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WORK PLANS

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DANIEL B. STEPHENS & ASSOCIATES, INC.
ENVIRONMENTAL SCIENTISTS AND ENGINEERS

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

Prepared for

ENRON Operations Corporation

Houston, Texas

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

1. INTRODUCTION

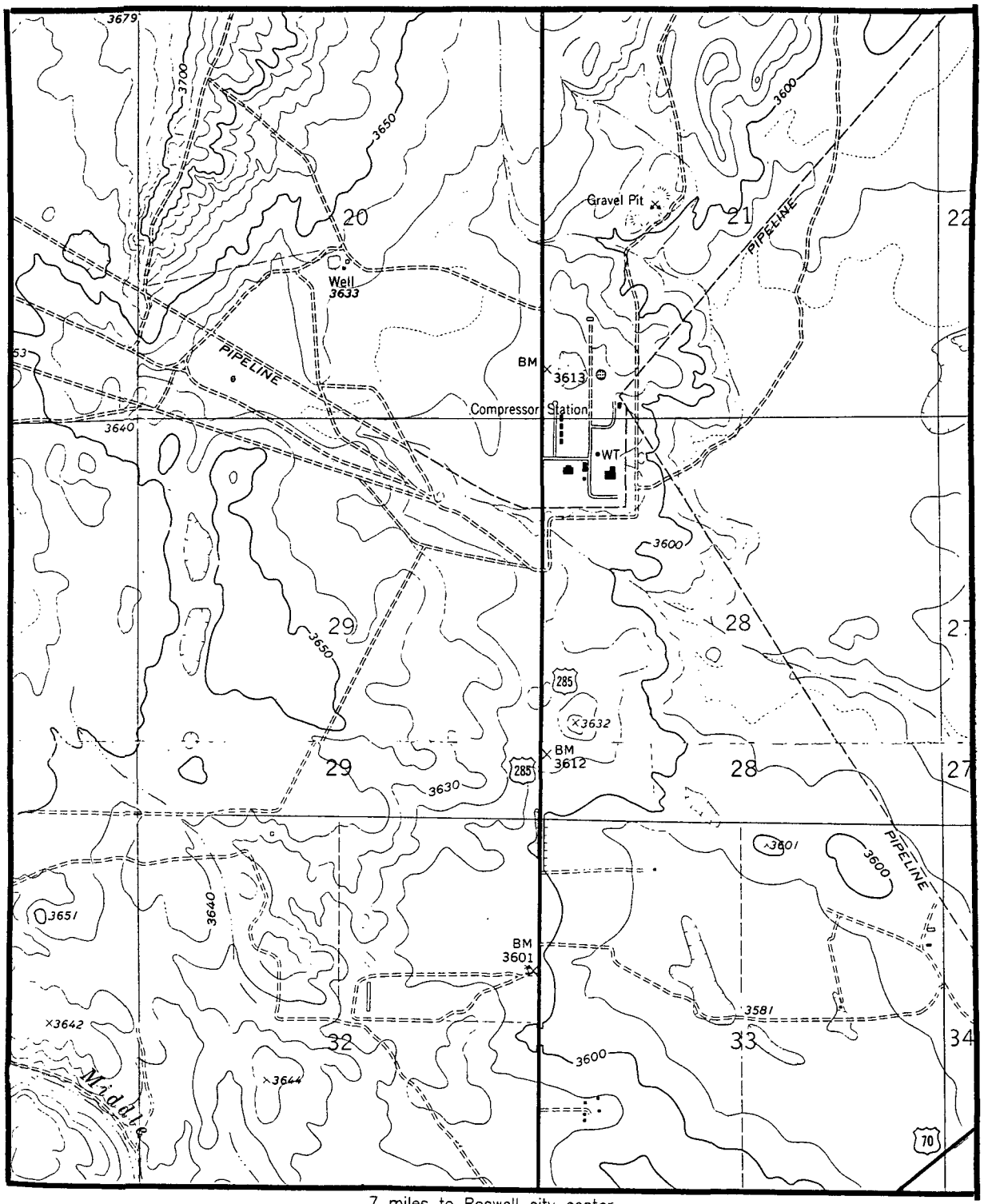
Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this work plan for the continued investigation and evaluation of remedial options for hydrocarbon-impacted soil and ground water at Transwestern Pipeline Company's (TPC) Roswell Compressor Station No. 9. The site is located approximately 6 miles north of Roswell, New Mexico, along U.S Highway 285 (Figure 1).

