EMCON
18912 North Creek Parkway • Suite 100 • Bothell, Washington 98011-8016 • (206) 485-5000 • Fax (206) 486-9766

July 18, 1995
Project 40311-106.001

Facility Number 9-0129
General Corr ☐
Service Reqs./Proposals ☐
Permits/Bonds ☐
Drawings/Photos/Notes ☐
Spill & Leak Reports ☐
Legal/Easements/Lic. ☐
Reports ☒

Mr. Garrick Jauregui
Chevron U.S.A. Products Company
2410 Camino Ramon
P.O. Box 5004
San Ramon, California 94583-0804

Re: Second Quarter (March 23 to June 7, 1995) Vapor Extraction System Monitoring
Chevron Facility 090129
4700 Brooklyn Avenue, Seattle, Washington

Dear Mr. Jauregui:

EMCON is pleased to submit this report regarding the status of ongoing remediation activities at the above-referenced service station located at 4700 Brooklyn Avenue in Seattle, Washington (Figure 1). This report summarizes the vapor extraction system (VES) operation and maintenance activities at the facility from March 23 to June 7, 1995. The scope of work conducted was consistent with EMCON's VES operation and maintenance program proposal, dated April 12, 1993.

## BACKGROUND

### Site Location and Description

The facility is an active retail gasoline station located on the northeast corner of the intersection of Brooklyn Avenue and Northeast 47th Street in Seattle, Washington. $H_2$Oil Recovery Equipment installed the vapor extraction system in February 1990 under the direction of GeoEngineers, Inc. (GEI). GEI received Puget Sound Air Pollution Control Authority (PSAPCA) approval to construct the system on April 20, 1990. The VES was activated on May 16, 1990, with a portable incineration combustion unit (ICU) to oxidize the extracted hydrocarbon vapors. The ICU was removed in 1991, and the VES emissions were discharged directly to the atmosphere. PSAPCA compliance was maintained by using a dilution valve. From April 1991 to September 1992, the VES operated on a 12-hour-on, 12-hour-off, cycle. The VES has operated almost continuously from October 1992 to the present, with periodic shutdowns for maintenance, instrument installation, and monitoring activities.

The VES consisted of 11 vertical extraction wells plumbed to two manifold areas. The two manifolds are connected to two Rotron DR404 blowers. The main system manifold, blowers, and system stack are located at the south end of the station building. A site plan showing the vapor extraction system configuration is included as Figure 2.

Product was encountered in monitoring well MW-12 during the fourth quarterly groundwater sampling event in 1994. Groundwater Technology Inc., monitored the water levels and product thicknesses between October 18 and November 14, 1994. Product removal from monitoring well MW-12 was performed, and residual product was stored in drums pending proper disposal. On November 22, 1994, EMCON personnel installed a groundwater aeration line in MW-12 to induce aeration of the product and to recover the volatile organics with the vapor extraction system.

EMCON has conducted quarterly VES monitoring since June 10, 1993. Hydrocarbon removal rates from December 9 to March 23, 1994, ranged from 11.9 to 160.0 pounds per day. EMCON previously monitored the system on March 23, 1995, with the results reported in the *First Quarter Vapor Extraction System Monitoring Report*, dated April 11, 1995. Measured product thickness in monitoring well MW-12 is included in Table 1.

## SCOPE OF WORK AND METHODS

EMCON's services were performed to monitor and evaluate the VES operation at the site. EMCON monitored the VES operation on March 23, May 12, and June 7, 1995, during this reporting period. The April site visit data, collected on March 23, 1995, were included in the first quarter report.

The system monitoring visits consisted of recording airflow, vacuum pressure, and volatile organic vapor concentrations. Airflow rates at each of the extraction points and at the system stack were monitored by using a Kurz™ Instruments, Inc., Mini Anemometer Series 490. Airflow readings were recorded in linear feet per minute (fpm), then converted to volumetric cubic feet per minute (cfm) by using the diameter of the extraction pipe at the given sample port and monitoring location. The vapor extraction system stack is 4 inches in diameter, and the extraction points are 2 inches in diameter.

Vacuum pressure was monitored at the individual extraction points and at the system manifold by using a series of portable magnehelic gauges with a pressure range of 0.01 to 50 inches of water. The system pressure was measured at a permanent pressure gauge mounted on the condensate tank.

Volatile organic vapor concentrations were monitored by using a flame ionization detector (FID), Foxboro™ Model 88 OVA and a photoionization detector (PID) Model 580 OVM. Readings were collected at the system stack, at the manifold, and at each individual extraction point.

The hydrocarbon mass removal and emission rates were calculated by using the following formula:

Lbs/day = cfm x FID (ppmv) x molecular weight (hexane) x 1.581 x $10^{-7}$ x 24 hrs/day.[1]

For the calculation of hydrocarbon mass removal, the following assumptions apply:

(1) Cfm = the volumetric airflow from the system stack.

(2) FID = volatile organic vapor concentrations were measured in parts per million—volume (ppmv).

(3) Molecular weight of hexane, the FID calibration gas, is 86 mg/mole.

(4) 1.581 x $10^{-7}$ lb-mole min/$ft^3$ ppmv hr = $\frac{1}{10^6\ ppmv} \times 60\ \frac{min}{hr} \times \frac{1lb\text{-}mole}{379.5ft^3}$.

(5) Total pounds were calculated assuming a linear increase or decrease in stack emissions from monitoring date to monitoring date.

The following formula was used to calculate total pounds removed between site visits:

$$Total\ Pounds = \frac{FE + IE}{2} \times Days$$

(1) FE = final emissions in lbs/day during previous site visit.

(2) IE = initial emissions in lbs/day during next site visit.

(3) Days = number of days between the two site visits.

## RESULTS

During the monthly site visits, each VES extraction point was isolated to record vacuum pressure, linear airflow, and VOC concentrations. Attachment A contains the field measurements collected during EMCON's second quarter site visits.

The VES was operating properly upon arrival on May 12, 1995, with vacuum applied to vapor extraction points MW-4 and MW-12. The system setup was designed to focus on the product

[1] Reference: United States Environmental Protection Agency, Office of Underground Storage Tanks, June 1989. *Estimating Air Emissions from Petroleum UST Cleanups.*

in the pump island area. Following isolation of each vapor extraction point to collect operating parameters, the system was adjusted to apply vacuum to MW-1, MW-4, MW-11, and MW-12. The net induced vacuum following adjustments was 33 inches of water at the condensate tank, with measurable linear airflow recorded at 2,000 fpm at the discharge stack. The VOC concentrations at the stack registered 1,750 ppmv by using an FID and 210 ppmv with an PID. The system was maximized based on the PID readings. An additional vacuum induced aeration line was installed in MW-11. The air intake valve at the condensate tank remained open to lower vacuum applied to the vapor extraction points and to maintain lower emissions.

The VES was operating properly upon arrival on June 7, 1995. No condensate was found in the lines or the condensate tank. Each vapor extraction point was isolated, and operating parameters were recorded. No system modifications were performed. Final vacuum pressure on the system was 20 inches of water at the condensate tank, with linear airflow recorded at 2,600 fpm at the discharge stack. The VOC concentrations at the stack registered 560 ppmv with an FID and 186 ppmv with a PID.

