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Alameda County
Environmental Health

# DPE/AS FEASIBILITY REPORT

German Autocraft
301 E. 14th Street
San Leandro, California

Global ID No. T0600100639
AC LOP Case # 2783

Prepared For

Mr. Seung Lee
German Autocraft
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Prepared By

**Groundwater Cleaners Inc.**
***Cleaning California from the Groundwater up***
*347 Frederick Street, San Francisco, California 94117*
*(415) 665-6181*

March 31, 2009

**Perjury Statement**

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached proposal or report is true and correct, to the best of my knowledge.

Seung Lee, owner, German Autocraft

**CONTENTS**



**FIGURES**



**TABLES**



**ATTACHMENTS**

## 1.0 INTRODUCTION

Groundwater Cleaners Inc (GCI) recently prepared a Corrective Action Plan (CAP) that proposes to reduce lingering high concentrations of subsurface fuel associated with the subject Site using a process known as dual-phase extraction with air sparging (DPE/AS). The February, 2008 Work Plan for DPE/AS Feasibility was a follow-on step to the CAP, as approved in the October 23, 2008 letter prepared by the agency overseeing this fuel leak case, the Alameda County Environmental Health (ACEH). This report presents the outcome of the feasibility testing.

Concurrently, as part of evaluating how extensive, aggressive and thorough the ultimate remedial actions should be, GCI prepared another work plan to investigate the current soil vapor concentrations and vapor intrusion risks. That work plan was also approved in the October, 2008 ACEH letter. The work was concluded on January 16, 2009, and the report was submitted March 12, 2009. The report concluded that there is no significant vapor intrusion risk into homes or businesses as long as the existing soil cover remains in place. Groundwater impacts have already been defined and tracked over time by the case's ongoing monitoring program.

## 2.0 SITE LOCATION AND BACKGROUND

### 2.1 Site Location and Description

The Site is located at 301 E. 14$^{th}$ Street in San Leandro, CA, in a high-density, mixed-use neighborhood of residential and small commercial buildings. Figure 1 shows the site location. E. 14$^{th}$ Street is a busy thoroughfare, running approximately 25 degrees west of north-south. Nine properties with past or current UST-related problems have been identified within five blocks of this site, along E. 14$^{th}$ Street. The Site is approximately 90' x 120' in size (~10,800 square feet) and its current use is an automobile repair facility.

### 2.2 Site Hydrogeologic Conditions

The Site is situated on mixed sediments about two miles east of San Francisco Bay within the East Bay Plain Groundwater Basin. First groundwater occurs within an areally continuous sandy stratum about 25-35 below grade. The groundwater gradient is usually about 0.002 ft/ft and the flow direction is typically WNW, which is consistent with the fuel plume orientation. Figure 2 shows the fuel impact area and the locations of monitoring wells, both on-site and off-site. The March, 2009 SVI Report contains updated geologic cross-sections of this area, which shows why the soil vapor flow rate is so very low.

## 2.3 Project History

The subject fuel leak was discovered when an on-site gasoline storage tank was removed in October of 1990. Several series of investigations were performed and 14 monitoring wells were constructed through the subsequent years up to 2001. Well '141 Farrelly' was formerly used by a private residence for irrigation water supply. Groundwater impacts have been defined and are now tracked over time by the case's ongoing monitoring program. No active remediation has taken place since the excavating associated with the removal of the gasoline storage tank.

At the time of tank removal, free-phase liquid was present and soils were contaminated with high levels of fuel hydrocarbons. Now, maximum levels of hydrocarbons in groundwater have stabilized at levels of about 100,000 µg/L near MW-1 and 5,000 to 10,000 µg/L near MW-1, -2 and -4. Detectable amounts of fuel impact groundwater up to 350 feet down-gradient of the site, but ongoing monitoring does not indicate any appreciable continued spreading.

# 3.0 PURPOSE

The primary purpose of the subject Feasibility Study was to affirm that DPE/AS would remove fuel mass effectively at this specific Site. Assuming that basic premise was shown to be true, additional objectives included the following - (a) obtaining data on key design parameters to be used in the actual remedial effort such as effective radii of influence, subsurface anisotropy influences (particularly with respect to the backfilled UST pit compared to undisturbed conditions), water yield rates, and relative conduciveness to air flow; and (b) improving predictions on how long and how expensive remediation will likely be.

# 4.0 METHODOLOGY

The root of the subject groundwater contamination is hydrocarbon-contaminated soil in the water-bearing stratum that contacts the groundwater flowing past the site and in the capillary "smear zone" directly above that stratum. DPE will attempt to markedly reduce the hydrocarbons so that natural bioattenuation processes can be reasonably expected to complete the remediation after operations cease. In the removal process, a significant amount of groundwater will probably be entrained in the vacuum-driven flow.