This work plan provides a brief summary of the Phase I investigation (Section 2) and a discussion of the scope of work to be implemented during Phase II (Section 3). Procedures outlined in the *Phase I Soil and Ground-Water Assessment Plan for Roswell Compressor Station Surface Impoundments* (DBS&A, 1995a) will serve as guidelines for Phase II field activities. In addition, Phase II activities will be completed in accordance with the site-specific health and safety plan (DBS&A, 1995b) and DBS&A standard operating procedures for field investigations.

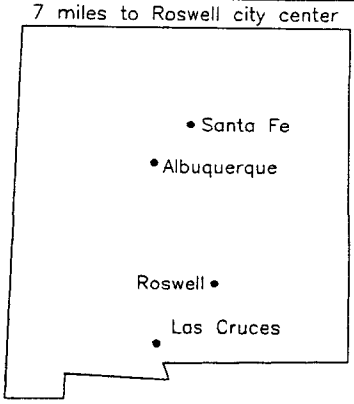
2. PHASE I ASSESSMENT

The Phase I assessment characterized the composition of the waste that remains in the former impoundments located along the northeastern property boundary, and established the downgradient extent of impacts to the uppermost aquifer. During the course of the investigation, eight soil borings were drilled, monitor wells were installed in three of the borings, aquifer tests were conducted, ground-water levels were measured, and soil and ground-water samples were collected for laboratory analysis. Samples were analyzed for numerous inorganic and organic constituents to determine if standards set by the U.S. Environmental Protection Agency (EPA) and/or the New Mexico Water Quality Control Commission (NMWQCC) were exceeded.

Analytical data indicate that waste within the surface impoundments consists primarily of petroleum hydrocarbons containing small quantities of regulated volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Based on the results of the Phase I



7 miles to Roswell city center



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0 3000 Feet

Source: U.S. Geological Survey, 1982
Panther Hill, Roswell North
7 1/2 Minute Topographic
Quadrangle Map.

ROSWELL COMPRESSOR STATION

Location Map

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Figure 1

investigation, and comparison with proposed EPA soil screening levels, the primary organic compounds of concern in the waste impoundments are benzene, 1,1-dichloroethene, methylene chloride, tetrachloroethene, toluene, and 1,1,1-trichloroethane.

The areal extent of VOCs exceeding NMWQCC standards is bounded on-site by clean monitor wells MW-3, MW-5, and MW-6 and downgradient by monitor well MW-8 (Figure 2). Phase-separated hydrocarbons (PSH) appear to be limited to the area near on-site recovery wells MW-1, MW-2, MW-1B, and RW-1. Inorganic chemical analyses indicate that ground-water samples from each well, including upgradient monitor well MW-6, exceed the NMWQCC ground-water standards for total dissolved solids, chloride, and sulfate.