An air sample was collected for the initial system setup and following the final setup on June 7, 1995. The final setup air sample bag was damaged; therefore, the final system setup air sample was recollected on June 8, 1995. The samples were submitted to North Creek Analytical in Bothell, Washington, for laboratory analysis. A copy of the laboratory report is included in Appendix A. The samples were analyzed for total petroleum hydrocarbons as gasoline (TPH-G) by using Washington WTPH-G Method and for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by using EPA Method 8020. TPH-G was detected at 300 $mg/m^3$ (70.7 ppmv) during the initial system setup and 120 $mg/mg^3$ (28.3 ppmv) for the final system setup. These data correlate more closely with the PID readings rather than the FID readings.

Since vapor extraction system activation in May 1990, the system appears to have removed approximately 18,321 pounds of volatile organic vapors from the soil beneath the site. This estimate is based on reported emission rates available from previous GEI VES progress reports. It is uncertain, based on the previously reported information, whether hydrocarbon recovery rates were calculated when the ICU was operating. A graphic representation of the system emissions over time is shown on Figure 3. The graph includes plots of both the daily emission rate and the total emissions.

EMCON did not review the emissions calculations made by previous consultants. The information contained in previous reports was transcribed into Table 2 and Figure 3. Table 2 presents the VES operating parameters from January 14, 1993, to the present, with estimated total emissions.

## CONCLUSIONS

The VES continued to recover volatile hydrocarbons from the subsurface during the second quarter reporting periods from March 23 to June 7, 1995. During this period, 920 pounds of volatile hydrocarbons were removed from the site. Based on the PID readings, hydrocarbon removal rates ranged from 2.8 to 18.8 pounds per day.

During the second quarter, the vapor extraction system operated properly. The vapor extraction points were isolated, and the operating parameters were collected. Recorded linear airflow at the stack ranged from 1,400 to 2,600 fpm. Volatile organic concentrations ranged from 126 to 1,750 ppmv with an FID and 70 to 330 ppmv with a PID at the discharge stack. Vacuum pressure ranged from 20 to 43 inches of water at the condensate tank.

During the second quarter of 1995, a product aeration line was installed in vapor extraction point MW-11 to aerate the groundwater and to extract the VOCs with the VES. System operations were maintained and maximized on vapor extraction points in the pump island area to address the product in MW-12, and the high dissolved concentrations in MW-1, MW-4, and MW-11.

Based on the PID reading, the final hydrocarbon removal rate was 13.8 pounds per day on June 7, 1995, with vapor extraction points MW-1, MW-4, MW-11, and MW-12 induced to vacuum. The system operations will continue at this site.

We appreciate the opportunity to be of service to Chevron U.S.A. Products Company on this project. Please contact us if you have any questions about this report.

Sincerely,

EMCON

Lisa Rutan
Project Manager

Daniel Balbiani, P.E.
Assistant Director of Remediation Services

Attachments: Limitations
Table 1 – Measured Product Thickness
Table 2 – Hydrocarbon Emissions/Mass Removal Results
Figure 1 – Site Location Map
Figure 2 – Site Plan
Figure 3 – Total and Daily Petroleum Hydrocarbon Emissions (May 1990-June 1995)
Attachment A – Field Data Sheets

## LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

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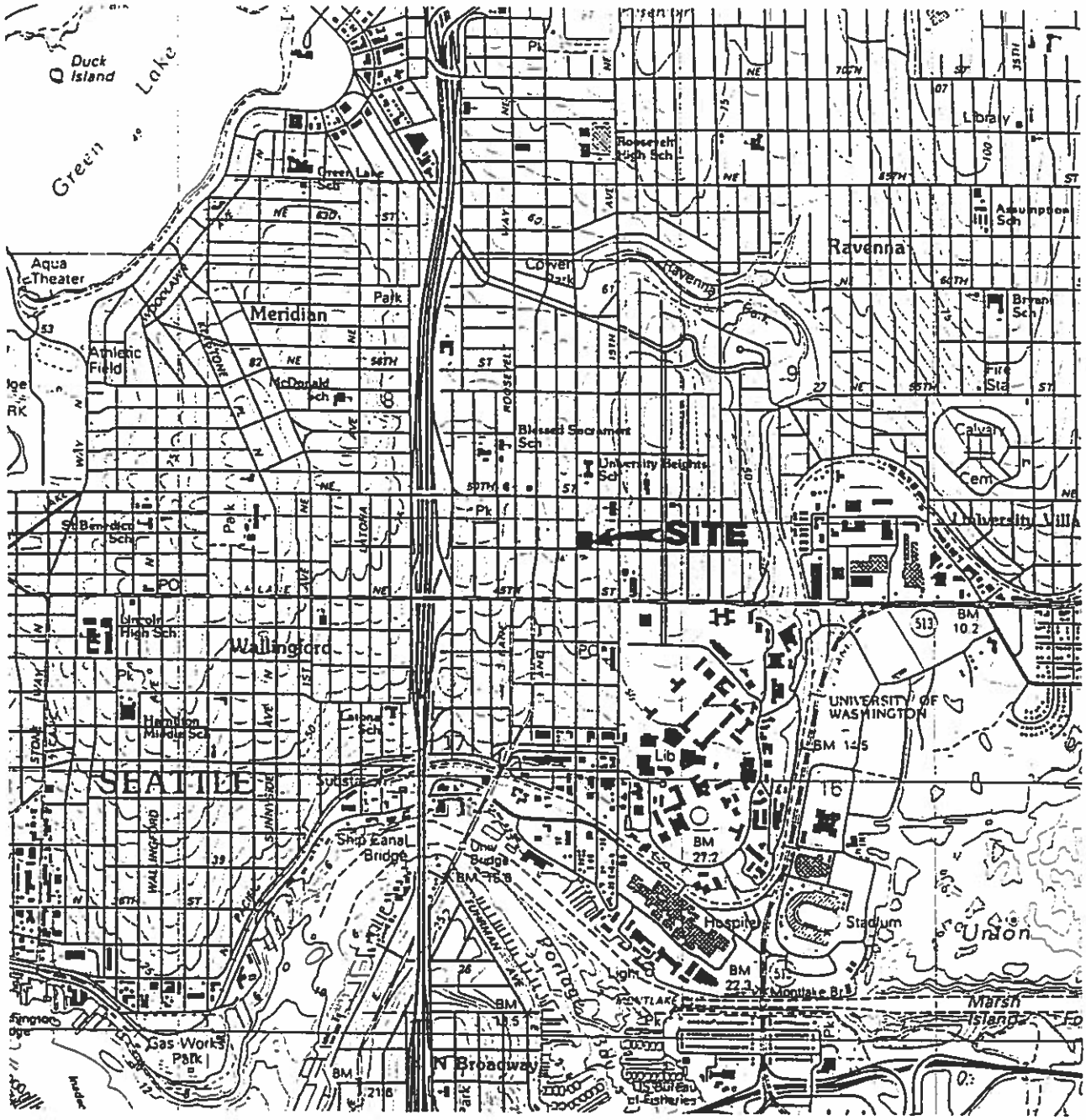


REFERENCE: USGS 7.5'X15' TOPOGRAPHIC-BATHYMETRIC QUADRANGLE MAP "SEATTLE NORTH, WASHINGTON".

