GW - 52

WORK PLANS

1997

Enron Gas
Pipeline Group
P. O. Box 1188
Houston, TX 77251-1188

February 28, 1997

RECEIVED
MAR - 3 1997
CONSERVATION DIVISION

Mr. William C. Olson
Environmental Bureau
New Mexico Oil Conservation Division
2040 S. Pacheco St.
Santa Fe, New Mexico 87505

RE: Phase III Soil and Ground Water Assessment Plan
Roswell Compressor Station
Transwestern Pipeline Company

Dear Bill,

Enclosed for your review and approval is the Phase III Soil and Ground Water Assessment Plan for the subject facility. Included in this plan are provisions for routine ground water monitoring.

The content of this plan, in general, is identical to the Phase III soil and ground water assessment plan incorporated into the Corrective Action Plan (CAP) which Transwestern recently submitted to the NMED (a copy of which was also submitted to your office).

If you have any questions or comments regarding this work plan, please contact me at (713) 646-7644 or George Robinson at (713) 646-7327.

Sincerely,

Bill Kendrick

Bill Kendrick
Manager, Environmental Affairs

gcr/BK

xc w/attachment: Benito Garcia NMED HRMB

WORK PLAN FOR PHASE III SOIL AND GROUND WATER ASSESSMENT FOR ROSWELL COMPRESSOR STATION NO. 9 SURFACE IMPOUNDMENTS

Prepared by:

Transwestern Pipeline Company
Houston, Texas

February 26, 1997

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1. INTRODUCTION

This work plan has been prepared for the continued investigation and evaluation of hydrocarbon affected soil and ground water at Transwestern Pipeline Company's (TPC) Roswell Compressor Station No. 9.

A phased approach has been implemented for the assessment of potentially affected soil and ground water at the site. In general, the objective of Phase I, which was completed in August, 1995, was to characterize the nature of affected soil immediately beneath the former impoundments. The objective of Phase II of investigation, which was completed in September, 1996, was to evaluate two additional potential source areas and to further assess the lateral and vertical extent of affected soil and ground water. The objective of Phase III of investigation will be to complete the assessment of the lateral and vertical extent of affected soil and ground water. This phase will include the installation of a deeper ground water monitor well into the regional aquifer. Subsequent phases may be required to complete assessment activities and to address corrective actions that may be required to meet soil and ground water cleanup criteria. A scope of work for subsequent phases will be prepared and submitted to the OCD for review and approval.

2. PHASE III SOIL ASSESSMENT PLAN

The primary objective of this plan is to complete characterization of potentially affected soil.

2.1 Characterization of Affected Soil for Remedial Measures Study

One or more samples of the most highly affected soil from within the former Pit 1 area will be obtained for bench scale tests. The bench scale tests will be performed by selected remediation contractors, such as, contractors that provide soil washing, solvent extraction, and soil stabilization services.

The sample size required has not yet been fully defined, however, Transwestern anticipates that the sample size will be on the order of one 55-gallon drum or less. These samples will be collected using conventional excavation equipment such as a backhoe.

2.2 Determination of Site-Specific Background Metals Concentrations in Soil

Several of the metal constituents detected in soil samples collected in the course of prior assessments are also known to occur naturally in soil. Therefore, in order to objectively evaluate laboratory analyses for metal constituents in potentially affected soil samples, Transwestern will collect soil samples in the course of the Phase III assessment program for the determination of site specific background concentrations of selected metal constituents. The background sampling program has been developed with guidance from two sources: 1) *EPA Soil Screening Guidance: Fact Sheet* (U.S. EPA, 1996); and 2) *Texas Risk Reduction Program Appendix IV: Draft Guidance on Background Sampling for Soils and Determining Sample Size* (TNRCC, 1996).

2.2.1 Excluded constituents

Generally, at sites where contaminant concentrations fall below performance levels, no further action or study is warranted (U.S. EPA, 1996). Laboratory analyses performed on soil samples collected from the most highly affected areas of the site indicate that the metal constituents Ni, Ag, Sn, V, and Zn have not been detected above the proposed performance standards for these constituents (Table 7-1). In addition, based on Transwestern's knowledge of the types of materials stored in the former surface impoundments, there is no reasonable expectation that any of these five metal constituents might be present as significant contaminants. Therefore, no further analyses of soil samples will be performed for these constituents and no attempt will be made to determine background concentrations.

2.2.2 Constituents subject to evaluation

The background soil concentration will be determined for each metal constituent: 1) for which at least one sample has been observed in excess of the proposed performance standard; and 2) for each potential metal constituent of concern for which no observation has yet been made. Therefore, background soil concentrations will be determined for the following metal constituents: Al, Sb, As, Ba, Be, Cd, Cr (total), Cr (VI), Co, Cu, Pb, Hg, Se, and Tl.

2.2.3 Soil sampling program

Number/frequency of samples

Transwestern will obtain 16 soil samples from 8 locations (two samples from each location) which are presumed to be uncontaminated by facility operations. Each sample will be delivered to a laboratory for analysis for each of the 14 metal constituents subject to evaluation. Analytical methods will follow those prescribed in Table 6-1.

Location/depths of samples

The proposed surface locations and sampling depths were selected based on the following guidance: 1) The background sampling domain (the area to be sampled) should be as close as possible to the same size as the area that is impacted; 2) Sample points for background samples should be selected in at least two rows around the contaminated site; and 3) Typically, sample locations should be at least 25 ft. apart and spaced evenly around the site (TNRCC, 1996).

The eight surface locations selected are indicated in Figure 4-1 as proposed soil borings BS-1 through BS-8. Two samples will be collected from each boring from the interval of 10-14 feet below ground surface. This sampling depth was chosen to correspond with the depth of the most highly affected soil in the immediate vicinity of the former impoundments.

Strong consideration was given to the selection of surface sample locations farther removed from the former impoundment area. However, prior soil assessment activities have clearly indicated that the near surface alluvial sediments in the vicinity of the site vary considerably within relatively short distances, laterally as well as vertically. As a result, although samples collected from locations farther removed from the former impoundment area would more assuredly produce "clean" samples, these samples would much more likely not be representative of affected soil in their elemental makeup. Therefore, Transwestern has chosen to propose background sample locations at a relatively close distance to the former impoundments and to impose certain criteria on the use of sample data as discussed below.