In our DPE/AS field work, a series of tests were performed to evaluate the optimal methodology for an eventual remedial action. In each test, a partial vacuum was applied to a well or group of wells for the purpose of extracting hydrocarbon vapors. Each run lasted a minimum of 2 hours. Different vacuum levels were tested to determine the degree of hydrocarbon removal and amount of vacuum influence at surrounding wells under each condition. Hydrocarbon vapor levels were measured using an infrared absorption instrument and were confirmed via laboratory analysis of test samples. Field Data Sheets appended to this report show the individual tests that were performed.

There are five on-site wells (i.e., MW-1 through MW-5) plus two fairly close off-site wells (MW-6 and MW-8 as shown on Figure 3). Table 1 summarizes available construction data for these seven wells.

## 5.0 WORK PERFORMED

Work began with single monitoring wells (MW-1, MW-2, MW-3 and MW-4), each tested in turn. Subsequently, we conducted one multi-well extraction test on the 3-well group consisting of MW-2 through MW-4. Outlying wells (MW-5, MW-6 and MW-8) were checked for possible vacuum influences. All on-site wells not under vacuum were also checked for vacuum influence during each test.

The baseline DPE tests showed that no vacuum influence could be measured at any of the nearby wells. Wells MW-3 and MW-4 are less than 30 feet apart, as are wells MW-1 and MW-4. Therefore, compressed air was not injected into the ground as envisioned in the Work Plan. Any remediation by DPE with Air Sparging would need specially designed extraction and sparge wells quite different in design from the monitoring wells currently available.

We anticipated that hydrocarbon removal would be much greater for MW-1 and MW-4 than for the other wells as these two are closest to both the original fuel source and larger vertical intervals of contaminated soil, but such was not the case. The tight, clay soils provided essentially no path for the flow of soil vapors, and DPE was not effective in any of the wells. Instead, the groundwater rose in the wells to the point of covering the well screens and any vapor flow ceased.

In order to remove the groundwater from the wells and allow vapor flow, we used Vacuum Assisted Groundwater Extraction (VAGE). An aspirator tube was inserted into the well under vacuum to allow atmospheric air to enter the well at a known elevation and a controlled rate. This places the well under vacuum and aspirates the groundwater into the vapor stream. VAGE is used to clear flooded aquifers and allow the passing of soil vapors. This method was successful in clearing some groundwater but not in stimulating the flow of soil vapors.

In order to determine whether vacuum levels were too low to completely clear the groundwater by VAGE, a submersible pump was placed in one of the wells (MW-4) and operated while the well was under vacuum. The (3 gpm) submersible pump did not have sufficient capacity to clear the well of groundwater. Two-inch monitoring wells severely limit the capacity of available pumps, and the well being under vacuum greatly increases the groundwater flow into the well. The VAGE apparatus could not be used concurrently with the submersible pump, due to interference of their piping in such a small well casing.

## 6.0 CONCLUSIONS

The soil at this site is not amenable to soil vapor extraction through vertical wells. Too much groundwater and not enough soil vapor is encountered. The means by which hydrocarbons could be extracted would be to construct an interconnected network of large-area horizontal wells well above the groundwater elevation but into the permeable soils that constitute the "smear zone" of groundwater elevation variations. Such wells could be placed under relatively low vacuum to limit the intrusion of groundwater and would provide a path for the collection of hydrocarbon vapors from the soil above groundwater elevation. Most hydrocarbons in the soil have been transported by floating on groundwater and are therefore located in the soils near maximum groundwater elevation.

## 7.0 RECOMMENDATIONS

We still believe that SVE represents the best technology for source reduction at this site, and that the hydrocarbon removal may be enhanced by sparging air into the groundwater. Vapor collection, however, will require a large surface area and a relatively low vacuum level and cannot be adequately tested using the existing monitoring wells. We therefore recommend that a single, horizontal well be constructed in the immediate vicinity of the former tank location. We recommend that this well be 20 feet long and three feet wide, filled with pea gravel from a depth of approximately 28 feet to 24 feet below ground surface and have a 6" diameter (horizontal) collection casing with a 4" or larger solid riser to the surface. SVE testing should be done on the completed well during a seasonally low groundwater level period to determine the design of extraction and abatement equipment and the need for additional extraction wells.

## 8.0 PROFESSIONAL CERTIFICATION

We declare, under penalty of perjury, that to the best of our knowledge, everything presented in this Work Plan is true and correct.

Should you have any questions or require supplemental information, please do not hesitate to contact us at (415) 665-6181.

Prepared by,


Glenn Reierstad, P.E.
Project Manager, Groundwater Cleaners, Inc.

