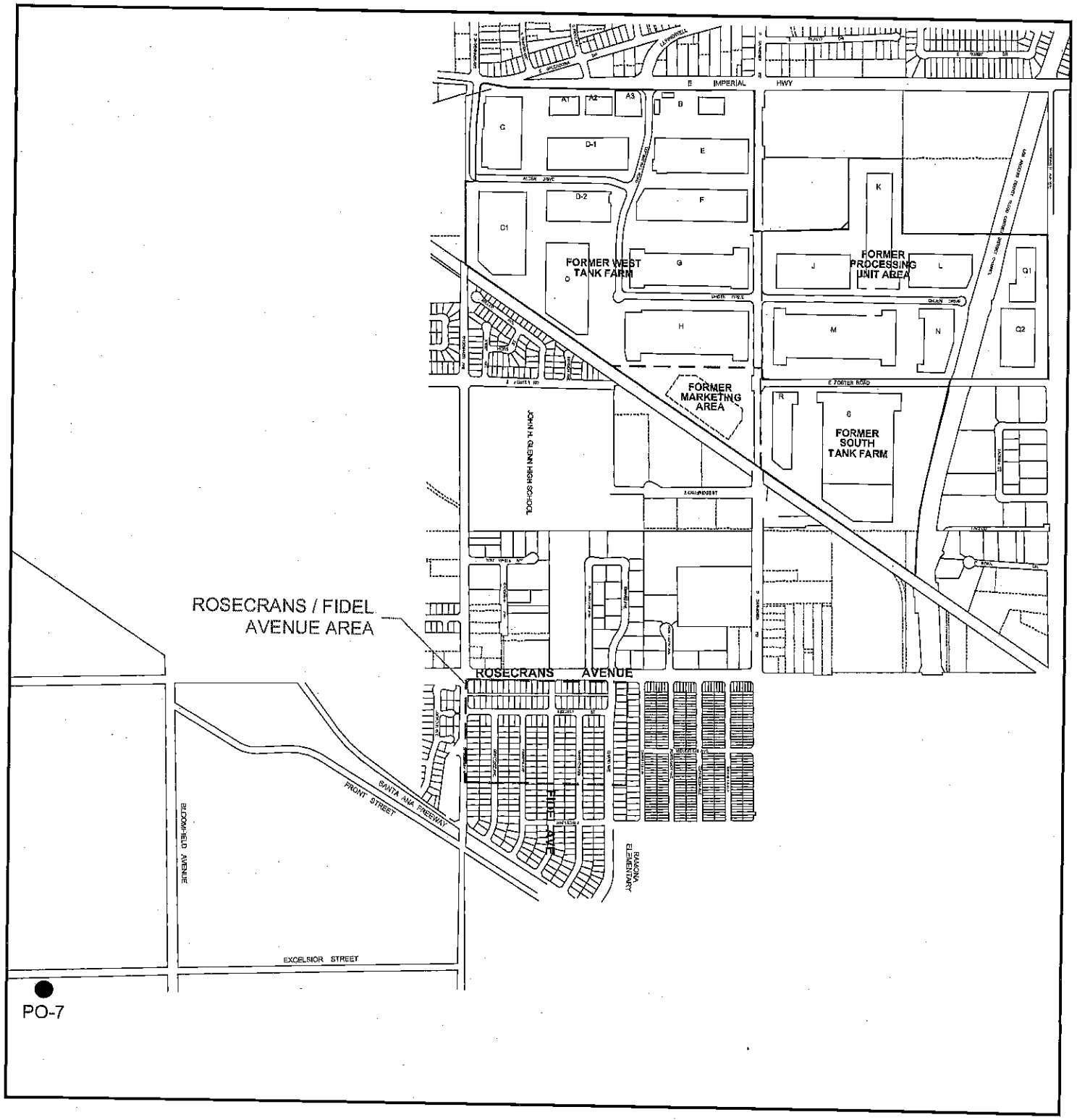
The Source Group, Inc, 2012a. *Groundwater Monitoring Program Review*, March 8.

The Source Group, Inc, 2012b. *Off-Site Soil Vapor Work Plan, Former Golden West Refinery*, August 10.

The Source Group, Inc, 2012c. *West Tank Farm Soil Vapor Survey Report, Former Golden West Refinery*, December 14

TriHydro, 1990-1991. *Reports Evaluating the Semi-Perched Zone and the Artesia Aquifer, GWRC*, September 1990-July 1911.