In order to better assure only "clean" samples are utilized in the determination of background concentrations, Transwestern also proposes to collect a sample from each location which will be submitted to a laboratory for determination of TPH by method 418.1. Prior soil assessment activities have indicated that near surface soils (that is, < 15 ft. bgs) outside the immediate vicinity of the former impoundments have been relatively free of organic contaminants. Furthermore, inorganic contaminants would not reasonably be expected to be present at this site in the absence of organic contaminants. Therefore, any samples collected from a location which also contain a reported TPH concentration > 50 mg/kg will be excluded from the dataset for determination of background concentrations. In addition, precautions will be exercised in the course of the field activities to avoid surface sample locations in potential storm water drainage areas and areas where facility operations were suspected to have taken place.

Sample collection methods

Soil sampling will be performed by hollow stem auger drilling techniques and a split-barrel sampler as described in Section 2.4 of this document.

2.2.4 Determination of Mean and Variance

The mean and variance will be determined for each of the 14 metal constituents using the analytical data obtained from the 16 background samples (excluding those which might exceed the TPH criteria for use). For data evaluation purposes, below detection limit (BDL) results will be represented with a value equal to 50% of the detection limit.

2.3 Further Delineation of Affected Soil

No additional soil borings with the primary objective of delineation of affected soil are proposed to be included with the Phase III activities. However, four soil borings will be advanced and subsequently completed as ground water monitor wells in the course of the Phase III ground water assessment activities designed to delineate the extent of affected ground water. Soil sampling procedures for these activities are outlined in Section 3.1.1.

2.4 Soil Sampling Procedures

2.4.1 Soil Sampling Procedures During Phase III Assessment

During the Phase III soil assessment activities, soil sampling will be performed by hollow stem auger drilling techniques and a split-barrel sampler (with the exception that the sample collected for treatability study will be collected using a backhoe in order to obtain sufficient volume). The split-barrel sampler will be driven into the soil using the rig-mounted drive hammer with uniform drive-pressure/drop-height. Blow counts will be recorded for all split-barrel drives. Following retrieval from the borehole, the split-barrel sampler will be opened and the soil material described. A subsample of the material will be placed in a ziplock plastic bag for field headspace screening for VOCs using a PID.

2.4.2 General Procedures for Sample Container Labeling and Shipping

All sample containers will be labeled using waterproof ink. Label information will include the sampling location, depth interval, sampling date and time, type of analysis requested, project number, and the initials of the sampler. The containers will be sealed and placed in clear plastic bags. The sealed containers will be put into coolers on bags of ice or frozen ice packs. Plastic bubble pack or other suitable packing material will be used to protect the samples during shipping. Chain-of-custody forms will be completed for each sample shipment.

Field personnel will ship the sample coolers to the laboratory using an overnight courier service. The fastest possible shipping method will be used, and all sample shipments will be carefully tracked to ensure that samples arrive intact and that all holding times are met.

2.5 Borehole Abandonment Procedures

All soil borings which are not completed as a ground water monitor well will be appropriately abandoned.

2.6 Decontamination Procedures

All non-disposable field equipment that may potentially come in contact with any soil sample will be decontaminated in order to minimize the potential for cross-contamination between sampling locations. Clean latex or plastic gloves will be worn during all decontamination operations. The following sequence of decontamination procedures will be followed prior to each sampling event:

1. Wash all down-hole equipment in a solution of non-phosphate detergent (Liquinox®) and distilled/deionized water. All surfaces that may come into direct contact with the soil sample will be washed. Use a clean Nalgene® tub to contain the wash solution and a scrub brush to mechanically remove loose particles.

2. Rinse the equipment twice with distilled/deionized water.

3. Allow the equipment to air dry prior to the next use.

The drill rig and all down-hole equipment will be steam-cleaned and allowed to air dry between borings.

2.7 Management of Investigation-Derived Wastes

All contaminated media (soil and ground water) which are managed at the site, including investigation derived waste (IDW), which contain hazardous constituents at a concentration above the performance standards set forth in Tables 7-1 and 7-2, yet which do not exceed any Toxicity Characteristic Leaching Procedure (TCLP) constituent concentration levels under the Hazardous Waste Management Regulations (20 NMAC 4.1) may either: 1) be treated on-site to reduce the concentration of hazardous constituents within the media to the levels set forth as performance standards; or 2) be disposed of off-site as non-hazardous wastes in accordance with all other applicable laws and regulations.

Liquid wastes generated and contained during decontamination of drilling and sampling equipment will be drummed and labeled to identify the contents, date of generation, and amount of material generated. All waste containers generated during assessment activities will be stored in a designated drum storage area within the facility. If the water is determined to be hazardous, it will be filtered through an activated carbon filtration system. A verification sample of each potential waste stream that has been filtered will be analyzed by the appropriate analytical method to test for the characteristics by which the water was determined to be hazardous. Upon verification that the water is clean, it will be released to the ground surface on-site. If the water after verification sampling shows concentrations of constituents above any applicable federal, state, and or local regulations then the remaining waste will be disposed of according to applicable regulations. Used carbon filters will be disposed of properly pending analytical results.

Hydrocarbon contaminated soils, as determined by field headspace screening (PID headspace measurement > 100 ppmv), will be segregated from soils determined by field screening not to be contaminated (PID headspace measurement < 100 ppmv). Soils segregated by field screening techniques will await analytical results before a hazardous waste determination is made. Clean soil will be disposed of on-site by spreading soil cuttings on the ground surface. Soil determined to be characteristically hazardous will be shipped for off-site disposal at a permitted RCRA disposal facility.

PPE and dry waste associated with these activities will be disposed of in a sanitary landfill.

2.8 Reporting Requirements

Following completion of the Phase III soil assessment, the results of the assessment activities will be summarized in a report submitted to the OCD along with copies of the laboratory results for the soil samples analyzed.