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# Figures

**Groundwater Cleaners, Inc.**
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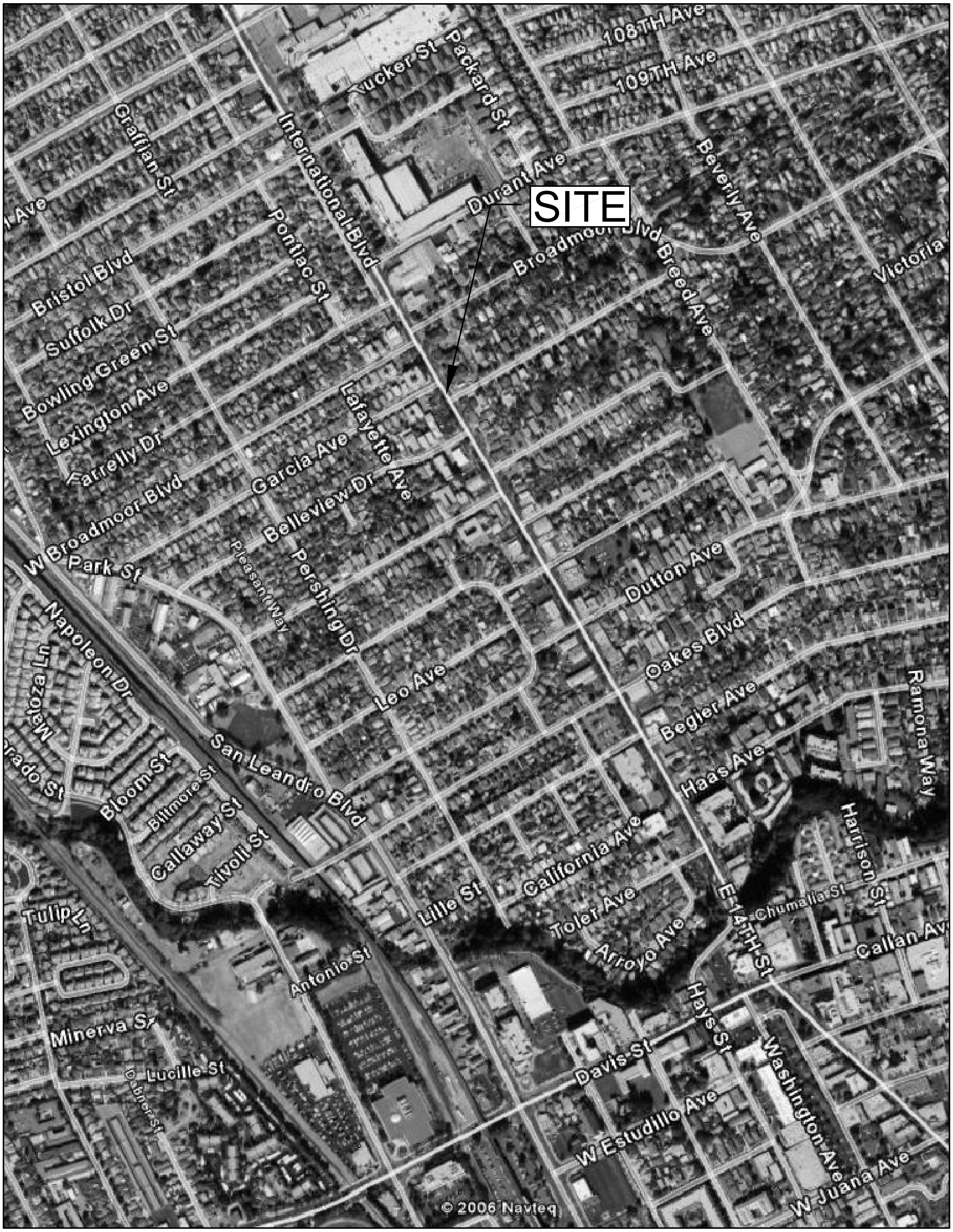
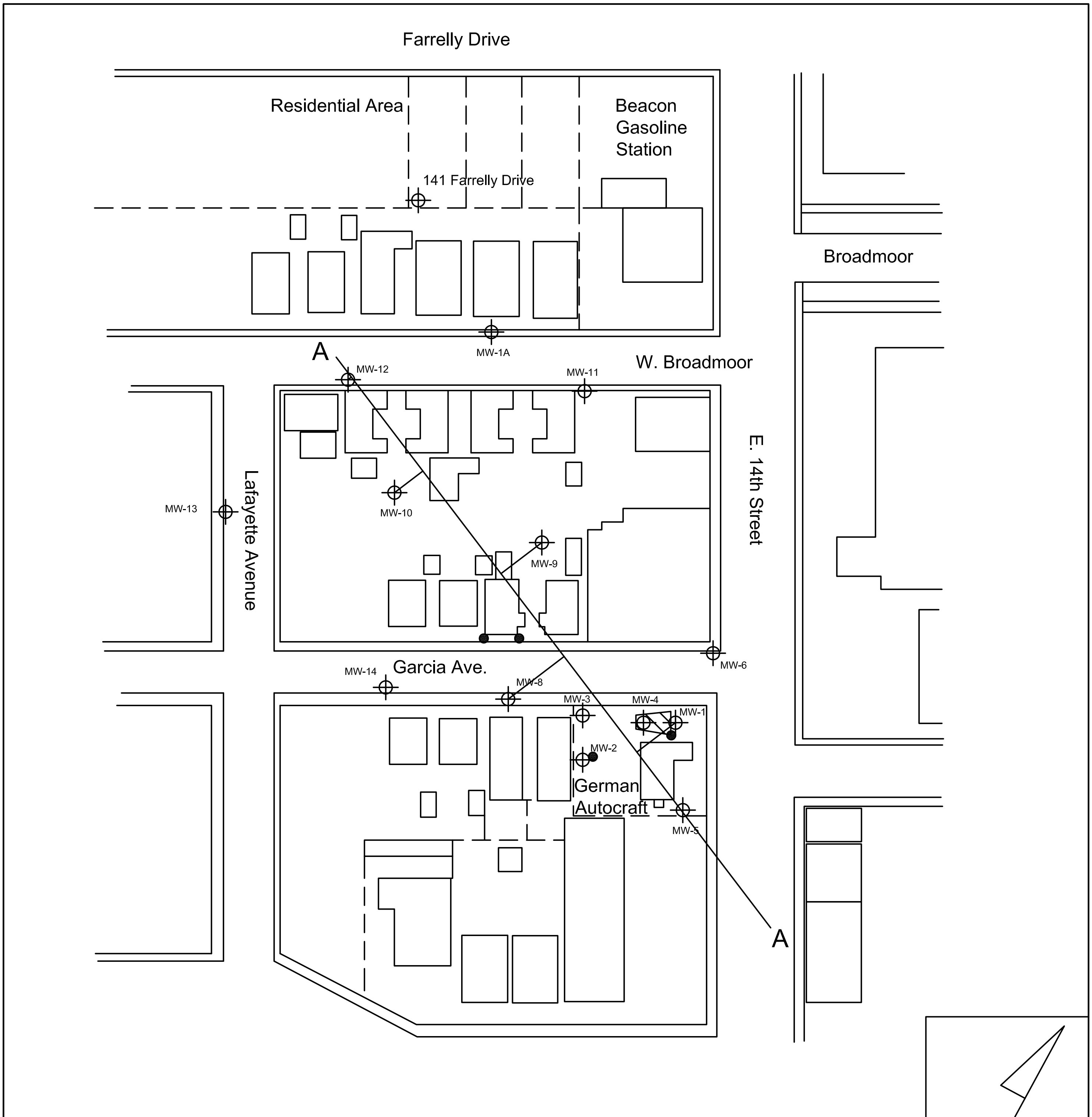