FIGURES



LEGEND

PO-7 — SOUTHWESTERN OFF-SITE WELL LOCATION

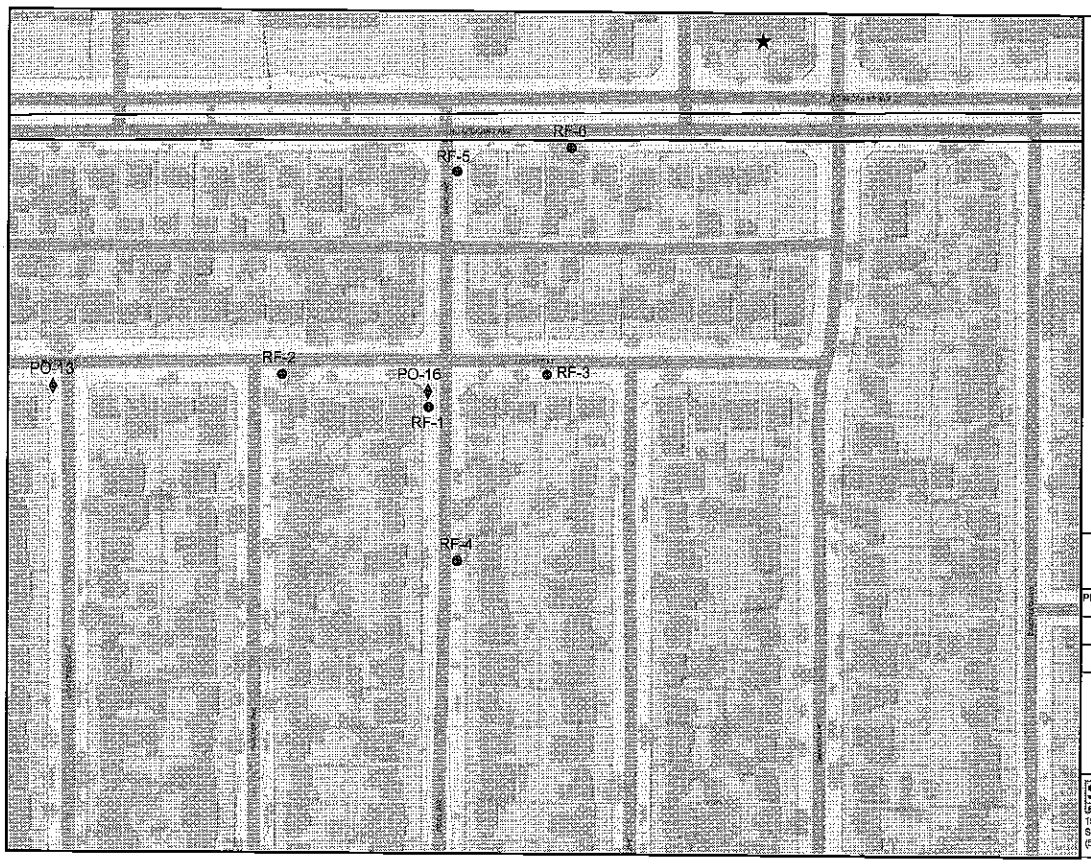
GWRC PROPERTY BOUNDARY

0 1200

SCALE IN FEET

N

SGI environmental THE SOURCE GROUP, INC.	FILE NAME: GWRC-ST-8x11	DATE: 11/2012	**ROSECRANS / FIDEL AVENUE SITE PLAN** **GOLDEN WEST REFINERY** SANTA FE SPRINGS, CALIFORNIA	**FIGURE** **1**
	SOURCE:			



Legend

- Monitoring Wells
- Pipelines (Approximate Location)
- Non-GWRC USTs
- Proposed Soil Gas Survey Locations

Norwalk, California

PROJECT NO.:	DATE:	DR.BY:	APP. BY:

0 35 70 140 210 280 Feet

Rosecrans/Fidel Area: Proposed Soil Gas Survey Locations

SGI THE SOURCE GROUP INC.
1962 Freeman Ave.
Signal Hill, California 90755
(562) 597-1055

N

FIGURE 2

EXHIBIT 8

California Water Boards

Edmund G. Brown Jr.
Governor

Matthew Rodriquez
Secretary for
Environmental Protection

Los Angeles Regional Water Quality Control Board

June 14, 2013

Mr. Chris Panaitescu
Golden West Refining Company
13116 Imperial Highway
Santa Fe Springs, CA 90670

Certified Mail
Return Receipt Requested
Claim No. 7012 1640 0000 6228 3505

SUBJECT: APPROVAL OF OFF-SITE SOIL VAPOR SURVEY WORKPLAN PURSUANT TO CLEANUP AND ABATEMENT ORDER NO. R4-2004-0020 AND JUNE 21, 2012, AMENDMENT

SITE: GOLDEN WEST REFINING COMPANY – 13539 FOSTER ROAD, SANTA FE SPRINGS, CALIFORNIA (SCP NO. 0227A, SITE ID NO. 2040073)

Dear Mr. Panaitescu:

The California Regional Water Quality Control Board (Regional Board), Los Angeles Region, is the State regulatory agency with primary responsibility for the protection of groundwater and surface water quality for all beneficial uses within major portions of Los Angeles and Ventura Counties, including the referenced site. To accomplish this, the Regional Board issues cleanup and investigative orders authorized by the Porter Cologne Water Quality Control Act (California Water Code (Water Code), Division 7).

The Regional Board has completed its review of the *Off-site Soil Vapor Survey Work Plan* (Work Plan) dated January 21, 2013 prepared by The Source Group, Inc. (SGI) on behalf of the Golden West Refining Company (Golden West). The Work Plan was submitted in response to Item No. 1 of the Regional Board letter dated June 21, 2012 (June 21 Letter) amending the existing Cleanup and Abatement Order No. R4-2004-0020 dated August 24, 2004 (CAO).

The former Golden West Refining Company (site) located in Santa Fe Springs is a former refinery and petroleum storage facility. A light non-aqueous phase liquid (LNAPL) plume floating over the shallow Semi-perched Aquifer has been documented to extend from the South Tank Farm to approximately 3000 feet toward the southwest in the down-gradient direction into a residential area located south of Rosecrans Avenue near well PO-16. The LNAPL plume occurs at an approximate depth of 20 feet below ground surface (bgs).

The Work Plan proposes six (6) soil vapor sampling locations south of Rosecrans Avenue in the vicinity of well PO-16. One soil vapor sample from 5-foot depth is proposed for analysis at each location. Due to the known lateral extent and shallow depth of the LNAPL plume, additional soil vapor sampling locations are needed for the preliminary characterization of the soil vapor within the vadose zone covering the entire foot print of the off-site LNAPL plume. In addition, at each location, additional depth-discrete soil vapor samples are needed for an understanding of the vertical profile of the soil vapor plume.

Although this is a preliminary soil vapor assessment for the offsite area, you are advised that it might be useful to install permanent soil vapor sampling probes that can be used for future sampling. If petroleum hydrocarbons are detected, additional assessment and/or remedial action will be required.

Due to the shallow depth of the off-site plume, the Regional Board has initiated the public participation process. At this time, the Regional Board is preparing a fact sheet for distribution within the investigation area to inform the residents and property owners about the preliminary soil vapor assessment and to address their concerns.

The Work Plan is approved with the following modifications and additions:

1. The LNAPL plume is approximately 3000 feet long. Therefore, install additional soil vapor sampling probes at nine (9) locations to extend the preliminary assessment over the entire footprint of the plume from the South Tank Farm to well PO-16. Approximate locations of RF-7 to RF-15 soil gas sampling probes are provided on Figure 1 (copy attached).

2. Collect soil vapor samples from 5-foot, 10-foot and 15-foot depths at each location (RF-1 to RF-15).

3. EPA Method 8260B is the proposed sample analysis. Analyze samples from 5-foot depth at each location for total petroleum hydrocarbons (gasoline). In addition, analyze 5-foot depth samples for methane and perform field screening for hydrogen sulfide gas.