The report will include the following information, as applicable:

- a descriptive summary of work conducted and general conclusions
- soil boring logs, including:
    1) boring number
    2) dates drilling began and finished
    3) driller's name and company
    4) drill rig type
    5) bit/auger size
    6) borehole diameter
    7) total depth drilled
    8) depths sampled
    9) lithologic logs
- field screening results, including:
    1) boring number

  - 2) sample depth - interval
  - 3) sample date
  - 4) instrument type & detection limit
  - 5) any pertinent field notes
  - 6) sample results
- soil sampling information, including:
  - 1) boring number
  - 2) sample depth - interval
  - 3) sample date
  - 4) any pertinent field observations
  - 5) sample parameters/methods
  - 6) sample container types
  - 7) sample handling procedures
  - 8) copy of chain of custody
  - 9) sample results & detection limits
  - 10) any pertinent QA/QC information
- comparison of constituents detected with action levels and/or background levels and any QA/QC concerns
- cross-sections shall be constructed throughout source areas from both N-S and E-W directions using definable stratigraphic units which can be correlated according to:
  - 1) particle size
  - 2) mineral composition
  - 3) and/or overall texture
- map(s) showing the concentrations and horizontal extent of contamination for key hazardous constituents identified from laboratory analysis
- a summary of the nature, rate, and extent of soil contamination at the site.

3. PHASE III GROUND WATER ASSESSMENT PLAN

The current ground water monitoring network consists of nineteen wells completed within the uppermost aquifer and one well completed within a perched zone (Figure 4-1). Information collected from additional monitor wells will help to refine the current picture of ground water flow direction, and the nature, rate, and extent of ground water contamination in the uppermost aquifer.

A deeper monitor well will be needed to determine the vertical extent of contamination. The installation of a deeper monitor well will follow the same investigative approach as the shallower ground water monitor well installation and assessment activities.

3.1 Installation of Additional Ground Water Monitor Wells

The primary objective of this plan, as it relates to the characterization of affected ground water, is to complete the delineation of the lateral extent of affected ground water in the uppermost aquifer. In addition, a second objective of this plan is to install a deeper ground water monitor well into the regional aquifer in order to confirm that this aquifer has not been affected by the release from the former impoundments.

3.1.1 Further Delineation of Affected Ground Water in the Uppermost Aquifer

Three ground water monitor wells will be installed in the uppermost aquifer to further delineate the extent of the dissolved-phase plume near the former impoundments. The proposed location of these three wells is indicated in Figure 4-1. In addition to the three wells indicated in Figure 4-1, as many as three additional monitor wells may be installed if warranted based on field observations.

Prior to well installation, soil borings will be drilled to the total depth, approximately 10 feet below the water table, at each location with minimum 6-inch-O.D. augers. Soil samples will be collected at 10-foot intervals during the drilling of the pilot hole and field headspace screening will be performed using a PID. Two samples from each boring will be collected for laboratory analyses; the sample collected from a depth nearest to the capillary fringe of the uppermost aquifer (or at total depth if water is not present in the soil boring) and the sample which indicates the greatest field headspace screening measurement. These samples will be submitted for analyses for TPH, VOCs, SVOCs, and selected metals (those metals listed in Section 2.2.2). Soil grab samples will also be collected periodically during drilling to better define the geologic conditions at the site.

The monitor wells will be installed within the hollow-stem augers following the completion of the soil boring. Immediately prior to well construction, the total depth of the borehole will be determined using a clean, weighted steel tape or tag line.

The monitor wells will be constructed of 2-inch diameter schedule 40 PVC pipe and will include, in ascending order, a flush-threaded silt trap (sump) at the bottom, 10 to 25 feet of flush-threaded 0.01-inch machine-slotted PVC screen, and blank casing from the top of the screen to ground surface. No more than 15 feet of screen will be installed below the water table.

Once the well casing has been lowered to the bottom of the borehole, a sandpack consisting of 12-20 silica sand will be poured down the annulus of the auger in 3-foot lifts. After each 3-foot interval is filled, the augers will be pulled up approximately the same distance. This procedure will be repeated until the sand pack level is approximately 2 feet above the top of the screened section. The annular space above the sand pack will then be filled with a minimum 2-foot-thick pelletized bentonite seal, which will be hydrated with distilled water. The remaining annular space will be filled with a cement/bentonite slurry grout consisting of approximately 3 percent bentonite by weight. The top of the well casing will be protected by a PVC cap, and the exposed casing will be protected by a locking steel shroud. A 6-inch-thick concrete pad will then be constructed around the shroud. Generalized monitor well construction details are shown in Figure 5-1.

Immediately following well installation, the new monitor wells will be developed following the procedures outlined in Section 3.2.

Ground water samples will be collected from all the existing and newly installed monitor wells. Ground water samples will be collected following the procedures outlined in Section 3.3. Ground water samples will be analyzed for VOCs, PAHs, major ions, TDS, and those metals regulated under WQCC 82-1 Part 3-103 A. & B. Note that this list of metal constituents includes all metals regulated under the Federal Safe Drinking Water Act (SDWA) with the exception of aluminum.

3.1.2 Installation of a Monitor Well into the Bedrock Aquifer

In addition to the installation of additional monitor wells in the uppermost aquifer, one downgradient deep monitor well will be installed into the deeper bedrock aquifer. The purpose of the deep well is to determine whether the bedrock aquifer has been impacted by the release from the former impoundments. The location of the deep bedrock monitor well is indicated in Figure 4-1.

The deep monitor well will be constructed with a 20-foot screened interval spanning an anticipated interval of 100 to 120 feet bgs. In order to avoid potential cross-contamination during well installation, a surface conductor casing will be installed to isolate the uppermost aquifer from the next underlying water-bearing unit. The deep monitor well will be constructed as follows:

1. A large diameter borehole will be advanced to a depth of approximately 90 feet bgs using air- or mud-rotary methods.
2. An 8-inch surface casing will be lowered into the borehole and the annulus will be grouted with a cement-bentonite grout from the bottom up.
3. The grout will be allowed to cure for at least 24 hours; drilling will then proceed inside the surface casing to a total depth of 120 feet bgs (or deeper if necessary to reach saturated soil).

4. A 2-inch diameter monitor well will be constructed within the borehole. From bottom to top, the monitor well will consist of:
    - 20 feet of slotted 0.010 inch schedule 40 PVC screen
    - Flush-threaded schedule 40 PVC blank casing to surface
    - 22 feet of 10-20 silica sand extending from the total depth to 2 feet above the screen
    - A 4.5 foot bentonite seal above the silica sand
    - Cement-bentonite grout to surface
    - PVC cap to protect the well casing
    - A flush-grade locking steel shroud set within a 6-inch thick concrete pad.

Immediately following well installation, the new monitor well will be developed following the procedures outlined in Section 3.2.