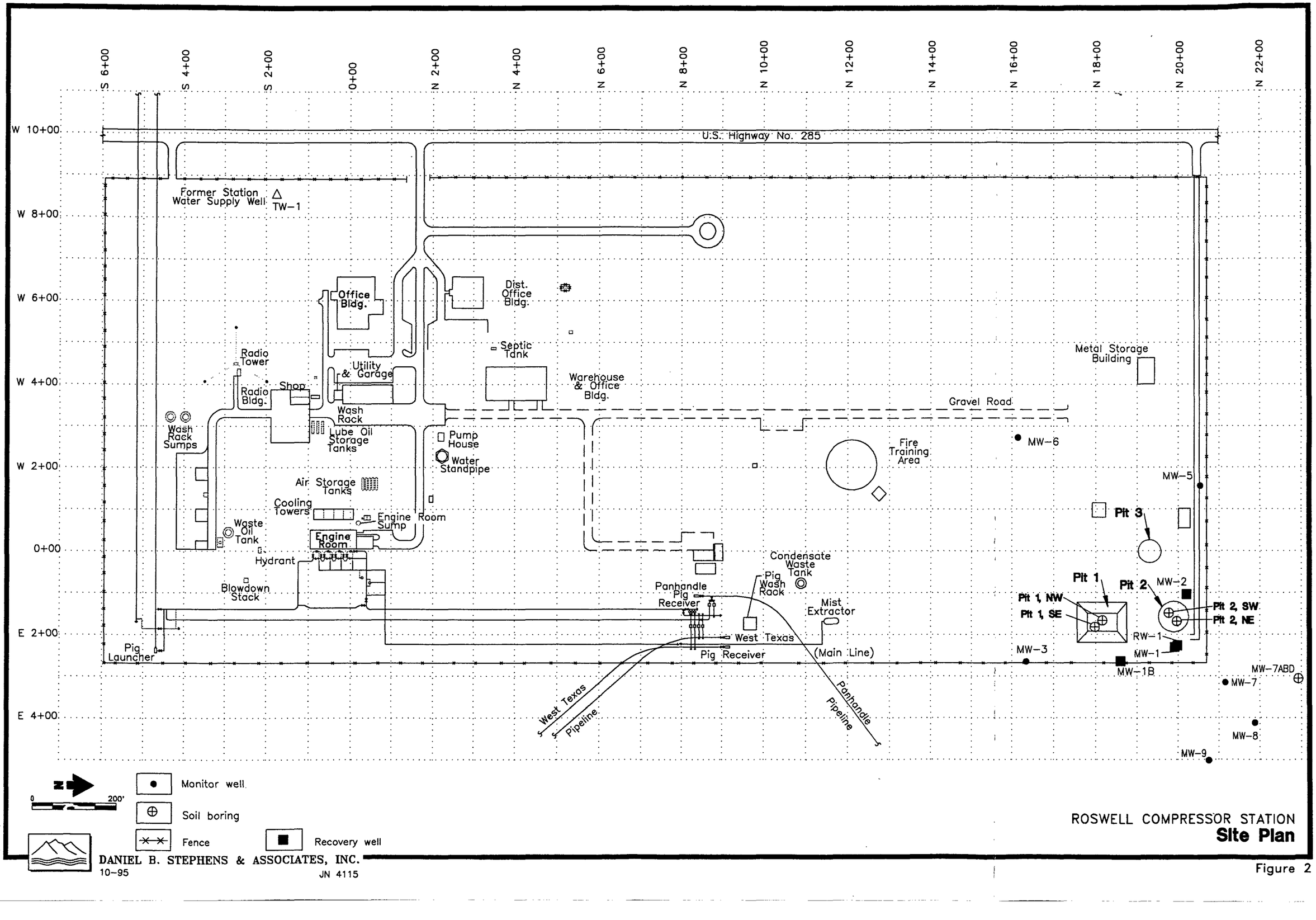
3. SCOPE OF WORK

The proposed scope of work is designed to determine (1) the areal extent of the subsurface contaminants identified near the former impoundments, and (2) soil vapor extraction (SVE) parameters necessary for design of future remedial activities. The field investigation will include the following activities:

- Delineation of impacted soils beneath and adjacent to Pit 1 by drilling and sampling three soil borings. The borings will be advanced to approximately 60 feet below ground surface (bgs). Upon reaching the total depth, the borings will be converted to SVE wells.

- Delineation of two potential source areas near (1) the former soil boring SG86 advanced by Metric Corporation, and (2) the location referred to as Pit 3 on Figure 3. The investigation will consist of drilling and sampling approximately 10 soil borings advanced to approximately 30 feet bgs. One of the soil borings located near SG86 will be completed as monitor well MW-13 (Figure 3); the others will be plugged with cement-bentonite slurry and abandoned.

- Areal definition of the extent of ground-water contamination within the uppermost aquifer by drilling and sampling five monitor wells (Figure 3). The borings will be advanced to