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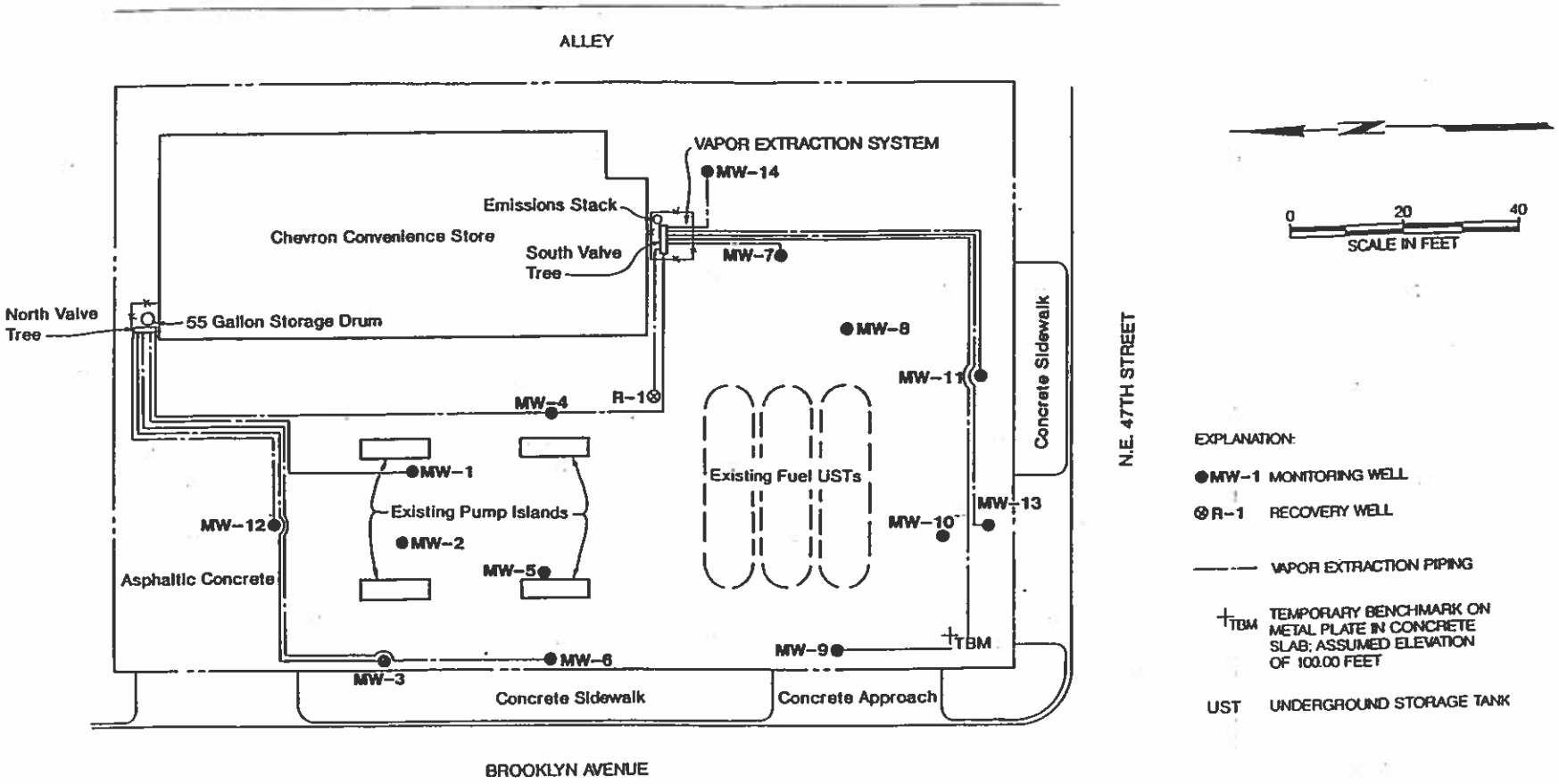
PROJECT NO. 0311-106.01

Figure 1
CHEVRON USA PRODUCTS COMPANY
FACILITY NO. 60090129
SEATTLE, WASHINGTON
**SITE LOCATION MAP**




EMCON Northwest Inc

SOURCE: GEO-ENGINEERS Figure 2, Vapor Extraction System Layout.

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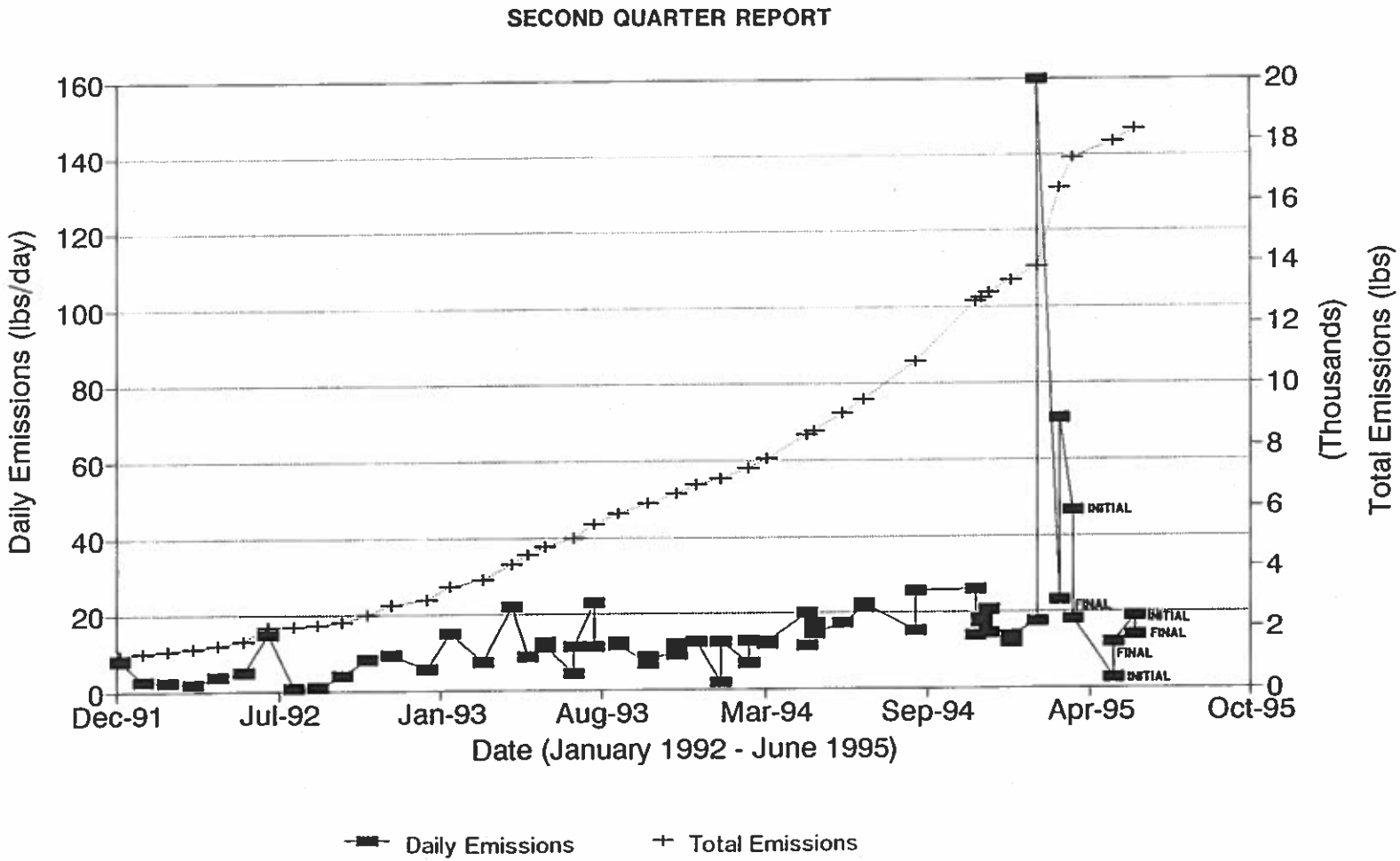
PROJECT NO. 0311-106.01