Ground water samples will be collected following the procedures outlined in Section 3.3. Ground water samples will be analyzed for VOCs, PAHs, major ions, TDS, and those metals regulated under WQCC 82-1 Part 3-103 A. & B. Note that this list of metal constituents includes all metals regulated under the Federal Safe Drinking Water Act (SDWA) with the exception of aluminum.

3.2 Monitor Well Development Procedures

The newly installed monitor wells will be developed by a sequence of surging and pumping and/or bailing. Initially, the wells will be surged to dislodge any smeared material on the borehole wall that would otherwise inhibit ground water flow and to remove fine particles from the formation surrounding the borehole. The suspended sediments will be removed by bailing, pumping, or air lifting. During well development, pH, temperature, specific conductance, and turbidity will be monitored periodically to determine when the wells have been sufficiently developed. Development will be considered complete when the water becomes relatively clear and water quality parameters have stabilized to within ± 5 percent over three consecutive measurements.

3.3 Ground Water Sampling Procedures

Prior to ground water sample collection, the following preparations will be made:

1. The area around the wellhead will be inspected for integrity, cleanliness, and signs of possible contamination.

2. The cap on the wellhead will be removed and a flame ionization detector (FID) or photoionization detector (PID) will be used to determine if VOC vapors are present. Any obvious odors will be noted in the field logbook.

3. The static water level will be measured to the nearest 0.01 foot using an electrical water level sounder. The presence of any obvious contamination on the water level sounder will be noted in the field logbook. The sounder will be decontaminated between wells, as described in Section 3.4, in order to prevent cross contamination.

4. Prior to purging the wells, a clear bailer, hydrocarbon indicating paste, or an interface probe will be used to check for the presence of PSH. The presence or absence of PSH will be recorded in the field logbook, as well as the thickness of PSH, if any.

5. The well will then be purged to remove standing/stagnant water in order to ensure the collection of representative ground water samples. Monitor wells with dedicated bladder pumps will be purged at a rate equal to or greater than the anticipated sample collection flow rate. Monitor wells without dedicated bladder pumps will be purged by hand bailing with dedicated, disposable polyethylene bailers. The field parameters pH, electric conductivity, dissolved oxygen, and temperature will be measured throughout the purging process at a frequency of at least once per casing volume. Purging will continue for a minimum of three casing volumes and until the field parameters remain stable to within ±5 percent over at least one casing volume, except if the well is a very poor producer. In

this case, the well will be purged dry once prior to sample collection. All fluids produced during purging will be contained for later disposal as described in Section 3.5.

Following purging, unfiltered ground water samples will be collected as soon as possible using either a dedicated bladder pump or a dedicated disposable polyethylene bailer. Under no circumstances will the well be allowed to stand for more than three hours after well purging before collecting samples. The only exception is for very low-yield wells that are pumped dry under normal purging and sampling rates. In this case, the well will be pumped dry and allowed to recover until sufficient water is present in the well to allow a sample to be collected.

In the event that a sample is turbid (i.e., > 5 NTU), a note will be placed on the sample COC that instructs the laboratory to filter the sample prior to analyses for inorganic constituents.

The samples will be collected in order of decreasing volatility, with samples for VOC analysis being collected first. The pumping rate during sample collection of VOC samples at monitor wells with a dedicated bladder pump will be maintained at 100 milliliters (mL) per minute or less to minimize volatilization. All samples will be collected in precooled, acidified, certified-clean 40-mL glass vials with septum caps supplied by the laboratory. Following collection of the VOC samples, the SVOC, metals, and other samples will be collected in appropriate containers.

The sample coolers with the associated chain-of-custody forms will be shipped to the laboratory using an overnight commercial carrier. The fastest possible shipping method will be used, and all sample shipments will be carefully tracked to ensure that samples arrive intact and that all holding times are met.

3.4 Decontamination Procedures

All non-disposable field equipment that may potentially come in contact with contaminated ground water or soils will be decontaminated in order to minimize the potential for cross-contamination between sampling locations. Clean latex or plastic gloves will be worn during all decontamination operations. The following sequence of decontamination procedures will be followed prior to each sampling and/or testing event:

1. Wash the equipment in a solution of non-phosphate detergent (Liquinox®) and distilled/deionized water. Use a clean Nalgene® tub to contain the wash solution and a scrub brush to mechanically remove loose particles.

2. Rinse the equipment twice with distilled/deionized water.

3. Allow the equipment to air dry before the next use.

3.5 Management of Investigation-Derived Wastes

A variety of wastes will be generated during the implementation of the ground water assessment plan. These wastes include soil cuttings, decontamination fluids, used PPE, and ground water produced during well development and purging.

All contaminated media (soil and ground water) which are managed at the site, including IDW, which contain hazardous constituents at a concentration above the performance standards set forth in Tables 7-1 and 7-2, yet which do not exceed any Toxicity Characteristic Leaching Procedure (TCLP) constituent concentration levels under the Hazardous Waste Management Regulations (20 NMAC 4.1) may either: 1) be treated on-site to reduce the concentration of hazardous constituents within the media to the levels set forth as performance standards within this CAP; or 2) be disposed of off-site as non-hazardous wastes in accordance with all other applicable laws and regulations.

All liquid wastes which are collected will be drummed and labeled to identify the contents, date of generation, and amount of material generated. All waste containers generated during the ground water assessment will be stored in a designated drum storage area within the facility. If the water is determined to be hazardous, it will be filtered through an activated carbon filtration system. A verification sample of each potential waste stream that has been filtered will be analyzed by the appropriate analytical method to test for the characteristics by which the water was determined to be hazardous. Upon verification that the water is clean, it will be released to the ground surface on-site. If the water after verification sampling shows concentrations of constituents above any applicable federal, state, and or local regulations then the remaining waste will be disposed of according to applicable regulations. Used carbon filters will be disposed of properly pending analytical results.

Hydrocarbon contaminated soils, as determined by field headspace screening (PID headspace measurement > 100 ppmv), will be segregated from soils determined by field screening not to be contaminated (PID headspace measurement < 100 ppmv). Soils segregated by field screening techniques will await analytical results before a hazardous waste determination is made. Clean soil will be disposed of on-site by spreading soil cuttings on the ground surface. Soil determined to be characteristically hazardous will be shipped for off-site disposal at a permitted RCRA disposal facility.

PPE and dry waste associated with these activities will be disposed of in a sanitary landfill.