4. The soil vapor sampling and analysis must be conducted in accordance with the *Advisory Active Soil Gas Investigations* dated April 2012 by the California Environmental Protection Agency.

5. All work must be conducted according to a Site-specific health and safety plan (HASP) in compliance with California Occupational Safety and Health Agency (Cal-OSHA), Health and Safety Code, Title 8, California Code of Regulations (CCR), Section 5192 and other appropriate sections.

6. Prior to starting field work, obtain all applicable permits from appropriate regulatory agencies as necessary.

7. Notify the Regional Board at least fifteen (15) days before the commencement of fieldwork.

8. Upon implementation of the Work Plan, submit a report containing the results, conclusions and recommendations to the Regional Board by **October 15, 2013**. Include a work plan for additional soil vapor sampling, if warranted. Include an initial evaluation of risk to human health from vapor intrusion to the residents of the homes and workers of the business located over the soil vapor plume.

Pursuant to section 13350 of the California Water Code, failure to comply with the requirements of Order No. R4-2004-0020, including subsequent amendments, by the specified due dates may result in civil liability administratively imposed by the Regional Board in an amount up to five thousand dollars ($5000) for each day of failure to comply.

If you have any questions, please contact Mr. Adnan Siddiqui (project manager) at (213) 576-6812 (asiddiqui@waterboards.ca.gov) or Dr. Arthur Heath, Section Chief at (213) 576-6725 (aheath@waterboards.ca.gov).

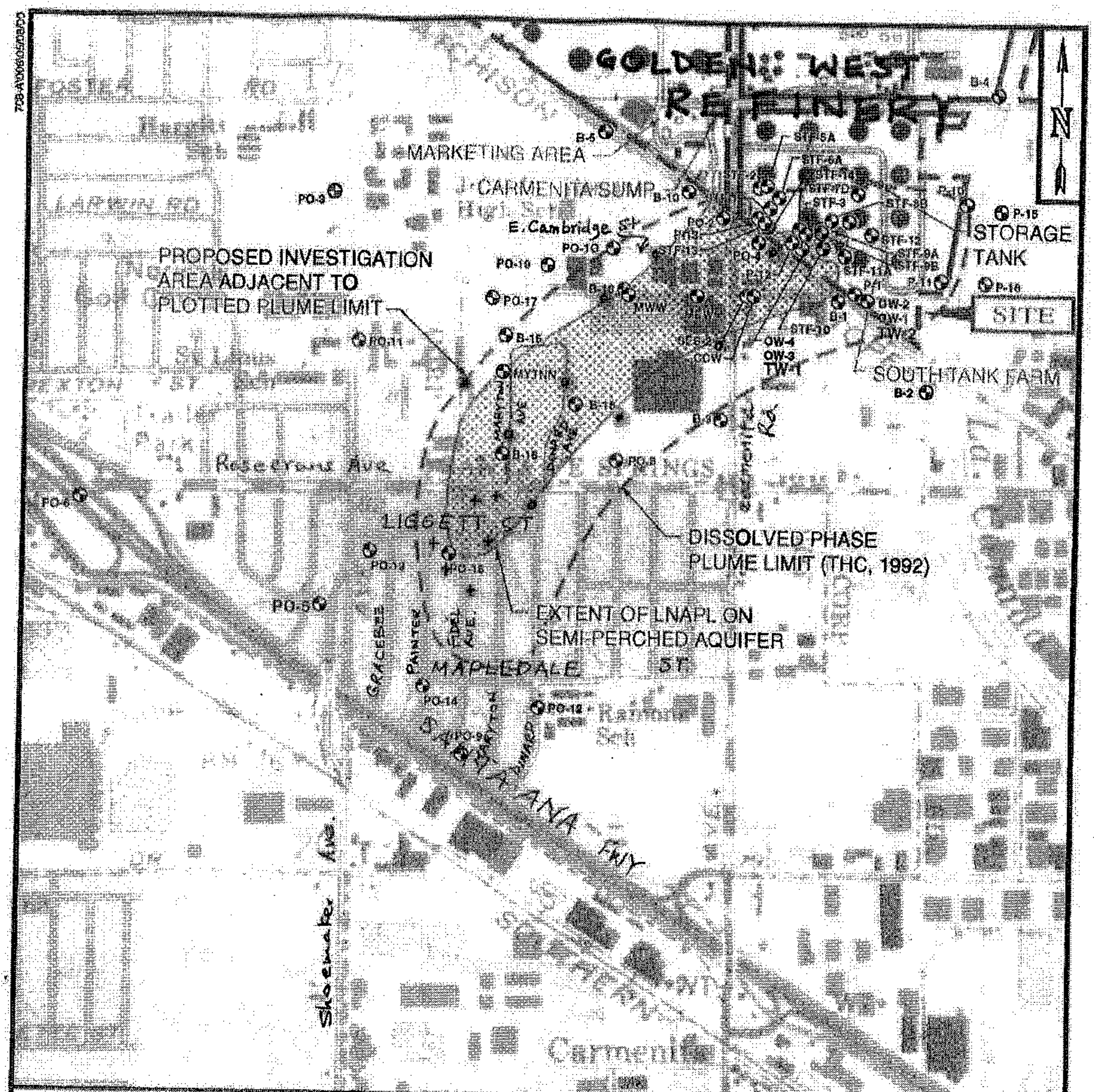
Sincerely,

Samuel Unger

Samuel Unger, PE
Executive Officer

Enclosed: Figure 1

CC: Steve Armann, USEPA (via e-mail)
Katherine Baylor, USEPA (via e-mail)
Paul Parmentier, SGI (via e-mail)



0 1000 2000 FEET

APPROXIMATE SCALE

EXPLANATION

PO-5	MONITORING POINT
	DISSOLVED PHASE PLUME LIMIT REPORTED BY THC, 1992
*	Proposed sampling locations
	Additional sampling location

NOTES:
WELL LOCATIONS ARE APPROXIMATE. WELLS ARE SCREENED IN THE SEMI PERCHED AQUIFER.