Image from Google ©2006

| | | |
|---|---|---|
| Groundwater GWC Cleaners Inc.<br>*Cleaning California from the Groundwater Up*<br>347 Frederick Street, San Francisco, California, 94117<br>(415) 665-6181 | German Autocraft<br>301 East 14th Street<br>San Leandro, California | Figure 1<br>Rev. B |
| | Site Area Map | 10.01.06 |




EXPLANATION:

0' 60' 120'

Scale: 1"=120'

A - A Geologic Cross Seciton - Figure 3

● Proposed Soil Vapor Sampling Point

Groundwater Monitoring Well

Former Tank Pit Areas

Buildings

Groundwater GWC Cleaners Inc.

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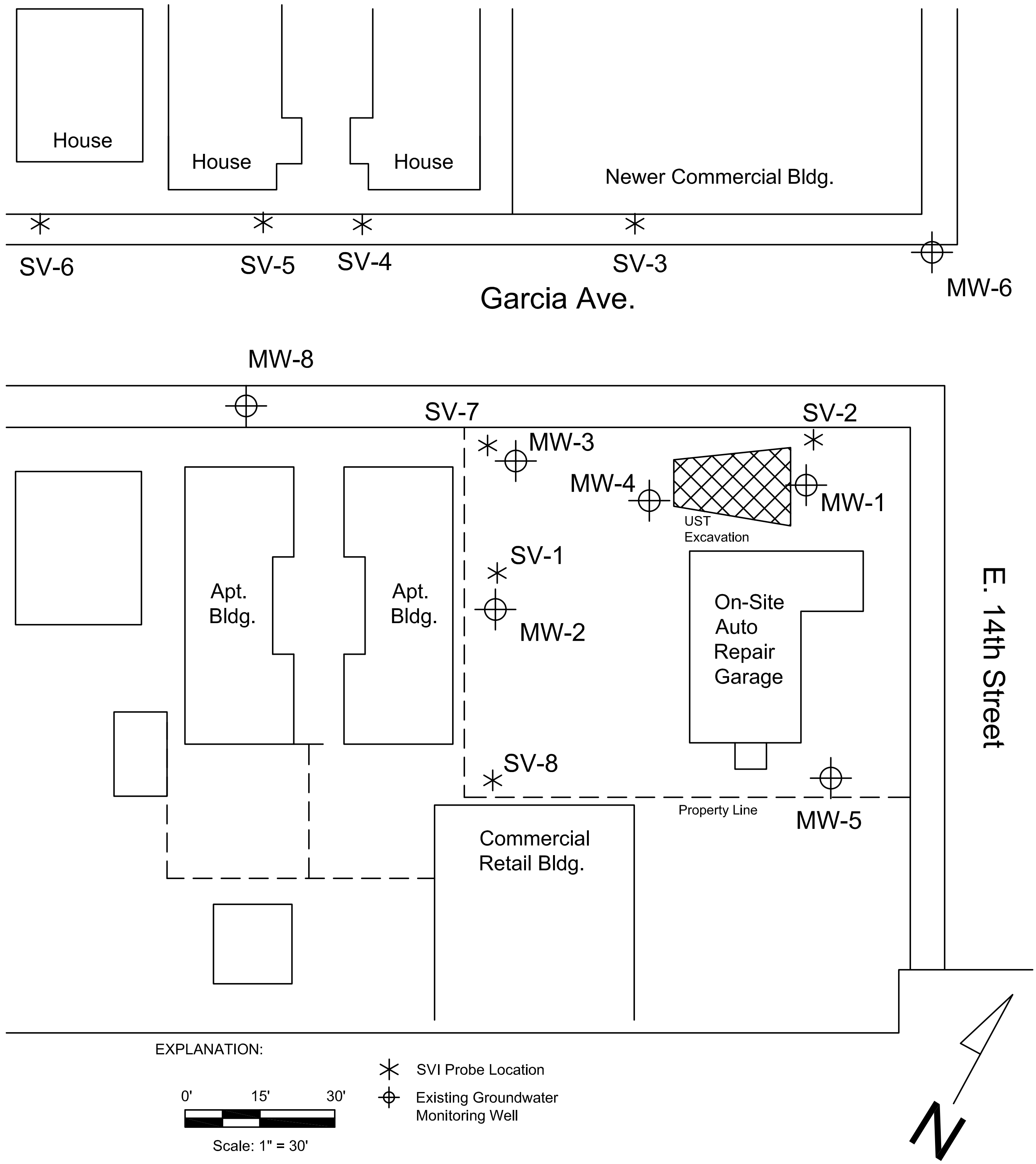
301 East 14th Street
San Leandro, California