3.6 Reporting Requirements

Following completion of the Phase III ground water assessment, the results of the assessment activities will be summarized in a report submitted to the OCD along with copies of the laboratory results for the ground water samples analyzed.

The report submitted will include the same information, if relevant, as described in Section 2.8 for the soil assessment reporting. In addition, the report will include the following information, as applicable:

- ground water sampling information
  1) monitor well ID

2) sample date - time
3) field observations (i.e., presence of PSH, turbidity, odor, etc.)
4) sample parameters/methods
5) sample container types
6) sample handling procedures
7) copy of chain of custody
8) sample results & detection limits
9) any pertinent QA/QC information

- comparison of constituents detected with previous sample results, action levels, and/or background levels and any QA/QC concerns

- water table elevation map indicating hydraulic gradient and ground water flow direction

- PSH distribution map indicating the lateral estimated extent of PSH at the water table

- contaminant distribution map(s) showing the concentrations and horizontal extent of contamination for key hazardous constituents identified from laboratory analysis

- discussion and results from any aquifer testing.

4. ROUTINE GROUND WATER MONITORING PLAN

4.1 Frequency and Sample Analyses

Beginning with the completion of the Phase III assessment activities, Transwestern will implement a routine ground water quality monitoring program.

Currently, there are fifteen monitor wells (excluding the five which currently contain accumulated PSH) in the uppermost aquifer. In addition, there will be a minimum of three additional wells that will be installed during the Phase III plan implementation and at least one additional well to be installed to evaluate ground water quality in the deeper bedrock aquifer. In total, Transwestern anticipates there will be a minimum of 19 ground water monitor wells installed at the site and possibly as many as 22 monitor wells installed by the time the Phase III assessment activities are complete.

Ground water samples will be collected from all monitor wells on a quarterly basis during 1997. Samples will not be collected from wells which contain PSH or from wells which do not contain a sufficient volume of water to collect a sample. Subsequent sample events will be on a semi-annual basis. An exception to the above sampling frequency is that monitor well MW-6 will be sampled on an annual basis. Monitor well MW-6 will be sampled less frequently due to its distance upgradient of the release area and due to the availability of monitor well MW-10 which is located between MW-6 and the release area.

Ground water samples collected during the quarterly sampling events in 1997 will be delivered to a qualified laboratory for analysis for VOCs, PAHs, major ions, TDS, and those metals regulated under WQCC 82-1 Part 3-103 A. & B.

Ground water samples collected during the first semi-annual sampling event in 1998 and subsequent years will be delivered to a qualified laboratory for analysis for VOCs only. Ground water samples collected during the second semi-annual sampling event of each year will be delivered to a qualified laboratory for analysis for VOCs, PAHs, major ions, TDS, and those metals regulated under WQCC 82-1 Part 3-103 A. & B.

In the event analyses indicate a metal constituent is non-detect in all monitor well samples for two consecutive sample events, then these constituents will be eliminated from the sample analysis plan for subsequent sample events. In addition, in the event Transwestern can demonstrate that analyses indicate a metal constituent is within the range of background concentrations in all monitor well samples for two consecutive sample events, then these constituents will be eliminated from the sample analysis plan for subsequent sample events.

Ground water sampling procedures will follow those outlined in Section 3.3. The management of purge water and other ground water sampling related waste generated will be managed as outlined in Section 3.5.

The reporting of routine ground water sampling results will be included in the annual progress report as described in Section 4.3. The information included in the annual report will include the pertinent information outlined in Section 3.6.

4.2 Notification Requirements

To the maximum extent possible, Transwestern will provide at least fifteen (15) working days advance notice of any sample collection events conducted in the course of soil and ground water assessment activities and for all routine ground water monitoring activities. When it is not possible to provide the full 15-day notice, Transwestern will provide as much advance notice as possible, but in no event less than forty-eight (48) hours telephonic or facsimile transmission notice prior to the field activities.

4.3 Routine Reporting Requirements

Annual ground water monitoring reports will be prepared and submitted to the OCD for review.

The annual reports will be submitted by the 31st day of March for the preceding year with the first report submitted by March 31, 1998. The reports will document work performed during the preceding period and will include the pertinent information outlined in Section 3.6.

5. REFERENCES

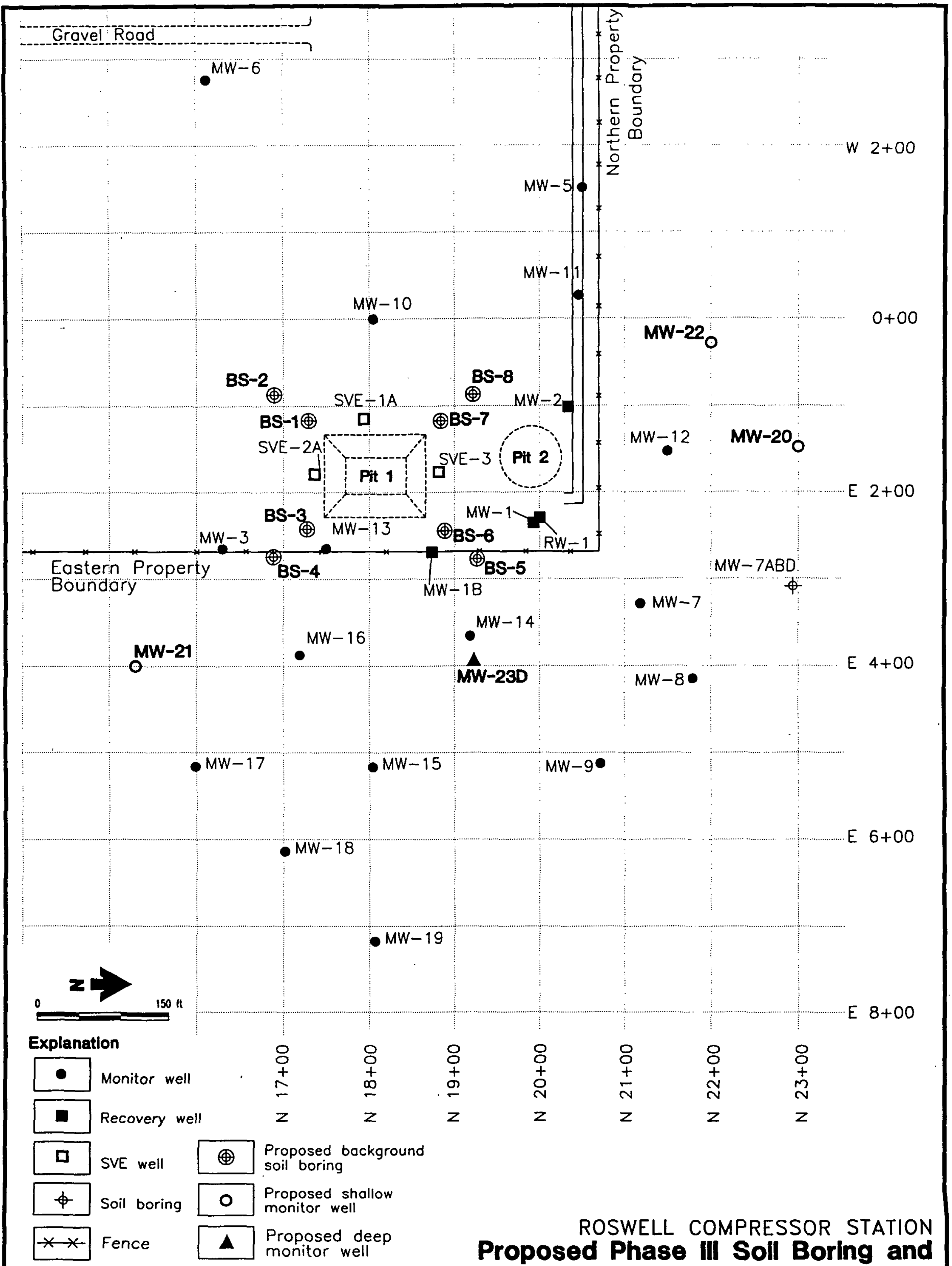
Daniel B. Stephens & Associates, Inc. 1995a. Phase I Soil and Ground Water Assessment for Roswell Compressor Station No. 9 Surface Impoundments. Prepared for ENRON Environmental Affairs, November 8, 1995.