REFERENCE:
7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAP OF WHITTIER, CALIFORNIA
DATED: 1964
PHOTOREVISED: 1981

WELL LOCATIONS AND ANALYTICAL DATA FROM THC 1993.

FIGURE 1

DISTRIBUTION OF LNAPL AND DISSOLVED PHASE TPH ON THE SEMI PERCHED AQUIFER

GOLDEN WEST REFINERY
SANTA FE SPRINGS, CALIFORNIA

PREPARED FOR

THRIFTY OIL COMPANY
SANTA FE SPRINGS, CALIFORNIA

ENGLAND & ASSOCIATES

EXHIBIT 9

SGI environmental THE SOURCE GROUP, INC.

July 9, 2013

Mr. Adnan Siddiqui
Regional Water Quality Control Board – Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Re: Golden West Refining Company, SCP No. 0227A:
Revised Soil Vapor Investigation Work Plan

Dear Mr. Siddiqui,

In response to your letter dated June 14, 2013, which conditionally approved the January 21, 2013, *Work Plan for Offsite Soil Vapor Survey* (Work Plan) prepared by The Source Group, Inc. (SGI), on behalf of the Golden West Refining Company (GWRC), SGI is submitting this *Revised Soil Vapor Investigation Work Plan* for the area south of the former Golden West Refining Company (GWRC), for your review and approval.

The RWQCB's approval of the January 21, 2013 Work Plan includes additional requirements, which are discussed below. Based on the rationale presented, SGI believes that the proposed revisions incorporated into the Revised Work Plan will be found to be consistent with the purpose of this investigation, and that this Revised Work Plan will be approved by the RWQCB. The RWQCB conditions are listed below (*italic*), and are followed by our comments:

1. *RWQCB: The LNAPL plume is approximately 3000 feet long. Therefore, install additional soil vapor sampling probes at nine (9) locations to extend the preliminary assessment over the entire footprint of the plume from the South Tank Farm to well P0-16. Approximate locations of RF-7 to RF-15 soil gas sampling probes are provided on Figure 1 (copy attached).*

SGI Comment:
SGI has reviewed the additional soil gas sample locations proposed by the RWQCB (see Attachment A for a summary of those locations, with SGI-assigned location names of IR-1 through 1R-9) against historical site data and the known configuration of the off-site LNAPL plume. We have also completed a detailed file review and a field reconnaissance of the area to be investigated. Based on this work, we have developed a compilation of the initial proposed soil gas locations (as outlined in the June 14 Work Plan) and the RWQCB's additional requested locations, based on which we have established proposed alternate sampling locations with supporting rationale.

1962 Freeman Avenue
Signal Hill, California 90755
Telephone: (562) 597-1055
Facsimile: (562) 597-1070

One factor that we considered was site access. Because several of the RWQCB's additionally requested locations would require access agreements to enter onto private properties, and efforts to obtain such access would certainly delay the sampling, we have provided alternate locations within the public right-of-way. In addition, as some of the RWQCB requested locations appear redundant or duplicate the work of previous investigations, SGI proposes a revised total of eleven SGS locations, which exceeds the original work plan dated January 21, 2013 by five locations. The revised locations are illustrated on Figure 1.

2. *RWQCB: Collect soil vapor samples from 5-foot, 10-foot and 15-foot depths at each location (RF-1 to RF-15)*

SGI Comment:
As described by the USEPA (USEPA, Expedited Site Assessment, 1997), soil gas surveys are typically conducted as an investigation tool to either (1) pre-screen the subsurface conditions of a given site for estimating the lateral and vertical extent of VOC plumes, which based on the results of the SGS may be later investigated by the completion of borings and/or monitoring wells, or (2) evaluate potential human health risks. Based on our June 12, 2012, meeting at the LARWQCB, and the subsequent communications, it is our understanding that the objective of the proposed soil gas investigation is the evaluation of potential health risks rather than an investigation of the extent of the plume. At this site the investigation of the plume was completed in the 1980s to early 1990s, and the extent of the LNAPL plumes has been well characterized and monitored for over 20 years. Further, as groundwater and LNAPL are found at a depth of approximately 20 feet below grade, sampling of soil gas VOCs at 5 and 10 feet above the known LANPL plume can be expected to result in the detection of VOCs and simply confirming the presence of LNAPL, which is already known and does not need reconfirmation. In addition, by collecting and analyzing additional two soil vapor samples per location, the cost of this investigation will significantly but unnecessary increase.

The 2012 Soil Gas Advisory (See RWQCB Requirement # 4 below) lists recommendations as to sample depths as follows:

> "*Section 3.1.3 Sample Depth*
>
> *If vertical characterization to groundwater is needed, the deepest soil gas sample should be collected near the top of the capillary fringe.....*
>
> *Vertical soil gas sampling should be conducted to determine the source of subsurface contamination. Ideally, numerous vertical profiles of soil gas should be developed at the site to accurately locate subsurface sources.*"

These guidance excerpts clearly indicate that the objective of multiple vertical sampling depths is vertical characterization and source identification. As the objective of the proposed soil gas investigation is the evaluation of potential human health risks associated with VOCs in soil gas, and since the vertical delineation and the extent of

LNAPL are well defined, the collection of soil gas samples only at the 5-foot target depth is deemed most appropriate.

At sites with a recent release and limited information on the plumes, sampling at 10 and 15 feet may be recommended as a precautionary measure if volatile organic compounds have not reached shallower soil since the initial release. At this site, the LNAPL has been documented for over 20 years, and therefore the vertical, upward mobilization of vapors from the 20-feet deep LNAPL is assumed to be at equilibrium, and the 5-foot deep soil gas samples should be considered representative of vapor concentrations that may affect aboveground receptors. The 5-foot soil gas samples will provide relevant, undisputable data with respect to hypothetical vapor intrusion risks posed to potential receptors. The collection and use of soil gas data from greater depths will require the use of calibrated models to interpret the data and to make decisions regarding immediate health risks. Use of these models, and the associated assumptions that will be required, result in unnecessary uncertainty and thus cannot be recommended.