# Fuel Leak Impact Area Plan

Figure 2

Rev. A

02.07.08

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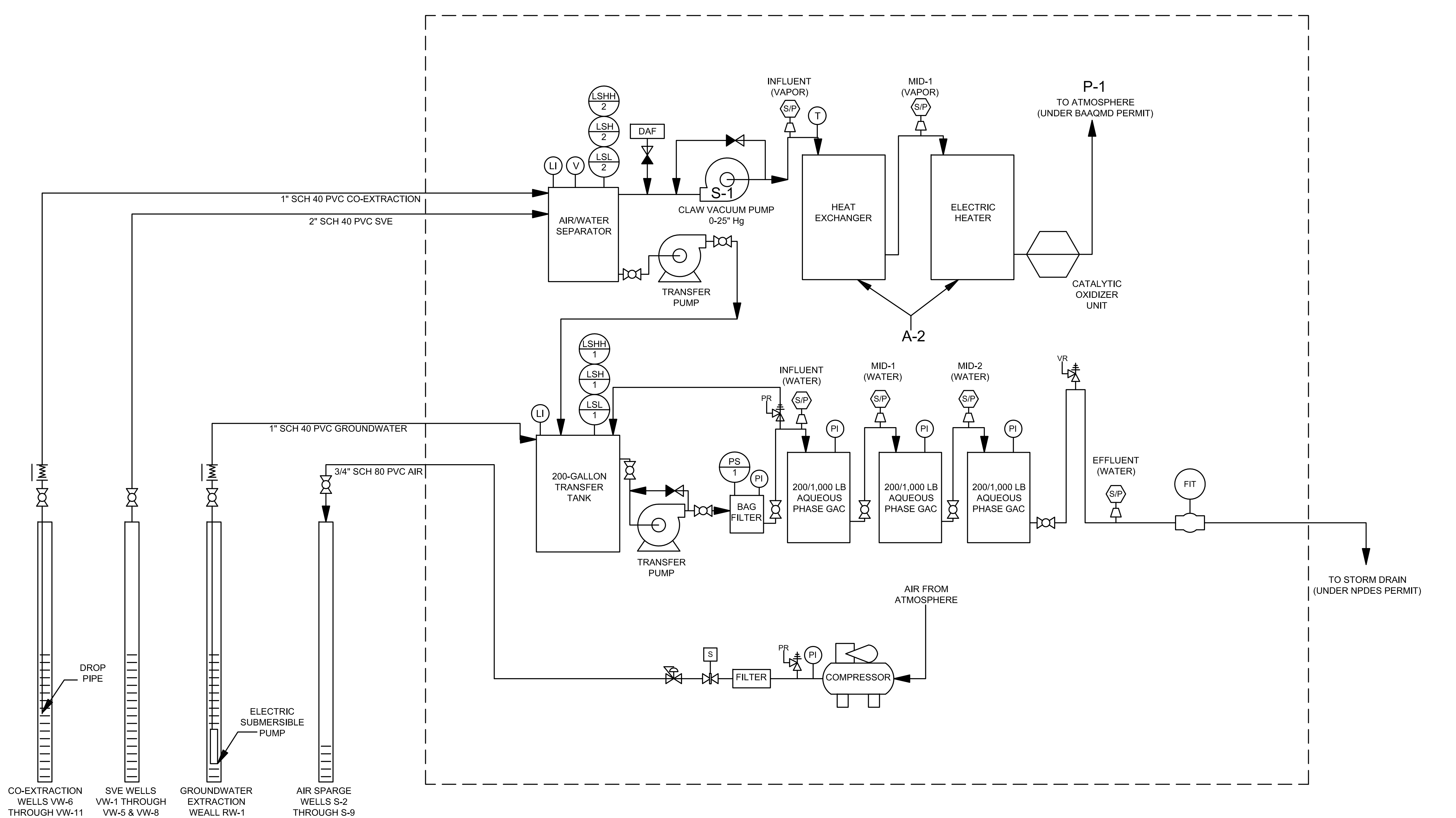
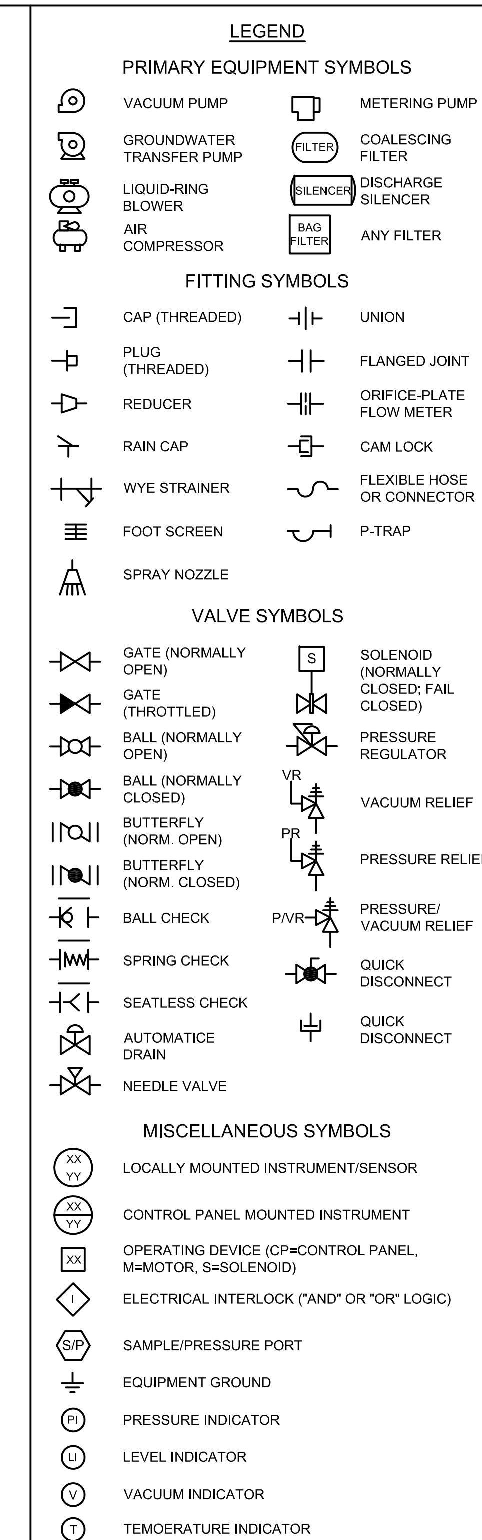
Near Source Well Locations