Daniel B. Stephens & Associates, Inc. 1996. Phase II Soil and Ground Water Assessment for Roswell Compressor Station No. 9 Surface Impoundments. Prepared for ENRON Operations Corporation, November 25, 1996.

Texas Natural Resource Conservation Commission, 1996. Texas Risk Reduction Program Appendix IV: Draft Guidance on Background Sampling for Soils and Determining Sample Size, TNRCC Office of Waste Management, May 14, 1996.

U.S. EPA. 1996. Soil Screening Guidance: Fact Sheet, Office of Solid Waste and Emergency Response, Publication 9355.4-14FSA, June 1996.

FIGURES



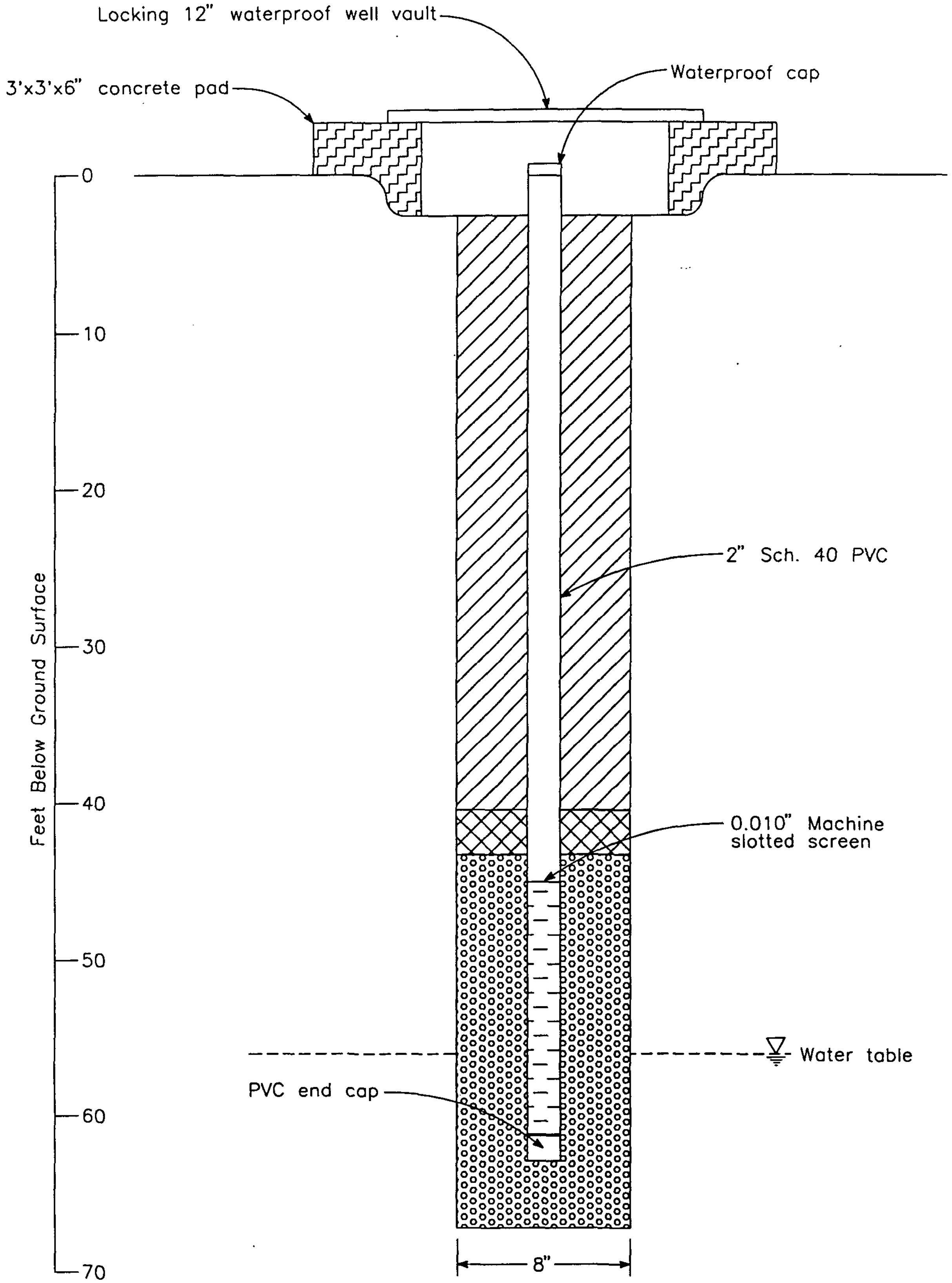
ROSWELL COMPRESSOR STATION

Proposed Phase III Soil Boring and Monitor Well Locations

DANIEL B. STEPHENS & ASSOCIATES, INC.
1-31-97
JN 6033

Figure 4-1

OP\6033\603352R.DWG



Note: Actual depths and screened intervals will be determined following initiation of ground-water assessment plan.