Sampling at 5 feet below grade will be conducted to evaluate the potential for vapor intrusion and associated potential human health risks. As listed in several studies cited as the basis of the recent USEPA "Draft Guidance for Addressing Petroleum Vapor Intrusion" (USEPA April 2013), bioattenuation effectively reduces concentrations of petroleum hydrocarbons in shallow soil, and no vapor sampling would be required for sites with a vertical separation of at least 6 feet over dissolved petroleum hydrocarbons and 15 feet over LNAPL plumes. With the depth to the Semi-Perched groundwater ranging from 20.5 feet below grade (Well OW-2, southern edge of GWRC South Tank Farm) to 23.5 feet below grade (well PO-16) in the area of updated proposed sampling locations, no LNAPL plume or dissolved plume is expected to present a potential vapor intrusion risk according to the Draft USEPA document. SGI is proposing to collect and analyze soil gas petroleum hydrocarbons from 5-ft deep soil gas probes at all proposed locations as a conservative demonstration that petroleum hydrocarbon vapor intrusion is not a concern over the footprint of the Rosecrans/Fidel plume.

Therefore, the soil vapor sampling at depths of 10 and 15 feet below grade is considered unnecessary for the principal purpose of this investigation, and consequently we request that the RWQCB withdraw this requirement.

3. *RWQCB: EPA Method 8260B is the proposed sample analysis. Analyze samples from 5-foot depth at each location for total petroleum hydrocarbons (gasoline). In addition, analyze 5-foot depth samples for methane and perform fleld screening for hydrogen sulfide gas.*

SGI Comment:
As recommended, in addition to the BTEX and oxygenates compounds by USEPA Method 8260B, the 5-ft soil gas samples will be analyzed for total petroleum hydrocarbons (TPH) as gasoline as part of the 8260 analysis, and for methane and hydrogen sulfide using a hand-held LandTec GEM 2000 Plus instrument or equivalent.

4. *RWQCB: The soil vapor sampling and analysis must be conducted in accordance with the Advisory Active Soil Gas Investigations dated April 2012 by the California Environmental Protection Agency.*

SGI Comment:
As noted in the Work Plan, the sampling and analysis will be conducted according to the April 2012 Cal EPA *Advisory Active Soil Gas Investigations.*

5. *RWQCB: All work must be conducted according to a Site-specific health and safety plan (HASP) in compliance with California Occupational Safety and Health Agency (Cal-OSHA), Health and Safety Code, Title 8, California Code of Regulations (CCR), Section 5192 and other appropriate sections.*

SGI Comment:
As noted in the Work Plan, the investigation will be conducted following a site-specific Health and Safety Plan and applicable safety regulations.

6. *RWQCB: Prior to starting fieldwork; obtain all applicable permits from appropriate regulatory agencies as necessary.*

SGI Comment:
Permits will be obtained from the cities of Norwalk and Santa Fe Springs, along with Underground Services Alert notifications.

7. *RWQCB: Notify the Regional Board at least fifteen (15) days before the commencement of fieldwork.*

SGI Comment:
The RWQCB will be notified at least 15 days prior to field sampling.

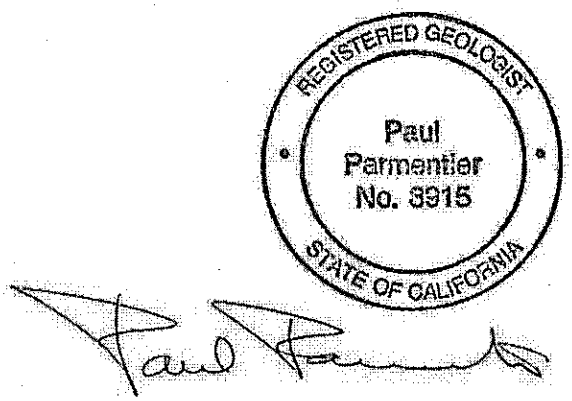
8. *RWQCB: Upon implementation of the Workplan, submit a report containing the results, conclusions and recommendations to the Regional Board by October 15, 2013. Include a work plan for additional soil vapor sampling, if warranted. Include an initial evaluation of risk to human health from vapor intrusion to the residents of the homes and workers of the business located over the soil vapor plume.*

SGI Comment:
The data will be compiled and an initial evaluation of risk to human health from vapor intrusion potentially affecting residents and commercial workers will be completed and presented in a report submitted to the RWQCB no later than October 15, 2013, assuming that access to the proposed sampling locations can be obtained in a timely manner. The report will include recommendations for additional vapor sampling if warranted.

SGI believes that the proposed revised soil gas survey will provide sufficient data to complete the evaluation of potential health risks associated with the Rosecrans/Fidel LNAPL plume.

If you have any questions, please call Mr. Chris Panaitescu at 562/921-3581, ext 390, or Paul Parmentier at 562/597-1055.

Sincerely,



Paul Parmentier, PG No. 3915

Cc: Mr. Chris Panaitescu, Golden West Refining Company
Mr. Neil Irish, The Source Group, Inc.

Attachments:

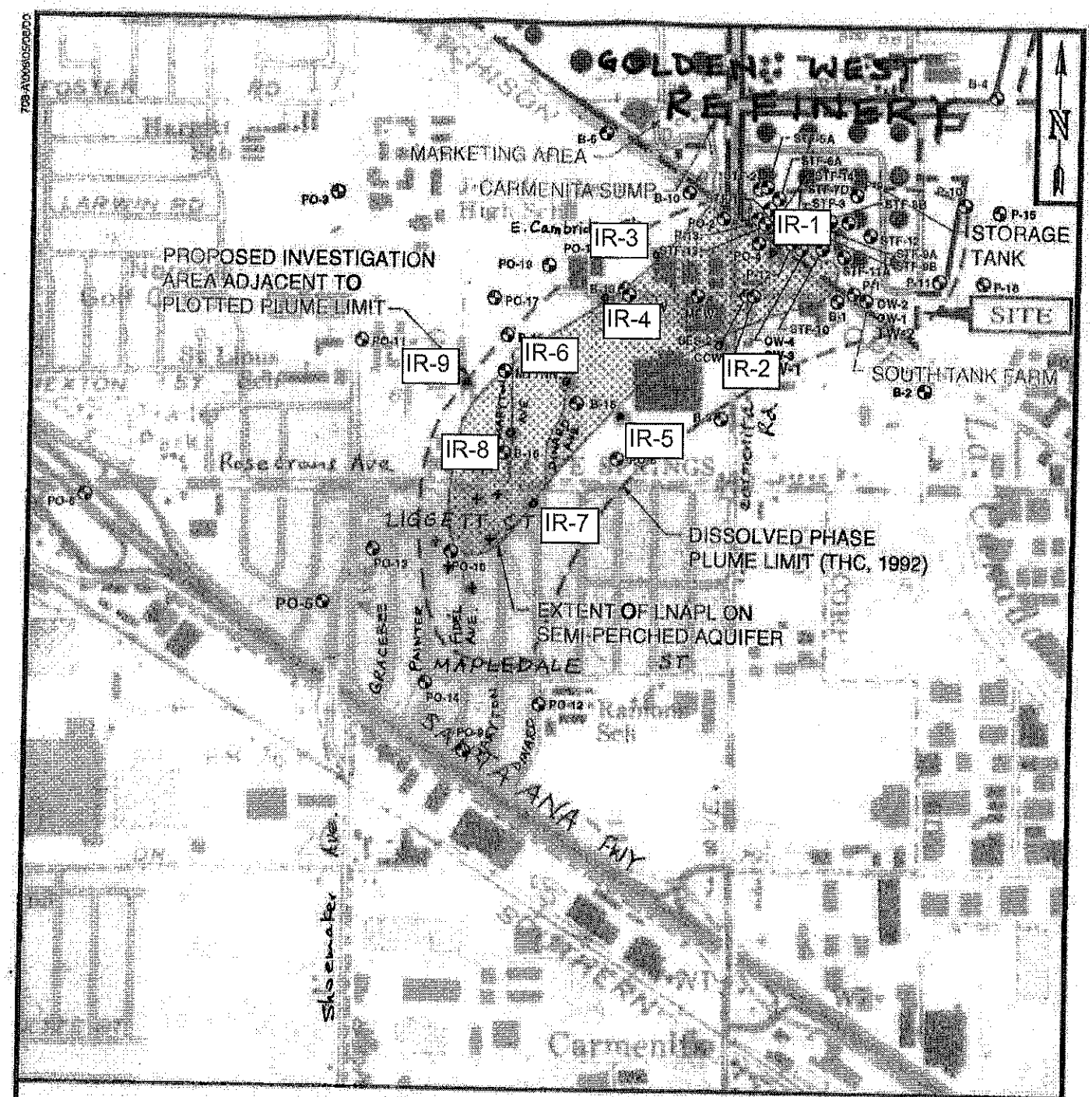
Attachment A: RWQCB Proposed Soil Gas Sampling Locations
Figure 1: SGI Proposed Updated Soil Gas Sampling Locations, Rosecrans/Fidel Area
Table 1: SGI Proposed Updated Soil Gas Sampling Locations and Rationale

References:

California Environmental Protection Agency, 2012. *Advisory Active Soil Gas Investigations*, April

United States Environmental Protection Agency, 1997. *Expedited Site Assessment Tools for Underground Storage Tank Sites, - A Guide for Regulators*, Chapter IV Soil-Gas Surveys, March

United States Environmental Protection Agency, 2013. *Draft Guidance for Addressing Petroleum Vapor Intrusion*, April



EXPLANATION

PO-5 MONITORING POINT

DISSOLVED PHASE PLUME LIMIT REPORTED BY THC, 1992

Proposed sampling locations

IR-1 through IR-9: Additional SGS Locations Suggested by RWQCB

0 1000 2000 FEET

APPROXIMATE SCALE

NOTES:
WELL LOCATIONS ARE APPROXIMATE. WELLS ARE SCREENED IN THE SEMI PERCHED AQUIFER.

REFERENCE:
7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAP OF WHITTIER, CALIFORNIA
DATED: 1964
PHOTOREVISED: 1981

WELL LOCATIONS AND ANALYTICAL DATA FROM THC 1993.

FIGURE 1

DISTRIBUTION OF LNAPL AND DISSOLVED PHASE TPH ON THE SEMI PERCHED AQUIFER

GOLDEN WEST REFINERY
SANTA FE SPRINGS, CALIFORNIA

PREPARED FOR

THRIFTY OIL COMPANY
SANTA FE SPRINGS, CALIFORNIA

ENGLAND & ASSOCIATES

TABLE 1
PROPOSED UPDATED SOIL GAS SAMPLING LOCATIONS AND RATIONALE
Rosecrans/Fidal Area, Nowalk and Santa Fe Springs, California
July 10, 2013

January 15, 2013 - Originally Proposed Soil Gas Field Point Name	June 14, 2013 - RWQCB Proposed Soil Gas Field Point Name *	Revised Field Point Name	Surrounding Area	Final Proposed Location	Rationale / Comments
RF-1 to RF-5	--	RF-1 to RF-5	Residential area near PO-16	Maintain	Locations previously proposed in January 2013 Workplan
RF-6	--	RF-6A	Residential area near PO-16	Location RF-6 proposed in the SGI Workplan moved east to location RF-6A	Location previously proposed (IS-1, Figure1) relocated further east to match sampling point requested by RWQCB
--	IR-1	(Eliminated)	Southern edge of refinery's South Tank Farm	Location IR-6 requested by RWQCB not maintained as final location	The vicinity of the IR-6 location proposed by RWQCB is on private commercial property or on railroad property, and access for sampling is unlikely to be expediently granted. Three soil gas surveys have been completed by GWRC at the South Tank Farm just north of the railroad: Building R, Building S and Building S Southern Extension. These soil gas surveys were approved by RWQCB and Santa Fe Springs Fire Department.
--	IR-2	RF-10	Commercial area on Carmenita Road, west and downgradient of ChemCentral facility	Location IR-12 requested by RWQCB, maintained as final sampling location RF-10	Sidewalk sampling; hand-held soil gas probe installation likely.
--	IR-3 and IR-4	RF-11	Cambridge Street commercial area	Locations IR-4 and IR-5 requested by RWQCB relocated and consolidated to location in street, RF-11	Initial sampling locations requested by RWQCB IR-4 and IR-5 proposed by RWQCB are on private property: location RF-11 is between IR-4 and IR-5 and on Cambridge Street
--	IR-5	RF-8	Commercial area north of Rosecrans, eastern edge of LNAPL plume	Location IR-5 requested by RWQCB, maintained as final sampling location RF-8	Location in city street, accessible
--	IR-6	RF-7	Commercial area north of Rosecrans, center of LNAPL plume	Location IR-6 requested by RWQCB, maintained as final sampling location RF-7	Location is near monitoring well B-18, with previously reported LNAPL
--	IR-7	(Eliminated)	Commercial area north of Rosecrans, center of LNAPL plume	Location not proposed	Data will be provided by location RF-7
--	IR-8	(Eliminated)	Commercial area north of Rosecrans, center of LNAPL plume	Location not proposed	Data will be provided by location RF-7
--	IR-9	RF-9	Commercial area north of Rosecrans, western edge of LNAPL plume	Location IR-9 requested by RWQCB, relocated west to RF-9	Relocated west of the RWQCB-selected location (IR-9), which is on private property, to street area to the west of IR-3