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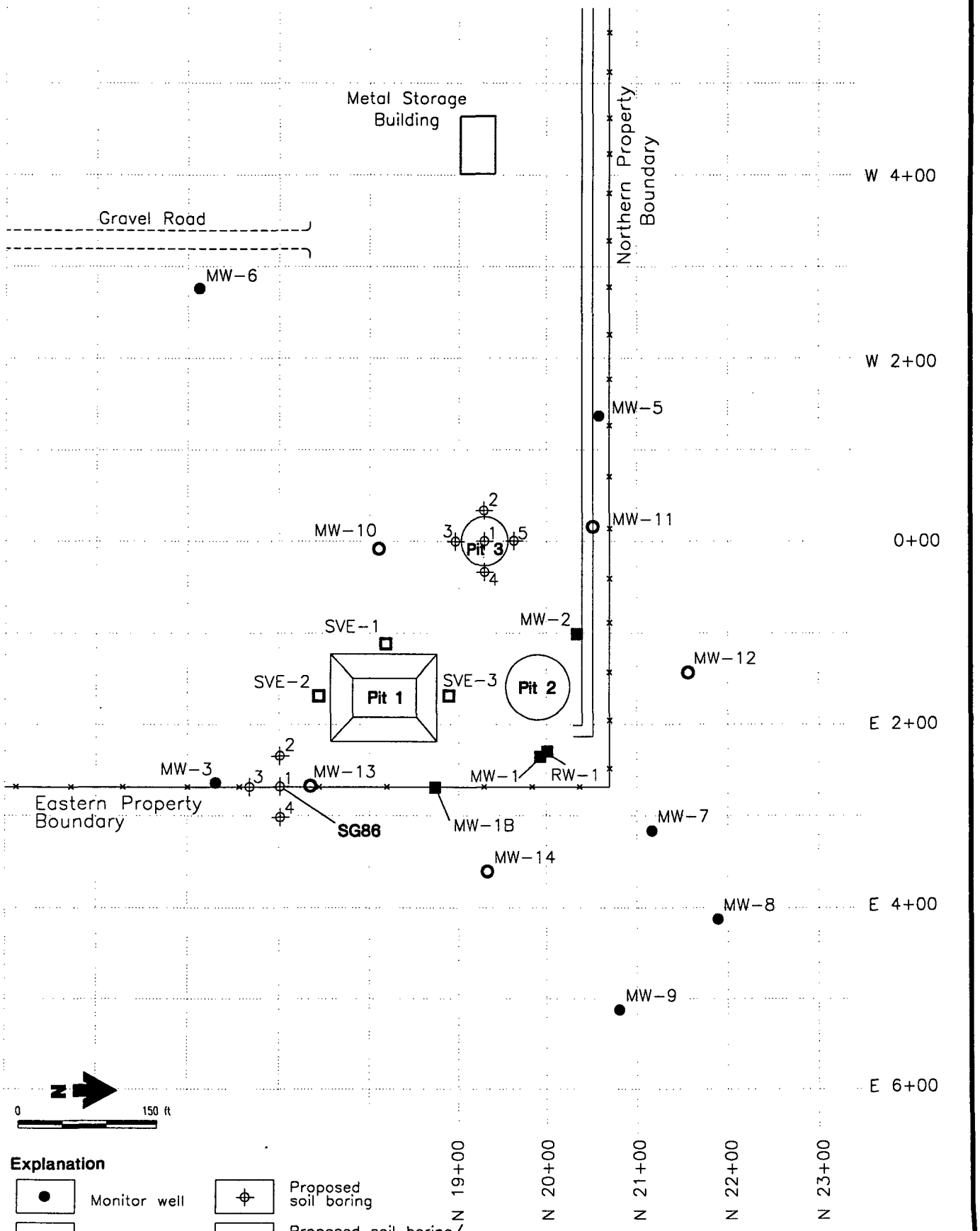
ROSWELL COMPRESSOR STATION
Site Plan

Figure 2



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ROSWELL COMPRESSOR STATION

Proposed Phase II Soil Boring and Monitor Well Locations

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Figure 3

approximately 70 feet bgs, whereupon the borings will be converted to monitor wells and sampled for the ground-water constituents regulated by NMWQCC.

Drilling will be accomplished by Rodgers Environmental Services of Albuquerque, New Mexico, using hollow-stem auger methods. The proposed drilling locations are shown in Figure 3, and the rationale for each location is set forth in Table 1. Additional drilling locations (beyond those proposed) will be selected, as necessary, to define the areal extent of subsurface impacts. After the drilling program is completed, all borings and wells will be surveyed relative to the plant grid system and mean sea level by Wagener Engineering of Roswell, New Mexico.

Table 1. Drilling Location Rationale

Boring/Monitor Well Number	Rationale
MW-10	Establish water quality immediately upgradient of pits
MW-11 through MW-14	Establish lateral extent of plume
SVE-1 through SVE-3	Establish the extent of VOCs in soils originating from Pit 1; determine SVE design parameters
Pit 3, 1 through 5	Establish the extent of subsurface impacts to soils
SG 86, 1 through 4	Establish the extent of subsurface impacts to soils

Drilling, well installation, and sampling procedures will be similar to those described in the Phase I assessment report (DBS&A, 1995c). The following sections briefly describe Phase II assessment activities.