Figure 3

Rev. A

02.26.09




| CONTROL UNIT | FUNCTION |
|---|---|
| LSHH 1 | LEVEL SWITCH/HIGH HIGH ALARM<br>TURNS OFF SUBMERSIBLE PUMP AND TRANSFER PUMP AT TRANSFER TANK, AND VACUUM PUMP AND AIR/WATER SEPARATOR TRANSFER PUMP DURING CO-EXTRACTION |
| LSH 1 | LEVEL SWITCH HIGH:<br>TURNS *ON* GROUNDWATER TRANSFER PUMP AT TRANSFER TANK |
| LSL 1 | LEVEL SWITCH LOW:<br>TURNS *OFF* GROUNDWATER TRANSFER PUMP AT TRANSFER TANK |
| PS 1 | PRESSURE SWITCH:<br>TURNS *OFF* GROUNDWATER TRANSFER PUMP AT TRANSFER TANK |

| CONTROL UNIT | FUNCTION |
|---|---|
| LSHH 2 | LEVEL SWITCH/HIGH HIGH ALARM:<br>TURNS *OFF* VACUUM PUMP AND TRANSFER PUMPS AT AIR/WATER SEPARATOR AND TRANSFER TANK<br>*CLOSES* SOLENOID VALVE ON AIR SPARGE LINE |
| LSH 2 | LEVEL SWITCH HIGH:<br>TURNS *ON* GROUNDWATER TRANSFER PUMP AT AIR/WATER SEPARATOR |
| LSL 2 | LEVEL SWITCH LOW:<br>TURNS *OFF* GROUNDWATER TRANSFER PUMP AT AIR/WATER SEPARATOR |

ABBREVIATIONS

| | |
|---|---|
| DPI | DIFFERENTIAL PRESSURE INDICATOR |
| DPT | DIFFERENTIAL PRESSURE TRANSMITTER |
| FI | FLOW INDICATOR |
| FIR | FLOW INDICATOR RECORDER |
| FIT | FLOW INDICATOR AND TOTALIZER |
| HS | HAND SWITCH (HAND, OFF, AUTO or ON, OFF) |
| LAHH | LEVEL ALARM HIGH HIGH |
| LAH | LEVEL ALARM HIGH |
| LAL | LEVEL ALARM LOW |
| LI | LEVEL INDICATOR |
| LSHH | LEVEL SWITCH HIGH HIGH |
| LSH | LEVEL SWITCH HIGH |
| LSL | LEVEL SWITCH LOW |
| MS | MOTOR STARTER |
| PAH | PRESSURE ALARM HIGH |
| PI | PRESSURE INDICATOR |
| PS | PRESSURE SWITCH |
| TAD | TELEPHONE AUTOMATIC DIALER |
| TAH | TEMPERATURE ALARM HIGH |
| TE | TEMPERATURE ELEMENT |
| TI | TEMPERATURE INDICATOR |
| TIC | TEMPERATURE INDICATOR CONTROLLER |
| TIR | TEMPERATURE INDICATOR RECORDER |
| TS | TEMPERATURE SWITCH |
| VSD | VARIABLE SPEED DRIVE |

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# TYPICAL DPE/AS SYSTEM

Process and Instrumentation Diagram - Catalytic Oxidizer As Abatement Device

Figure 5

Figure
Rev.Date

**Tables**

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**Table 1**
**Summary of Pertinent Well Construction Details**
**DPE+AS Feasibility Testing**

German Autocraft, 301 E. 14th Street, San Leandro, California

| Well Number | Date Installed | Casing Diameter (inches) | Total Depth (feet) | Screened Interval (feet) | Relative Location | TOC Elevation |
|---|---|---|---|---|---|---|
| **MW-1** | 1/6/95 | 2 | 32.10 | 20-40 ft | Onsite | 49.40 |
| **MW-2** | 1/6/95 | 2 | 33.05 | 10-35 ft | Onsite | 50.02 |
| **MW-3** | 1/6/95 | 2 | 34.80 | 10-35 ft | Onsite | 49.32 |
| **MW-4** | 12/30/98 | 2 | 34.30 | 10-35 ft | Onsite | 49.61 |
| **MW-5** | 12/30/98 | 2 | 21.15 | conflict | Onsite | 49.57 |
| **MW-6** | 12/30/98 | 2 | 33.10 | 20-35 ft | Off-site | 48.06 |
| **MW-8** | 12/30/98 | 2 | 34.20 | 20-30 ft | Off-site | 49.35 |