Figure 2
CHEVRON USA PRODUCTS COMPANY
FACILITY NO. 60090129
SEATTLE, WASHINGTON
SITE PLAN

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| | |
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| DATE | 6-95 |
| DWN. | MLP |
| REV. | |
| APPR. | |
| PROJECT NO. | 0311-106.001 |

Figure 3
CHEVRON USA PRODUCTS COMPANY
FACILITY NO. 60090129
SEATTLE, WASHINGTON
**TOTAL AND DAILY PETROLEUM HYDROCARBON EMISSIONS**

## Table 1

## Measured Product Thickness
## Chevron U.S.A. Products Company Station 60090129
## Seattle, Washington

| Location | Date | Product Thickness | Product Volume Bailed (gallons) |
|---|---|---|---|
| MW-4 | 11/22/94 | Trace | — |
| MW-12 | 11/22/94 | 2.45 | — |
| | 11/29/94 | 1.36 | — |
| | 12/09/94 | Trace | — |
| | 02/06/95 | 0.63 | — |
| | 03/06/95 | 0.62 | — |
| | 03/23/95 | NM | 0.25 |

NOTE: NM = not measured.

## Table 2

## Second Quarter 1995
## Hydrocarbon Emissions/Mass Removal Results
## Chevron U.S.A. Products Company Station 60090129
## Seattle, Washington



| Date | Flow @ Stack (fpm) | Flow @ Stack (cfm) | Vacuum (" water) | FID (ppmv) | Emissions (lbs/day) | Total[a] (pounds) |
|---|---|---|---|---|---|---|
| 01/14/93 * | 2,030 | 177 | NA | 100 | 5.8 | 2,989 |
| 02/11/93 * | 1,940 | 169 | NA | 280 | 15.0 | 3,409 |
| 03/23/93 * | 980 | 86 | NA | 260 | 7.3 | 3,635 |
| 04/27/93 | 1,770 | 154 | NA | 440 | 22.1 | 4,150 |
| 05/18/93 | 1,580 | 137 | NA | 200 | 8.9 | 4,476 |
| 06/10/93 (initial) | 1,600 | 140 | 9 | 275 | 12.6 | 4,723 |
| 06/10/93 (final) | 2,000 | 174 | 7 | 200 | 11.4 | 4,723 |
| 07/14/93 (initial) | 1,100 | 96 | 6 | 140 | 4.4 | 4,992 |
| 07/14/93 (final) | 1,000 | 87 | 11 | 400 | 11.4 | 4,992 |
| 08/09/93 (initial) | 1,600 | 140 | 11.5 | 500 | 22.8 | 5,437 |
| 08/09/93 (final) | 1,600 | 140 | 10 | 250 | 11.4 | 5,437 |
| 09/08/93 (initial) | 1,600 | 140 | 10 | 275 | 12.6 | 5,797 |
| 09/08/93 (final) | 1,200 | 105 | 8.5 | 340 | 11.6 | 5,797 |
| 10/15/93 (initial) | 1,100 | 96 | 8.5 | 220 | 6.9 | 6,139 |
| 10/15/93 (final) | 1,200 | 105 | 9 | 250 | 8.6 | 6,139 |
| 11/19/93 (initial) | 1,400 | 122 | 7 | 230 | 9.2 | 6,451 |
| 11/19/93 (final) | 1,400 | 122 | 10 | 300 | 11.9 | 6,451 |
| 12/14/93 (initial) | 1,100 | 96 | 9 | 400 | 12.5 | 6,756 |
| 12/14/93 (final) | 3,500 | 305 | 13 | 125 | 12.4 | 6,756 |
| 01/13/94 (initial) | 3,600 | 314 | 12 | 18 | 1.8 | 6,969 |
| 01/13/94 (final) | 3,400 | 296 | 15 | 130 | 12.6 | 6,969 |
| 02/14/94 (initial) | 2,500 | 218 | 15 | 98 | 7.0 | 7,282 |
| 02/14/94 (final) | 2,500 | 218 | 26 | 180 | 12.8 | 7,282 |
| 03/09/94 (initial) | 2,000 | 174 | 23 | 210 | 12.0 | 7,567 |
| 03/09/94(final) | 2,000 | 174 | NA | 220 | 12.6 | 7,567 |

## Table 2

## Second Quarter 1995
## Hydrocarbon Emissions/Mass Removal Results
## Chevron U.S.A. Products Company Station 60090129
## Seattle, Washington



| Date | Flow @ Stack (fpm) | Flow @ Stack (cfm) | Vacuum (" water) | FID (ppmv) | Emissions (lbs/day) | Total[a] (pounds) |
|---|---|---|---|---|---|---|
| 04/27/94(initial) | 2,000 | 174 | 32 | 350 | 20.0 | 8,366 |
| 04/27/94(final) | 2,000 | 174 | 27 | 200 | 11.4 | 8,366 |
| 05/05/94(initial) | 2,000 | 174 | 27 | 300 | 17.1 | 8,480 |
| 05/05/94(final) | 2,000 | 174 | 30 | 250 | 14.3 | 8,480 |
| 06/10/94(initial) | 2,000 | 174 | 27 | 300 | 17.1 | 9,046 |
| 06/10/94(final) | 2,000 | 174 | 30 | 300 | 17.1 | 9,046 |
| 07/05/94(initial) | 2,000 | 174 | 35 | 375 | 21.4 | 9,527 |
| 07/05/94(final) | 2,000 | 174 | 25 | 275 | 22.3 | 9,527 |
| 09/08/94(initial) | 2,100 | 183 | 25 | 225 | 15.3 | 10,749 |
| 09/08/94(final) | 2,400 | 209 | 24 | 220 | 25.6 | 10,749 |
| 11/22/94(initial) | 2,600 | 227 | 25 | 350 | 25.9 | 12,680 |
| 11/22/94(final) | 2,400 | 209 | 45 | 200 | 14.0 | 12,680 |
| 11/29/94(initial) | 1,500 | 131 | 45 | 400 | 17.1 | 12,789 |
| 11/29/94(final) | 1,600 | 140 | 44 | 400 | 18.3 | 12,789 |
| 12/09/94(initial) | 1,800 | 157 | 45 | 400 | 20.5 | 12,983 |
| 12/09/94(final) | 1,800 | 157 | 43 | 280 | 14.3 | 12,983 |
| 01/06/95(initial) | 1,600 | 140 | 36 | 260 | 11.9 | 13,350 |
| 01/06/95(final) | 1,600 | 140 | 35 | 300 | 13.7 | 13,350 |
| 02/06/95(initial) | 2,250 | 195.5 | 36 | 275 | 17.6 | 13,835 |
| 02/06/95(final) | 2,250 | 195.5 | 22 | 2,500 | 160.0 | 13,835 |
| 03/06/95(initial) | 2,500 | 218 | 21 | 325 | 23.1 | 16,398 |
| 03/06/95(final) | 2,500 | 218 | 25 | 1,000 | 70.0 | 16,398 |
| 03/23/95(initial) | 2,200 | 192 | 27 | 750 | 47.0 | 17,401 |
| 03/25/95(final) | 1,400 | 122 | 44 | 450 | 18.0 | 17,401 |