3.1 Phase II Soil Assessment

The soil assessment will consist of delineating the lateral and vertical extent of impacted soils beneath and adjacent to Pit 1 and suspected source areas near SG86 and Pit 3 (Figure 3). Three borings will be drilled around the perimeter of Pit 1. Delineation of impacts near suspected source areas (SG86 and Pit 3) will require an iterative approach to soil sampling because the

exact locations, if indeed these sources exist, are not well known. Soil borings near the suspected sources will be drilled outward along a grid centered on the suspected location of the source areas.

All sampling equipment will be decontaminated prior to use by washing with Liquinox® detergent, followed by rinsing with deionized water. Drilling equipment will be steam cleaned before each boring is drilled.

Drill cuttings will be segregated based on field screening for VOCs. The clean cuttings will be stockpiled at the site on clean plastic. Segregation of drill cuttings will be based on an action level for contaminated soils of 100 parts per million determined by field headspace methods. A composite sample will be collected from the clean stockpile and analyzed for total petroleum hydrocarbons (TPH) (EPA method 418.1) and VOCs (EPA method 8010/8020) in order to determine the proper disposal of drill cuttings. Contaminated cuttings will be contained in 55-gallon drums for appropriate disposal.

3.1.1 Pit 1 Area

During delineation of subsurface impacts emanating from Pit 1, split-spoon samples will be collected on 5-foot intervals to an approximate depth of 60 feet bgs. Samples will be lithologically described and analyzed for VOC content by field headspace methods using an organic vapor analyzer equipped with a photoionization detector (PID).

A single sample of the most highly impacted soils will be selected from each boring, based on visual examination and PID readings. Soil samples collected for chemical analysis will be contained in 250-mL glass jars or 6-inch brass liner rings and placed in an ice-filled cooler for shipment to Core Laboratories in Denver, Colorado. Samples will be analyzed for VOCs (EPA method 8010/8020), PAHs (EPA method 8100), and TPH (EPA method 418.1).

Upon reaching the total depth of each boring, a SVE well will be constructed in the borehole so that remedial design parameters can be evaluated. Wells SVE-1 and SVE-2 will consist of 30 feet of 2-inch diameter, 0.020-inch machine-slotted polyvinyl chloride (PVC) screen,

approximately 30 feet of flush-thread 2-inch PVC blank casing, and 32 feet of 12-20 silica sand filter pack. A bentonite seal will be emplaced on top of the filter pack, followed by cement-bentonite grout to the ground surface.

Well SVE-3 will be completed with two separate screened intervals. The SVE well cluster will be designated SVE-3A and SVE-3B for the shallow (screened from 10 to 30 feet bgs) and deep (screened from 40 to 60 feet bgs) zones, respectively. The annulus will be completed with 12-20 silica sand pack and a bentonite seal between the two screened zones. The upper bentonite seal will be followed by cement-bentonite grout to ground surface.

The surface completion for each well will consist of a flush-grade vault set in a concrete pad. Section 3.3 describes pilot testing of the newly installed SVE wells.

3.1.2 Pit 3 and SG86 Area

If wastes are present at the Pit 3 and SG86 locations, a single soil sample from the most highly impacted boring at each of the two potential source locations will be selected for waste characterization. These soil samples will be analyzed for TPH (EPA method 418.1), VOCs (EPA method 8240), SVOCs (EPA method 8270), polychlorinated biphenyls (EPA method 8080), metals (EPA methods 6010 and 7471), cyanide (EPA method 9010), and sulfide (EPA method 9030).

If no evidence of hydrocarbon impacts is noted in any of the five borings at Pit 3 or SG86, as determined by field screening with the PID, a single soil sample from the center boring will be submitted for the aforementioned laboratory analyses. In addition, one sample from the remaining borings will be submitted for analysis of VOCs (EPA method 8010/8020) and TPH (EPA method 418.1). All borings, with the exception of a monitor well to be constructed near SG86, will be plugged and abandoned following sample collection.

3.2 Phase II Ground-Water Assessment

Five additional monitor wells will be installed in the uppermost aquifer to delineate the extent of the dissolved-phase plume near the former impoundments (Figure 3). During drilling, split-spoon

samples will be collected on 10-foot intervals. Soil samples will be collected for laboratory analysis from the interval with the highest PID reading and water table interface. Soil samples will be submitted for analysis of VOCs (EPA method 8010/8020) and TPH (EPA method 418.1).