▨ Cement/bentonite grout
⊠ Hydrated bentonite plug
░ 20/40 Silica sand pack

Not to Scale

D\4115\6-. 5.DWG

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12-19-96 4115

ROSWELL COMPRESSOR STATION
Monitor Well Schematic

Figure 5-1

TABLES

Table 6-2. Sample Collection Protocol

Analyte	EPA Method [a]	Sample Volume/Container	Sample Preservation	Holding Time
Soil Matrix				
VOCs	8010/8020/ 8240	6" brass ring/250 mL glass jars	Chill to 4°C	14 days
SVOCs	8100/8270	6" brass ring/250 mL glass jars	Chill to 4°C	14/40 days
PCBs	8080	6" brass ring/250 mL glass jars	Chill to 4°C	14/40 days
Appendix IX metals [b]	6010/7000	6" brass ring/250 mL glass jars	Chill to 4°C	6 months
Total cyanide	9010	6" brass ring/250 mL glass jars	Chill to 4°C	14 days
Total sulfide	9030	6" brass ring/250 mL glass jars	Chill to 4°C	7 days
TPH (gasoline)	418.1	6" brass ring/250 mL glass jars	Chill to 4°C	28 days
Ground-Water Matrix				
VOCs	8010/8020 8240	Two 40-mL septum vials	HCl to pH<2; chill to 4°C	14 days
SVOCs	8100/8270	1 L glass	Chill to 4°C	7/40 days
PCBs	8080	1 L glass	Chill to 4°C	7/40 days
Appendix IX metals [b]	6010/7000	1 L glass	Chill to 4°C	6 months
Total cyanide	9010	1 L glass	NaOH to pH>12	14 days
Total sulfide	9030	1 L glass	ZnAc + NaOH to pH>12	7 days
TPH (gasoline)	418.1	Two 40-mL septum vials	HCl to pH<2; chill to 4°C	28 days
Major cations [c]	3010/6010	500-mL plastic	HNO_3 to pH<2	6 months
Bicarbonate (total)	310.1	500-mL plastic	Chill to 4°C	14 days
Chloride (total)	9250	500-mL plastic	Chill to 4°C	28 days
Nitrate (total)	9200	500-mL plastic	H_2SO_4 to pH<2; chill to 4°C	28 days
Sulfate (total)	9038	500-mL plastic	Chill to 4°C	28 days
TDS	160.1	500-mL plastic	Chill to 4°C	7 days

Note: All laboratory analyses to be performed on unfiltered ground-water samples except for samples with a measured turbidity of 5 NTU or greater, in which case the laboratory will be instructed to filter the sample prior to analysis.

[a] U.S. EPA, 1986
[b] Includes Ag, As, Ba, Be, Cd, Co, Cr, Cu, Hg, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
[c] Includes Ca, K, Mg, Na, Fe, Mn

VOCs = Volatile organic compounds
SVOCs = Semivolatile organic compounds
PCBs = Polychlorinated biphenyls
TPH = Total petroleum hydrocarbons
TDS = Total dissolved solids

Table 7.1: Performance Standards for Soil

		Max. conc. detected in any sample (mg/kg)	Performance Standard (mg/kg)	Source of standard
MAHs	Total BTEX	228	50	NM OCD
	benzene	3.00	0.5	TX RRR
	toluene	68.00	100	TX RRR
	ethyl benzene	17.00	70	TX RRR
	xylene (total)	140.00	1,000	TX RRR
Other VOCs	acetone	1.5	365	TX RRR
	2-butanone (MEK)		183	TX RRR
	carbon disulfide	0.06	365	TX RRR
	carbon tetrachloride		0.5	TX RRR
	chlorobenzene	0.12	10	TX RRR
	chloroethane		73	TX RRR
	chloroform	0.2	10	TX RRR
	1,1-dichloroethane	1.2	365	TX RRR
	1,2-dichloroethane		0.5	TX RRR
	1,1-dichloroethene	0.04	0.7	TX RRR
	c-1,2-dichloroethene		7	TX RRR
	t-1,2-dichloroethene		10	TX RRR
	2-hexanone (MNBK)	0.46		(no standard)
	MIBK		183	TX RRR
	methyl methacrylate		292	TX RRR
	methylene chloride	0.16	0.5	TX RRR
	1,1,1,2-tetrachloroethane	2.1	3.28	TX RRR
	1,1,2,2-tetrachloroethane		0.426	TX RRR
	tetrachloroethene	1.9	0.5	TX RRR
	1,1,1-trichloroethane	19	20	TX RRR
	1,1,2-trichloroethane		0.5	TX RRR
	trichloroethene		0.5	TX RRR
	Freon-113	5.1	3,100	EPA Reg. III SSLs
	vinyl acetate	7	365	TX RRR
	vinyl chloride		0.2	TX RRR
PAHs	acenaphthene		219	TX RRR
	benzo(b)fluoranthene		4	EPA Reg. III SSLs
	benzo(k)fluoranthene		4	EPA Reg. III SSLs
	benzo(j)fluoranthene	0.33		(no standard)
	benzo(a)pyrene		4	EPA Reg. III SSLs
	chrysene	0.33	1	EPA Reg. III SSLs
	fluoranthene	0.76	146	TX RRR
	fluorene		146	TX RRR
	1-methylnaphthalene			(no standard)
	2-methylnaphthalene	4.8		(no standard)
	naphthalene	0.92	146	TX RRR
	phenanthrene	5.6		(no standard)
	pyrene	0.89	110	TX RRR
Other SVOCs	bis(2-ethylhexyl)phthalate	4.8	0.608	TX RRR
	di-n-butyl-phthalate	2.2	365	TX RRR
	m-cresol (3-methylphenol)		183	TX RRR
	o-cresol (2-methylphenol)		183	TX RRR
	p-cresol (4-methylphenol)		183	TX RRR
	m-dichlorobenzene (1,3)		60	TX RRR
	o-dichlorobenzene (1,2)		60	TX RRR
	p-dichlorobenzene (1,4)		7.5	TX RRR
	phenol	200	2,190	TX RRR
Other	PCBs	0.32	0.05	TX RRR
	cyanide	1.4	20	TX RRR
	sulfide	1,800		(no standard)
	TPH	55,000	100/1,000/5,000	NM OCD
Metals	aluminum	5,950	3,700	EPA Reg. III (TWx100)
	antimony	10	0.6	TX RRR
	arsenic	17	5	TX RRR
	barium	734	200	TX RRR
	beryllium	0.5	0.4	TX RRR
	cadmium	0.6	0.5	TX RRR
	chromium (total)	28	10	TX RRR
	chromium (VI)		10	TX RRR
	cobalt		220	EPA Reg. III (TWx100)
	copper	337	150	EPA Reg. III (TWx100)
	lead	18	1.5	TX RRR
	mercury	1.36	0.2	TX RRR
	nickel	9	10	TX RRR
	selenium	10	5	TX RRR
	silver	4	18.3	TX RRR
	thallium		0.4	EPA Reg. III SSLs
	tin	6	2,200	EPA Reg. III (TWx100)
	vanadium	21	26.0	EPA Reg. III (TWx100)
	zinc	282	42,000	EPA Reg. III