## Table 2

## Second Quarter 1995
## Hydrocarbon Emissions/Mass Removal Results
## Chevron U.S.A. Products Company Station 60090129
## Seattle, Washington



| Date | Flow @ Stack (fpm) | Flow @ Stack (cfm) | Vacuum (" water) | FID (ppmv) | Emissions (lbs/day) | Total[a] (pounds) |
|---|---|---|---|---|---|---|
| 05/12/95(initial) | 1,400 | 122 | 43 | 70 | 2.8 | 17,921 |
| 05/12/95(final) | 2,000 | 175 | 33 | 210 | 12.0 | 17,921 |
| 06/07/95(initial) | 2,000 | 175 | 33 | 330 | 18.8 | 18,321 |
| 06/12/95(final) | 2,600 | 227 | 20 | 186 | 13.8 | 18,321 |

NOTE: NA = not available.
Equation: ER (emission rate, lbs.day) = cfm x FID (ppmv) x MW x $1.581^{-7}$ x 24 hours/day. (Molecular weight [MW] for hexane, the FID calibration gas was 86 grams/mole.)
Reference: United States Environmental Protection Agency, Office of Underground Storage Tanks, June 1989. *Estimating Air Emissions from Petroleum UST Cleanups.*

[a] Total pounds were calculated assuming a linear increase or decrease in stack emissions from monitoring date to monitoring date.

* Data were collected and calculated by GEI. Information was transcribed from previously submitted reports. EMCON did not review or evaluate any calculations made before the April 27, 1993, visit.

# ATTACHMENT A

# FIELD DATA SHEETS

SOIL VAPOR EXTRACTION SYSTEM - FIELD OPERATIONS DATA SHEET

PROJECT: CHEVRON # 60090129
LOCATION: 4700 Brooklyn Avenue, Seattle, WA
DATE: 5-12-95

| LOCATION | INITIAL SET-UP | | | ISOLATION | | | FINAL SET-UP | | |
|---|---|---|---|---|---|---|---|---|---|
| | Vacuum (in. wc) | Flow (fpm) | Concentration (ppm-v) | Vacuum (in. wc) | Flow at stack | Concentration (ppm-v) | Vacuum (in. wc) | Flow (fpm) | Concentration (ppm-v) |
| Stack 4" | | 1400 | 126/70 | | | | | 2,000 | 1750/210 |
| Condensation Tank | 43 | | | | | | 33 | | |
| Manifold | 39 | 5600 | 126/70 | | | | 28 | 6,000+ | 1750/210 |
| MW-1 | | | | 35 | 1800 | 840/164 | ON | | |
| MW-3 | | | | 37 | 1700 | 70/22 | | | |
| MW-4 | ON | | | 47 | 900 | 140/42 | ON | | |
| MW-6 | | | | 40 | 1600 | 77/29 | | | |
| MW-7 | | | | 47 | 1000 | ND/0 | | | |
| MW-9 | | | | 47 | 900 | 5/4 | | | |
| MW-11 | | | | 55 | 500 | 1,000+/89 | ON | | |
| MW-12 | ON | | | 39 | 1400 | 126/70 | ON | | |
| MW-13 | | | | 50 | 650 | 18/2 | | | |
| MW-14 | | | | 49 | 750 | ND/1 | | | |
| RW-1 | | | | 43 | 1200 | 112/29 | | | |

EMISSIONS: FID 122 cfm * 126 ppmv * 86 g/mole * $1.581^{-7}$ * 24 hrs/day ≃ 5.0 lbs/day
Initial: PID 122 cfm * 70 ppmv * 86 g/mole * $1.581^{-7}$ * 24 hrs/day ≃ 2.8 lbs/day

Final: FID 175 cfm * 1750 ppmv * 86 g/mole * $1.581^{-7}$ * 24 hrs/day ≃ 99.7 lbs/day
PID 175 cfm * 210 ppmv * 86 g/mole * $1.581^{-7}$ * 24 hrs/day ≃ 12.0 lbs/day

COMMENTS:

Placed additional vacuum induced aeration line in MW-11.
Maximized emissions based on PID.

SOIL VAPOR EXTRACTION SYSTEM - FIELD OPERATIONS DATA SHEET

PROJECT: CHEVRON # 60090129
LOCATION: 4700 Brooklyn Avenue, Seattle, WA
DATE: 6-7-95

| LOCATION | INITIAL SET-UP | | | ISOLATION | | | FINAL SET-UP | | |
|---|---|---|---|---|---|---|---|---|---|
| | Vacuum (in. wc) | Flow (fpm) | Concentration (ppm-v) | Vacuum (in. wc) | Flow at stack | Concentration (ppm-v) | Vacuum (in. wc) | Flow (fpm) | Concentration (ppm-v) |
| Stack 4" | | 2,000 | 770/330 | | | | | 2600 | 560/186 |
| Condensation Tank | 33 | | | | | | 20 | | |
| Manifold | 28 | 6,000+ | 770/330 | | | | 16 | 4800 | 1260/336 |
| MW-1 | ON | | | 34 | 2000 | 980/482 | ON | | |
| MW-3 | | | | 37 | 1900 | 105/121 | | | |
| MW-4 | ON | | | 49 | 1000 | 200/230 | ON | | |
| MW-6 | | | | 40 | 1800 | 140/154 | | | |
| MW-7 | | | | 50 | 1000 | 5/3 | | | |
| MW-9 | | | | 49 | 1000 | 7/7 | | | |
| MW-11 | ON | | | 56 | 300 | 980/57 | | | |
| MW-12 | ON | | | 39 | 1800 | 195/183 | ON | | |
| MW-13 | | | | 53 | 700 | 19/13 | ON | | |
| MW-14 | | | | 50 | 750 | 5/4 | | | |
| RW-1 | | | | 44 | 1300 | 330/196 | | | |

EMISSIONS: Initial FID 175 cfm * 770 ppmv * 86g/mole * 1.581$^{-7}$ * 24 hrs/day = 43.9 lbs/day
PID 175 cfm * 330 ppmv * 86g/mole * 1.581$^{-7}$ * 24 hrs/day = 18.8 lbs/day
Final FID 227 cfm * 560 ppmv * 86g/mole * 1.581$^{-7}$ * 24 hrs/day ≃ ~~39.5~~ 41.5 lbs/day
PID 227 cfm * 186 ppmv * 86g/mole * 1.581$^{-7}$ * 24 hrs/day ≃ 13.8 lbs/day

COMMENTS:

Emissions were higher on arrival than on the previous set up.
18.8 lbs/day in reference to the PID.
Collected an air sample for verification.
Isolated points. Re-set emissions.
Collected an additional air sample for compliance verification
No condensate.