Proposed soil gas points plotted in a June 22, 2013, RWQCB
*Note: communication to GWRC were assigned temporary identification numbers of IR-1 through IR-9 (see Attachment A to this Work Plan)

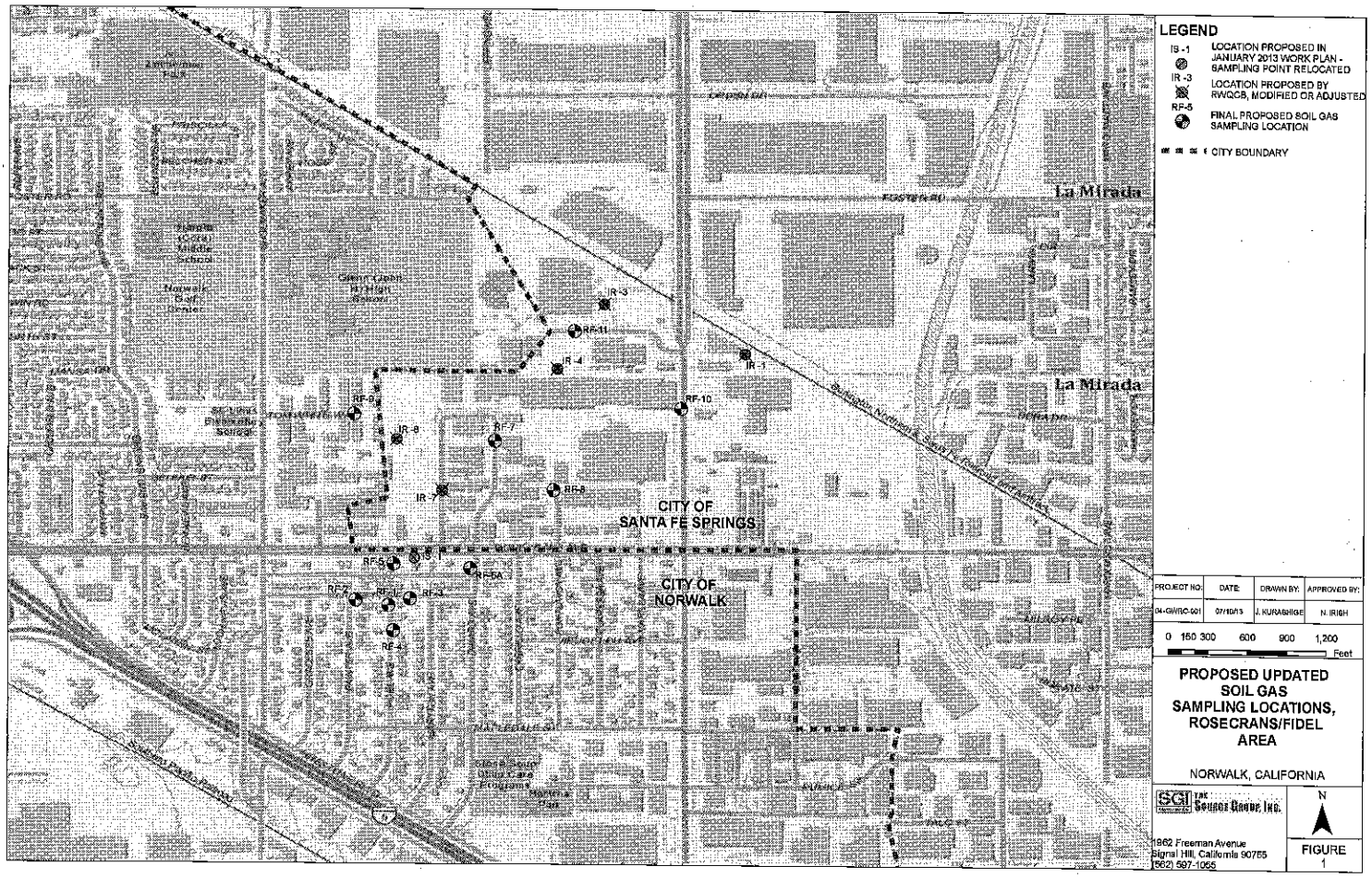

LEGEND
IS-1 LOCATION PROPOSED IN JANUARY 2013 WORK PLAN - SAMPLING POINT RELOCATED
IR-3 LOCATION PROPOSED BY RWQCB, MODIFIED OR ADJUSTED
RF-5 FINAL PROPOSED SOIL GAS SAMPLING LOCATION
CITY BOUNDARY
La Mirada
La Mirada
CITY OF SANTA FE SPRINGS
CITY OF NORWALK
IR-1
IR-3
IR-4
IR-7
IR-8
IR-9
RF-4
RF-5
RF-5A
RF-6
RF-7
RF-8
RF-9
RF-10
RF-11
PROJECT NO: 04-GWRC-001
DATE: 07/10/13
DRAWN BY: J. KURASHIGE
APPROVED BY: N. IRIGH
0 150 300 600 900 1,200 Feet
PROPOSED UPDATED SOIL GAS SAMPLING LOCATIONS, ROSECRANS/FIDEL AREA
NORWALK, CALIFORNIA
SCG The Source Group Inc.
1962 Freeman Avenue Signal Hill, California 90755 (562) 597-1055
N
FIGURE 1