# Field Data Sheets

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# German Autocraft – Field Data Sheet

| Date | Time | Well(s) under vacuum | Flow SCFM | Vacuum Inches Hg | PPM Influent | PPM Effluent | Sparge Pressure psig | Heater Temp-erature | Catalyst Temp-erature | Stack Temp-erature |
|---|---|---|---|---|---|---|---|---|---|---|
| 02/26 | 8 AM | MW-4 | 140 | 15 | 29 | 0 | n/a | 650 | 612 | nm |
| | 9 AM | | 90 | 17 | 34 | 0 | n/a | 650 | 615 | nm |
| | 10AM | | 75 | 17 | 19 | 0 | n/a | 650 | 617 | nm |
| | 11AM | | 50 | 17 | 0 | 0 | n/a | 650 | 622 | nm |
| | 12 PM | MW-2 | 150 | 16 | 450 | 0 | n/a | 650 | nm | nm |
| | 1 PM | | 50 | 17 | 37 | 0 | n/a | 650 | nm | nm |
| | 2PM | | 60 | 16 | 49 | 0 | n/a | 650 | nm | nm |
| | 3 PM | | 75 | 17 | 55 | 0 | n/a | 650 | nm | nm |
| | 4 PM | | 75 | 17 | 39 | 0 | n/a | 650 | nm | nm |
| 02/27 | 8 AM | MW-3 | 80 | 12 | 150 | 0 | n/a | 650 | nm | nm |
| | 9 AM | | 70 | 17 | 10 | 0 | n/a | 650 | nm | nm |
| | 10AM | | 80 | 17 | 17 | 0 | n/a | 650 | nm | nm |
| | 11AM | | 80 | 17 | 13 | 0 | n/a | 650 | nm | nm |
| | 12PM | MW-1 | 40 | 14 | 0 | 0 | n/a | 650 | nm | nm |
| | 1 PM | | 40 | 17 | 0 | 0 | n/a | 650 | nm | nm |
| | 2 PM | | 50 | 17 | 0 | 0 | n/a | 650 | nm | nm |
| | Add | aspirator | | | | | | | | |
| | 4 PM | | 125 | 12 | 29 | 0 | n/a | 650 | nm | nm |
| 02/28 | 8AM | | 125 | 12 | 41 | 0 | n/a | 650 | nm | nm |
| | 9 AM | | 125 | 14 | 37 | 0 | n/a | 650 | nm | nm |
| | 10AM | | 140 | 12 | 26 | 0 | n/a | 650 | nm | nm |
| | 11AM | | 140 | 14 | 33 | 0 | n/a | 650 | nm | nm |
| * | Try | Submersible | | pump | | | | | | |
| | 12PM | MW-4 | 125 | 12 | 117 | 0 | n/a | 650 | nm | nm |
| | 1PM | | 125 | 12 | 92 | 0 | n/a | 650 | nm | nm |
| | 2 PM | | 125 | 12 | 77 | 0 | n/a | 650 | nm | nm |
| | 3PM | | 125 | 12 | 43 | 0 | n/a | 650 | nm | nm |
| | 4PM | | 125 | 12 | 68 | 0 | n/a | 650 | nm | nm |
| 3/2/09 | 8AM | MW-2 | 160 | 13 | 24 | 0 | n/a | 650 | nm | nm |
| | 9AM | | 160 | 13 | 34 | 0 | n/a | 650 | nm | nm |
| | 10AM | | 160 | 13 | 114 | 0 | n/a | 650 | nm | nm |
| ** | 11AM | | 175 | 13 | 29 | 0 | n/a | 650 | nm | nm |
| | 12PM | | 160 | 15 | 78 | 0 | n/a | 650 | nm | nm |
| | 1PM | MW-3 | 125 | 12.5 | 35 | 0 | n/a | 650 | nm | nm |
| | 2PM | | 125 | 13 | 127 | 0 | n/a | 650 | nm | nm |
| | 3PM | | 125 | 12 | 134 | 0 | n/a | 650 | nm | nm |
| | 4PM | | 125 | 12.5 | 117 | 0 | n/a | 650 | nm | nm |
| 3/3/09 | 8AM | MW-1 | 90 | 14 | 312 | 0 | n/a | 650 | nm | nm |
| | 9 AM | | 90 | 14 | 345 | 0 | n/a | 650 | nm | nm |
| | 10AM | | 90 | 15 | 90 | 0 | n/a | 650 | nm | nm |
| | 11AM | | 90 | 15 | 56 | 0 | n/a | 650 | nm | nm |
| | 12PM | | 90 | 16 | 49 | 0 | n/a | 650 | nm | nm |
| | 2PM | | 90 | 15 | 46 | 0 | n/a | 650 | nm | nm |
| | 3PM | | 90 | 15 | 61 | 0 | n/a | 650 | nm | nm |
| | 4 PM | | 90 | 14 | 76 | 0 | n/a | 650 | nm | nm |

* Placed submersible pump in well. Screens flooded. **Connected wells MW-3 and MW-4 in parallel with MW-2