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-9508 (206) 481-9200 • FAX 485-2992
East 11115 Montgomery, Suite B • Spokane, WA 99206-4776 (509) 924-9200 • FAX 924-9290
9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

EMCON Northwest
18912 N. Creek Parkway, #100
Bothell, WA 98011
Attention: Lisa Rutan

Project Name: Chevron Seattle, #9-0129
Client Project : #0311-106.01

NCA Project #: B506131

Received: Jun 8, 1995
Reported: Jun 13, 1995

## PROJECT SUMMARY PAGE

| Laboratory Sample Number | Sample Description | Sample Matrix | Date Sampled |
|---|---|---|---|
| B506131-01 | VES SAMPLE B | Air | 6/8/95 |



The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

| | | | | |
|---|---|---|---|---|
| EMCON Northwest | Client Project ID: | Chevron Seattle, #9-0129 | Sampled: | Jun 8, 1995 |
| 18912 N. Creek Parkway, #100 | Sample Matrix: | Air | Received: | Jun 8, 1995 |
| Bothell, WA 98011 | Analysis Method: | TPH-G in Air | Analyzed: | Jun 9, 1995 |
| Attention: Lisa Rutan | First Sample #: | B506131-01 | Reported: | Jun 13, 1995 |

## TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

| Sample Number | Sample Description | Sample Result mg/ cubic meter | Surrogate Recovery % |
|---|---|---|---|
| B506131-01 | VES SAMPLE B | 120 | 87 |
| BLK060995 | Method Blank | N.D. | 79 |

| | |
|---|---|
| **Reporting Limit:** | **2.0** |

4-Bromofluorobenzene surrogate recovery control limits are 50 - 150 %.
Volatile Total Petroleum Hydrocarbons are quantitated as Gasoline Range Organics (toluene - dodecane).
Analytes reported as N.D. were not detected above the stated Reporting Limit.

**NORTH CREEK ANALYTICAL Inc.**

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

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East 11115 Montgomery, Suite B • Spokane, WA 99206-4776 (509) 924-9200 • FAX 924-9290
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EMCON Northwest
18912 N. Creek Parkway, #100
Bothell, WA 98011
Attention: Lisa Rutan

Client Project ID: Chevron Seattle, #9-0129
Sample Matrix: Air
Analysis Method: WTPH-G
Units: mg/cubic meter

Analyst: B. Christlieb, F. Shino
Analyzed: Jun 6, 1995
Reported: Jun 13, 1995

# HYDROCARBON QUALITY CONTROL DATA REPORT

## ACCURACY ASSESSMENT
### Laboratory Control Sample

| Gasoline |
|---|

| | |
|---|---|
| Spike Conc. Added: | 500 |
| Spike Result: | 313 |
| % Recovery: | 63 |
| Upper Control Limit %: | 108 |
| Lower Control Limit %: | 37 |

## PRECISION ASSESSMENT
### Sample Duplicate

| Gasoline Range Organics |
|---|

| | |
|---|---|
| Sample Number: | B506071-01 |
| Original Result: | 560 |
| Duplicate Result: | 610 |
| Relative % Difference: | 8.5 |
| Maximum RPD: | 59 |

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

$$\%\ \text{Recovery:} \quad \frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$$

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| | | | |
|---|---|---|---|
| EMCON Northwest | Client Project ID: | Chevron Seattle, #9-0129 | Sampled: Jun 8, 1995 |
| 18912 N. Creek Parkway, #100 | Sample Descript: | Air, VES SAMPLE B | Received: Jun 8, 1995 |
| Bothell, WA 98011 | Analysis Method: | EPA 8020 Modified | Analyzed: Jun 9, 1995 |
| Attention: Lisa Rutan | Sample Number: | B506131-01 | Reported: Jun 13, 1995 |

## AROMATIC VOLATILE ORGANICS in AIR

| Analyte | Reporting Limits | | Sample Results | |
|---|---|---|---|---|
| | mg/cubic meter | ppmv Air | mg/cubic meter | ppmv Air |
| Benzene | 0.05 | 0.016 | 21.00 | 6.58 |
| Ethyl Benzene | 0.05 | 0.012 | 2.60 | 0.60 |
| Toluene | 0.05 | 0.013 | 26.00 | 6.90 |
| Xylenes | 0.10 | 0.023 | 15.00 | 3.46 |

The Reporting Limits shown are based on an injection volume of: 50 mLs of sample.

4-Bromofluorobenzene Surrogate Recovery, %: 98
Surrogate Recovery Control Limits are 56 - 139 %
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

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| | | | | |
|---|---|---|---|---|
| EMCON Northwest | Client Project ID: | Chevron Seattle, #9-0129 | | |
| 18912 N. Creek Parkway, #100 | Sample Descript: | Method Blank | | |
| Bothell, WA 98011 | Analysis Method: | EPA 8020 Modified | Analyzed: | Jun 9, 1995 |
| Attention: Lisa Rutan | Sample Number: | BLK060995 | Reported: | Jun 13, 1995 |

## AROMATIC VOLATILE ORGANICS in AIR

| Analyte | Reporting Limits | | Sample Results | |
|---|---|---|---|---|
| | mg/cubic meter | ppmv Air | mg/cubic meter | ppmv Air |
| Benzene | 0.05 | 0.016 | N.D. | N.D. |
| Ethyl Benzene | 0.05 | 0.012 | N.D. | N.D. |
| Toluene | 0.05 | 0.013 | N.D. | N.D. |
| Xylenes | 0.10 | 0.023 | N.D. | N.D. |

The Reporting Limits shown are based on an injection volume of: 50 mLs of sample.

4-Bromofluorobenzene Surrogate Recovery, %: 74
Surrogate Recovery Control Limits are 56 - 139 %
Analytes reported as N.D. were not detected above the stated Reporting Limit.

**NORTH CREEK ANALYTICAL Inc.**

Matthew T. Essig
Project Manager

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EMCON Northwest
18912 N. Creek Parkway, #100
Bothell, WA 98011
Attention: Lisa Rutan

Client Project ID: Chevron Seattle, #9-0129
Sample Matrix: Air
Analysis Method: EPA 8020
Units: mg/cubic meter
QC Sample #: BLK060695

Analyst: B. Christlieb, F. Shino
Analyzed: Jun 6, 1995
Reported: Jun 13, 1995

## BLANK SPIKE QUALITY CONTROL DATA REPORT

| ANALYTE | Benzene | Toluene | Ethyl Benzene | Xylenes |
|---|---|---|---|---|
| Sample Result: | N.D. | N.D. | N.D. | N.D. |
| Spike Conc. Added: | 10.0 | 10.0 | 10.0 | 30.0 |
| Spike Result: | 8.3 | 8.9 | 7.0 | 21.8 |
| Spike % Recovery: | 83% | 89% | 70% | 73% |
| Spike Dup. Result: | 8.0 | 8.4 | 6.9 | 20.9 |
| Spike Duplicate % Recovery: | 80% | 84% | 69% | 70% |
| Upper Control Limit %: | 116 | 115 | 116 | 115 |
| Lower Control Limit %: | 62 | 57 | 61 | 61 |
| Relative % Difference: | 3.6% | 5.8% | 1.4% | 4.2% |
| Maximum RPD: | 23 | 23 | 25 | 25 |

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

% Recovery: $\frac{\text{Spike Result - Sample Result}}{\text{Spike Conc. Added}} \times 100$