NM OCD - New Mexico Oil Conservation Division, Guidelines for Remediation of Leaks, Spills, and Releases
TX RRR - Texas Risk Reduction Rules Media Specific Concentrations for Standard No. 2 (GWP-Res.)
EPA Reg. III SSLs - EPA Region III Risk-Based Concentration Table Soil Screening Levels
EPA Reg. III (TWx100) - EPA Region III Risk-Based Concentration Table (Tap Water Standard × 100)

Table 7.2: Performance Standards for Ground Water

		Note (1)	Max. conc. detected in any sample (µg/L)	Performance Standard (µg/L)	Source of standard
MAHs	benzene	x	6,500	5	SDWA MCL
	toluene	x	15,000	750	NMWQCC
	ethyl benzene	x	2,100	700	SDWA MCL
	xylene (total)	x	13,000	620	NMWQCC
Other VOCs	acetone			3,650	TX RRR
	2-butanone (MEK)		900	1,830	TX RRR
	carbon disulfide			3,650	TX RRR
	carbon tetrachloride	x		5	SDWA MCL
	chlorobenzene	x		100	SDWA MCL
	chloroethane	x		730	TX RRR
	chloroform	x		100	NMWQCC
	1,1-dichloroethane	x	560	25	NMWQCC
	1,2-dichloroethane	x		5	SDWA MCL
	1,1-dichloroethene	x		5	NMWQCC
	c-1,2-dichloroethene	x		70	SDWA MCL
	t-1,2-dichloroethene	x		100	SDWA MCL
	2-hexanone (MNBK)				(no standard)
	MIBK			1,830	TX RRR
	methyl methacrylate		5	2,920	TX RRR
	methylene chloride	x		100	NMWQCC
	1,1,1,2-tetrachloroethane	x		32.8	TX RRR
	1,1,2,2-tetrachloroethane	x		10	NMWQCC
	tetrachloroethene	x		5	SDWA MCL
	1,1,1-trichloroethane	x	180	60	NMWQCC
	1,1,2-trichloroethane	x		10	NMWQCC
	trichloroethene	x		5	SDWA MCL
	Freon-113			59,000	EPA Reg. III
	vinyl acetate			36,500	TX RRR
	vinyl chloride	x		1	NMWQCC
PAHs	Total naphthalene plus monomethylnaphthalenes		85	30	NMWQCC
	acenaphthene	x		2,190	TX RRR
	benzo(b)fluoranthene	x		0.092	EPA Reg. III
	benzo(k)fluoranthene	x		0.92	EPA Reg. III
	benzo(j)fluoranthene	x			(no standard)
	benzo(a)pyrene	x		0.7	NMWQCC
	chrysene	x		9.2	EPA Reg. III
	fluoranthene	x		1,460	TX RRR
	fluorene	x		1,460	TX RRR
	1-methylnaphthalene	x			(no standard)
	2-methylnaphthalene	x	51		(no standard)
	naphthalene	x	34	1,460	TX RRR
	phenanthrene	x			(no standard)
	pyrene	x		1100	TX RRR
Other SVOCs	bis(2-ethylhexyl)phthalate	x		6.08	TX RRR
	di-n-butyl-phthalate	x		3,650	TX RRR
	m-cresol (3-methylphenol)			1,830	TX RRR
	o-cresol (2-methylphenol)			1,830	TX RRR
	p-cresol (4-methylphenol)		250	1,830	TX RRR
	m-dichlorobenzene (1,3)	x		600	TX RRR
	o-dichlorobenzene (1,2)	x		600	TX RRR
	p-dichlorobenzene (1,4)	x		75	TX RRR
	phenol	x		5	NMWQCC
Other	PCBs	x		0.5	SDWA MCL
	cyanide			200	NMWQCC
	sulfide		100		(no standard)
	TPH		37		(no standard)
Metals	aluminum		3,130	5,000	NMWQCC
	antimony			6	TX RRR
	arsenic		190	50	SDWA MCL
	barium		4,400	1,000	NMWQCC
	beryllium			4	TX RRR
	cadmium			5	SDWA MCL
	chromium (total)		30	50	NMWQCC
	chromium (VI)			100	TX RRR
	cobalt			50	NMWQCC
	copper		10	1,000	NMWQCC
	lead		40	15	SDWA MCL
	mercury		0.5	2	NMWQCC
	nickel			200	NMWQCC
	selenium		20	50	NMWQCC
	silver			50	NMWQCC
	thallium				(no standard)
	tin			22,000	EPA Reg. III
	vanadium			260	EPA Reg. III
	zinc		80	10,000	NMWQCC

Note (1) - "x" indicates those constituents listed as "toxic pollutants" under NMR Title 20/Chapter 6/Part 2/ Subpart I/1101
SDWA MCL - Federal Safe Drinking Water Act Maximum Contaminant Level
NMWQCC - New Mexico Water Quality Control Commission Ground Water Standards; August 18, 1991
TX RRR - Texas Risk Reduction Rules Media Specific Concentrations for Standard No. 2
EPA Reg. III - EPA Region III Risk-Based Concentration Table