EXHIBIT 10

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

July 23, 2013

Mr. Chris Panaitescu
Golden West Refining Company
13116 Imperial Highway
Santa Fe Springs, CA 90670

Certified Mail
Return Receipt Requested
Claim No. 7012 1640 0000 6228 3550

SUBJECT: APPROVAL OF OFF-SITE SOIL VAPOR SURVEY WORKPLAN PURSUANT TO CLEANUP AND ABATEMENT ORDER NO. R4-2004-0020 AND JUNE 21, 2012, AMENDMENT

SITE: GOLDEN WEST REFINING COMPANY – 13539 FOSTER ROAD, SANTA FE SPRINGS, CALIFORNIA (SCP NO. 0227A, SITE ID NO. 2040073) ("Site")

Dear Mr. Panaitescu:

On June 21, 2012 the California Regional Water Quality Control Board, Los Angeles (Regional Board) directed Golden West Refining Company to submit a soil vapor survey work plan pursuant to Cleanup and Abatement Order No. R4-2004-0020 (CAO) dated August 24, 2004. On January 21, 2013 the Regional Board received the technical document titled *Off-site Soil Vapor Survey Work Plan* "Work Plan" prepared by The Source Group, Inc. (SGI). The Regional Board approved the Work Plan on June 14, 2013. On July 12, 2013 the Regional Board received the technical document titled *Revised Soil Vapor Investigation Work Plan* "revised work plan" dated July 9, 2013 prepared by SGI.

The revised work plan addressed the initial site investigation in order to determine the nature and extent of the vapor plume in the off-site area, and to perform a vapor intrusion evaluation.

The revised work plan proposes modifications eliminating four soil vapor sampling points to reduce the number of soil vapor sampling points from 15 to 11. Three soil vapor sampling locations are also relocated due to site access issues. In addition, the revised work plan proposes to eliminate the Regional Board requirement for collecting additional soil vapor samples from 10 and 15 feet depths at each soil sampling location. This is based on the premise that the purpose of the soil vapor investigation is only to evaluate potential risks from vapor intrusion and therefore collecting soil samples only from 5 feet depth at each location would fulfill the objective.

The revised work plan proposes no other modifications to the Regional Board requirements stated in its June 14, 2013 letter, which conditionally approved the Work Plan. The revised work plan with the following additions is hereby approved.

1. The Regional Board concurs with the modifications to the number and locations of the soil vapor sampling locations as proposed.

2. The Regional Board denies your request to eliminate the requirement to collect additional soil vapor samples at each location. You shall collect soil vapor samples from 5, 10 and 15 feet depths at each soil sampling location. The purpose of the initial soil vapor survey is to characterize the nature and extent of the soil vapor plume as well as to evaluate potential risk to human health from vapor intrusion into indoor air.

3. The due date to submit the report upon implementation of the revised work plan remain October 15, 2013.

Pursuant to section 13350 of the California Water Code, failure to comply with the requirements of Order No. R4-2004-0020, including subsequent amendments, by the specified due dates may result in civil liability administratively imposed by the Regional Board in an amount up to five thousand dollars ($5000) for each day of failure to comply.

If you have any questions, please contact Mr. Adnan Siddiqui (project manager) at (213) 576-6812 (asiddiqui@waterboards.ca.gov) or Dr. Arthur Heath, Section Chief at (213) 576-6725 (aheath@waterboards.ca.gov).

Sincerely,

Samuel Unger, PE
Executive Officer

CC: Steve Armann, USEPA (via e-mail)
Katherine Baylor, USEPA (via e-mail)
Paul Parmentier, SGI (via e-mail)

EXHIBIT 11

California Water Boards

Edmund G. Brown Jr.
Governor

Matthew Rodriquez
Secretary for
Environmental Protection

Los Angeles Regional Water Quality Control Board

July 30, 2013

Mr. Chris Panaitescu
Golden West Refining Company
13116 Imperial Highway
Santa Fe Springs, CA 90670

Certified Mail
Return Receipt Requested
Claim No. 7011 3500 0003 5491 0940

SUBJECT: RESPONSE TO GROUNDWATER PROGRAM REVIEW - CLEANUP AND ABATEMENT ORDER NO. R4-2004-0020

SITE: GOLDEN WEST REFINING COMPANY – 13539 FOSTER ROAD, SANTA FE SPRINGS, CALIFORNIA (SCP NO. 0227A, SITE ID NO. 2040073) ("Site")

Dear Mr. Panaitescu:

The California Regional Water Quality Control Board (Regional Board), Los Angeles Region, is the State regulatory agency with primary responsibility for the protection of groundwater and surface water quality for all beneficial uses within major portions of Los Angeles and Ventura Counties, including the referenced site. To accomplish this, the Regional Board issues investigative and cleanup orders authorized by the Porter Cologne Water Quality Control Act (California Water Code [CWC], Division 7).

The Source Group, Inc. (SGI) submitted a *Groundwater Monitoring Program Review* (Report) dated March 2012 to the Regional Board on behalf of the Golden West Refining Company (Golden West). In the Report, SGI asserts that many of the off-site wells installed by Golden West or its predecessors are located beyond the boundaries of the waste plume attributable to discharges of waste at the Site. SGI then proposes a modification to the current groundwater monitoring plan for the Site. Regional Board staff has completed its review of the Report.

I. Site History and Background

The Golden West Refining Company is a former refinery and petroleum storage facility located in Santa Fe Springs. From the 1920s to 1997, Golden West and its predecessors conducted refining, blending and storage of crude oil and finished products at the Site. The Site encompasses approximately 269 acres and was divided into four areas based on the refinery operations. The Processing Unit Area was mainly used for refining crude oil into various products such as fuel oil, diesel, and gasoline. Aviation fuels were also produced at the Site. The South Tank Farm and West Tank Farm were used for storage and blending of crude oil, intermediate products and finished products. Loading and inventory of finished products took place in the Marketing Area. The Site is now completely redeveloped into a business park for commercial and industrial use.

In 1979, when Gulf Oil Company owned and operated the refinery, light non-aqueous phase liquid (LNAPL) was discovered during the construction of the Carmenita Road underpass