Relative % Difference: $\frac{\text{Spike Result - Spike Dup. Result}}{(\text{Spike Result + Spike Dup. Result}) / 2} \times 100$

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EMCON Northwest
18912 N. Creek Parkway, #100
Bothell, WA 98011
Attention: Lisa Rutan

Client Project ID: Chevron Seattle, #9-0129
Sample Descript: Air, VES SAMPLE B

Sample Number: B506131-01

Sampled: Jun 8, 1995
Received: Jun 8, 1995
Analyzed: Jun 9, 1995
Reported: Jun 13, 1995

## FIXED GASES by METHOD GC/TCD

| Analyte | Reporting Limit Percent (%) | Sample Results Percent (%) |
|---|---|---|
| **Carbon Dioxide** | 1.0 | 21 |
| Carbon Monoxide | 1.0 | N.D. |
| Methane | 0.80 | N.D. |
| **Nitrogen** | 16 | 72 |
| **Oxygen** | 4.2 | 20 |

Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

# CHEVRON U.S.A., Inc. CHAIN OF CUSTODY REPORT

## CHEVRON INFORMATION

CHEVRON Facility #: 60090129
Facility Address: 4700 Brooklyn Ave
City, State, ZIP: Seattle, WA 98105
CHEVRON Contact Name:
CHEVRON Telephone #: (206) 546-0523
Laboratory Release #: 307-0890

## CONSULTANT INFORMATION

Name: Emlon Consultant Project #: 0311-106.01
Address: 18912 North Creek Pkwy #100
Bothell, WA 98011
Phone: 485-5000 Fax: 486-9766
Project Manager: Lisa Ruton Consultant Project #: 0311-106.01
Sample Collection by: Scott Telford Airbill #:

## Turnaround Times

Standard Analyses (DAYS): 10
RUSH Analyses (HOURS): 24 48
RUSH Analyses (DAYS): 5

O Oregon O Washington O Alaska O Other - Hydrocarbon Methods

| SAMPLE IDENTIFICATION | SAMPLING DATE / TIME | MATRIX (W,S,O,A) | # OF CONTAINERS | TPH-HCID | TPH-Gas | BTEX (EPA 8020 Mod.) | TPH-Gas + BTEX | TPH-Diesel | TPH-Diesel Extended | TPH-418.1 | Halogen Volatiles (EPA 8010) | Aromatic Volatiles (EPA 8020) | Pesticides/PCBs or PCBs Only | GC/MS Volatiles (EPA 8240/8260) | GC/MS SemiVols. (EPA 8270) | PAHs by HPLC (EPA 8310) | Lead: Total or Dissolved | TCLP Metals (8) | NCA Sample Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. VES SAMPLE B | 6/8/95 / 1230 | A | 2 | | | | X | | | | | | | | | | | | B506131-01 |
| 2. | | | | | | | | | | | | | | | | | | | |
| 3. | | | | | | | | | | | | | | | | | | | |
| 4. | | | | | | | | | | | | | | | | | | | |
| 5. | | | | | | | | | | | | | | | | | | | |
| 6. | | | | | | | | | | | | | | | | | | | |
| 7. | | | | | | | | | | | | | | | | | | | |
| 8. | | | | | | | | | | | | | | | | | | | |
| 9. | | | | | | | | | | | | | | | | | | | |
| 10. | | | | | | | | | | | | | | | | | | | |

Also run for:

REMARKS: Permanent Gases

| Relinquished by: | Firm: | Date & Time | Received by: | Firm: | Date & Time |
|---|---|---|---|---|---|
| 1. M. Scott Telford | Emlon | 06/08/95 1400 | | UCA | 6/8/95 1400 |
| 2. | | | | | |
| 3. | | | | | |

REPORTS: Level 1 Level 2

SAMPLE PRESERVATION (Iced): Yes No

Fax Copy of Lab Report & COC to CHEVRON: Yes No



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EMCON Northwest
18912 N. Creek Parkway, #100
Bothell, WA 98011
Attention: Lisa Rutan

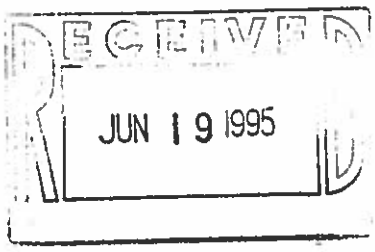
Project Name: Chevron Seattle, #9-0129
Client Project : #0311-106.01

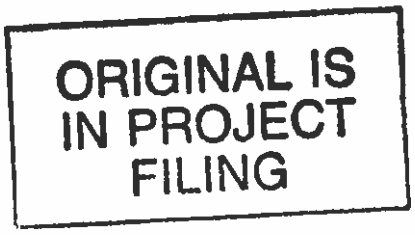
NCA Project #: B506121

Received: Jun 7, 1995
Reported: Jun 12, 1995

## PROJECT SUMMARY PAGE

| Laboratory Sample Number | Sample Description | Sample Matrix | Date Sampled |
|---|---|---|---|
| B506121-01 | VES SAMPLE | Air | 6/7/95 |






NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

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| | | | | |
|---|---|---|---|---|
| EMCON Northwest | Client Project ID: | Chevron Seattle, #9-0129 | Sampled: | Jun 7, 1995 |
| 18912 N. Creek Parkway, #100 | Sample Matrix: | Air | Received: | Jun 7, 1995 |
| Bothell, WA 98011 | Analysis Method: | TPH-G in Air | Analyzed: | Jun 9, 1995 |
| Attention: Lisa Rutan | First Sample #: | B506121-01 | Reported: | Jun 12, 1995 |

## TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

| Sample Number | Sample Description | Sample Result mg/ cubic meter | Surrogate Recovery % |
|---|---|---|---|
| B506121-01 | VES SAMPLE | 300 | 116 |
| BLK060995 | Method Blank | N.D. | 79 |

| | |
|---|---|
| **Reporting Limit:** | **2.0** |

4-Bromofluorobenzene surrogate recovery control limits are 50 - 150 %.
Volatile Total Petroleum Hydrocarbons are quantitated as Gasoline Range Organics (toluene - dodecane).
Analytes reported as N.D. were not detected above the stated Reporting Limit.

**NORTH CREEK ANALYTICAL Inc.**

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

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EMCON Northwest
18912 N. Creek Parkway, #100
Bothell, WA 98011
Attention: Lisa Rutan

Client Project ID: Chevron Seattle, #9-0129
Sample Matrix: Air
Analysis Method: WTPH-G
Units: mg/cubic meter

Analyst: B. Christlieb, F. Shino
Analyzed: Jun 6, 1995
Reported: Jun 12, 1995

# HYDROCARBON QUALITY CONTROL DATA REPORT

## ACCURACY ASSESSMENT
### Laboratory Control Sample

| Gasoline |
|---|

| | |
|---|---|
| **Spike Conc. Added:** | 500 |
| **Spike Result:** | 313 |
| **% Recovery:** | 63 |
| **Upper Control Limit %:** | 108 |
| **Lower Control Limit %:** | 37 |

## PRECISION ASSESSMENT
### Sample Duplicate

| Gasoline Range Organics |
|---|

| | |
|---|---|
| **Sample Number:** | B506071-01 |
| **Original Result:** | 560 |
| **Duplicate Result:** | 610 |
| **Relative % Difference:** | 8.5 |
| **Maximum RPD:** | 59 |