The monitor wells will be drilled to a depth of approximately 10 feet below the water table, whereupon a 2-inch-diameter monitor well will be constructed to evaluate ground-water quality. Each monitor well will consist of 15 feet of 2-inch diameter, 0.010-inch machine-slotted PVC screen, approximately 55 feet of flush-threaded 2-inch PVC blank casing, and 17 feet of 12-20 silica sand filter pack. A bentonite seal will be emplaced on top of the filter pack, followed by cement-bentonite grout to the ground surface. The surface completion for each well will consist of a 8-inch-diameter flush-grade vault set in a concrete pad.

Before ground-water sampling, each well will be developed by the surge and bail method until the wells yield relatively sediment-free ground water. During development, field parameters (pH, temperature, and electrical conductivity) will be measured and recorded periodically. All purged ground water will be contained in 55-gallon drums. Upon receipt of the analytical results, the ground water will be disposed of as appropriate by TPC personnel.

Ground-water samples will be hand bailed from all newly installed monitor wells with dedicated, disposable polyethylene bailers. Before the samples are collected, water levels will be measured and the presence or absence of PSH will be determined. Each well will then be bailed until approximately three casing volumes have been purged. Field parameters will be measured and recorded every half casing volume during purging. Ground-water samples will be analyzed by Core Laboratories in Denver, Colorado for VOCs (EPA method 8010/8020), PAHs (EPA method 8100), major ions, total dissolved solids, and metals regulated by the NMWQCC. In addition, existing monitor wells MW-7, MW-8, and MW-9 will be sampled and analyzed for VOCs and SVOCs.

In order to check intralaboratory precision, quality assurance/quality control samples consisting of trip blanks and sample replicates will comprise approximately 5 percent of the total number of water and soil samples.

3.3 Soil Vapor Extraction Pilot Tests

SVE pilot testing will be conducted on the newly installed wells to (1) determine operational parameters (e.g., relative air permeability of soils and contaminant concentrations in soil gas) and (2) assess whether an SVE system is a viable technology for remediation of contaminated soils at this site. The short-term tests will be conducted by AcuVac Remediation of Houston, Texas. AcuVac uses an internal combustion engine to supply vacuum to the well head and to combust extracted soil vapors.

During the pilot tests, the following parameters will be recorded: (1) induced vacuum in surrounding wells to determine the radius of influence, (2) air flow rates for the SVE wells to determine soil permeability and hydrocarbon mass extraction rates, (3) percent of well vapor as engine fuel to determine supplemental fuel consumption rates and potential mass extraction rates, and (4) hydrocarbon vapor concentrations as measured with a Horiba vapor analyzer. In addition, soil vapor samples will be collected in stainless steel canisters and analyzed for benzene, toluene, ethylbenzene, and xylenes, extended refinery gases (aliphatics and branched paraffins), and fixed gases ($O_2/N_2/CO_2$) by Core Laboratories in Houston, Texas.

3.4 Investigation Report Preparation

At the conclusion of the Phase II assessment, DBS&A will prepare a report that summarizes the findings of the investigatory activities. The report will include:

- Figures, tables, and descriptive text that delineate the areal extent of soil and ground-water impacts based on current and past investigations.

- Detailed soil boring logs, well construction diagrams, copies of analytical laboratory reports, chain of custody documentation, and documentation of field activities.

- Discussion and results of SVE pilot testing activities.

4. REFERENCES

Daniel B. Stephens & Associates, Inc. (DBS&A). 1995a. *Phase I Soil and Ground-Water Assessment Plan for Roswell Compressor Station Surface Impoundments,* Prepared for ENRON Environmental Affairs, Houston, Texas. July 10, 1995.

Daniel B. Stephens & Associates, Inc. (DBS&A). 1995b. *Health and Safety Plan for Field Activities at Transwestern Pipeline Company Roswell Compressor Station.* January 12, 1995.

Daniel B. Stephens & Associates, Inc. (DBS&A). 1995c. *Phase I Soil and Ground-Water Assessment for Roswell Compressor Station No. 9 Surface Impoundments, Volume I.* Prepared for ENRON Environmental Affairs, Houston, Texas. November 8, 1995.