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

% Recovery: $\frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$

Relative % Difference: $\frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$

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| | | | |
|---|---|---|---|
| EMCON Northwest | Client Project ID: | Chevron Seattle, #9-0129 | Sampled: Jun 7, 1995 |
| 18912 N. Creek Parkway, #100 | Sample Descript: | Air, VES SAMPLE | Received: Jun 7, 1995 |
| Bothell, WA 98011 | Analysis Method: | EPA 8020 Modified | Analyzed: Jun 9, 1995 |
| Attention: Lisa Rutan | Sample Number: | B506121-01 | Reported: Jun 12, 1995 |

## AROMATIC VOLATILE ORGANICS in AIR

| Analyte | Reporting Limits | | Sample Results | |
|---|---|---|---|---|
| | mg/cubic meter | ppmv Air | mg/cubic meter | ppmv Air |
| Benzene | 0.05 | 0.016 | 14.0 | 4.39 |
| Ethyl Benzene | 0.05 | 0.012 | 8.4 | 1.94 |
| Toluene | 0.05 | 0.013 | 37.00 | 9.81 |
| Xylenes | 0.10 | 0.023 | 49.00 | 11.29 |

The Reporting Limits shown are based on an injection volume of: 50 mLs of sample.

4-Bromofluorobenzene Surrogate Recovery, %: 100
Surrogate Recovery Control Limits are 56 - 139 %
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

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EMCON Northwest
18912 N. Creek Parkway, #100
Bothell, WA 98011
Attention: Lisa Rutan

Client Project ID: Chevron Seattle, #9-0129
Sample Descript: Method Blank
Analysis Method: EPA 8020 Modified
Sample Number: BLK060995

Analyzed: Jun 9, 1995
Reported: Jun 12, 1995

## AROMATIC VOLATILE ORGANICS in AIR

| Analyte | Reporting Limits | | Sample Results | |
|---|---|---|---|---|
| | mg/cubic meter | ppmv Air | mg/cubic meter | ppmv Air |
| Benzene | 0.05 | 0.016 | N.D. | N.D. |
| Ethyl Benzene | 0.05 | 0.012 | N.D. | N.D. |
| Toluene | 0.05 | 0.013 | N.D. | N.D. |
| Xylenes | 0.10 | 0.023 | N.D. | N.D. |

The Reporting Limits shown are based on an injection volume of: 50 mLs of sample.

4-Bromofluorobenzene Surrogate Recovery, %: 74
Surrogate Recovery Control Limits are 56 - 139 %
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

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EMCON Northwest
18912 N. Creek Parkway, #100
Bothell, WA 98011
Attention: Lisa Rutan

Client Project ID: Chevron Seattle, #9-0129
Sample Matrix: Air
Analysis Method: EPA 8020
Units: mg/cubic meter
QC Sample #: BLK060695

Analyst: B. Christlieb, F. Shino
Analyzed: Jun 6, 1995
Reported: Jun 12, 1995

## BLANK SPIKE QUALITY CONTROL DATA REPORT

| ANALYTE | Benzene | Toluene | Ethyl Benzene | Xylenes |
|---|---|---|---|---|
| **Sample Result:** | N.D. | N.D. | N.D. | N.D. |
| **Spike Conc. Added:** | 10.0 | 10.0 | 10.0 | 30.0 |
| **Spike Result:** | 8.3 | 8.9 | 7.0 | 21.8 |
| **Spike % Recovery:** | 83% | 89% | 70% | 73% |
| **Spike Dup. Result:** | 8.0 | 8.4 | 6.9 | 20.9 |
| **Spike Duplicate % Recovery:** | 80% | 84% | 69% | 70% |
| **Upper Control Limit %:** | 116 | 115 | 116 | 115 |
| **Lower Control Limit %:** | 62 | 57 | 61 | 61 |
| **Relative % Difference:** | 3.6% | 5.8% | 1.4% | 4.2% |
| **Maximum RPD:** | 23 | 23 | 25 | 25 |

**NORTH CREEK ANALYTICAL Inc.**

Matthew T. Essig
Project Manager

% Recovery: $\frac{\text{Spike Result - Sample Result}}{\text{Spike Conc. Added}} \times 100$

Relative % Difference: $\frac{\text{Spike Result - Spike Dup. Result}}{(\text{Spike Result + Spike Dup. Result}) / 2} \times 100$

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NORTH CREEK ANALYTICAL

# CHEVRON U.S.A., Inc. CHAIN OF CUSTODY REPORT

## CHEVRON INFORMATION

CHEVRON Facility #: 60090129
Facility Address: 4700 Brooklyn Ave
City, State, ZIP: Seattle, WA 98105
CHEVRON Contact Name:
CHEVRON Telephone #: (206) 540-0523
Laboratory Release #: 307-0890

## CONSULTANT INFORMATION

Name: EMION Consultant Project #: 0311-106.01
Address: 18912 North Creek Parkway
Bothell Wa 98011
Phone: 485-5000 Fax: 486-9766
Project Manager: Lisa Ruton Consultant Project #: 0311-106.01
Sample Collection by: Scott Telford Airbill #:

## Turnaround Times

Standard Analyses (DAYS): (10)
RUSH Analyses (HOURS): 24 | 48
RUSH Analyses (DAYS): 5

O Oregon X Washington O Alaska O Other - Hydrocarbon Methods

| SAMPLE IDENTIFICATION | SAMPLING DATE / TIME | MATRIX (W,S,O,A) | # OF CONTAINERS | TPH-HCID | TPH-Gas | BTEX (EPA 8020 Mod.) | TPH-Gas + BTEX | TPH-Diesel | TPH-Diesel Extended | TPH-418.1 | Halogen. Volatiles (EPA 8010) | Aromatic Volatiles (EPA 8020) | Pesticides/PCBs or PCBs Only | GC/MS Volatiles (EPA 8240/8260) | GC/MS SemiVol. (EPA 8270) | PAHs by HPLC (EPA 8310) | Lead: Total or Dissolved | TCLP Metals (8) | NCA Sample Number | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Yes Sample | 6/7/95 / 1500 | A | 1 | | | | X | | | | | | | | | | | | B506121-01 | |
| 2. | | | | | | | | | | | | | | | | | | | | |
| 3. | | | | | | | | | | | | | | | | | | | | |
| 4. | | | | | | | | | | | | | | | | | | | | |
| 5. | | | | | | | | | | | | | | | | | | | | |
| 6. | | | | | | | | | | | | | | | | | | | | |
| 7. | | | | | | | | | | | | | | | | | | | | |
| 8. | | | | | | | | | | | | | | | | | | | | |
| 9. | | | | | | | | | | | | | | | | | | | | |
| 10. | | | | | | | | | | | | | | | | | | | | |

| | Relinquished by: | Firm: | Date & Time | Received by: | Firm: | Date & Time |
|---|---|---|---|---|---|---|
| 1. | Scott Telford | EMION | 6/7/95 17? | | NCA | 6/7/95 1730 |
| 2. | | | | | | |
| 3. | | | | | | |

REPORTS: Level 1 ☐ Level 2 ☐

SAMPLE PRESERVATION (Iced): Yes ☐ No ☐

Fax Copy of Lab Report & COC to CHEVRON: Yes ☐ No ☐

Page ____ of ____

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