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S. S. PAPADOPULOS & ASSOCIATES, INC.
ENVIRONMENTAL & WATER-RESOURCE CONSULTANTS

December 6, 2004

United States Environmental Protection Agency (3 copies)
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Mr. Baird Swanson (1 copy)
New Mexico Environment Department – District 1
4131 Montgomery Boulevard, NE
Albuquerque, NM 87109

Subject: Sparton Technology, Inc. Former Coors Road Plant Remedial Program
Work Plan for Installing a Monitoring/Standby-Extraction Well in the Deep Flow Zone

Gentlemen:

On behalf of Sparton Technology, Inc., S. S. Papadopulos & Associates, Inc. (SSP&A) is pleased to submit the subject Work Plan. The Work Plan was prepared by SSP&A in cooperation with Metric Corporation, Inc.

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I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my inquiry of either the person or persons who manage the system and/or the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify, to the best of my knowledge and belief, that this document is consistent with the applicable requirements of the Consent Decree entered among the New Mexico Environment Department, the U.S. Environmental Protection Agency, Sparton Technology, Inc., and others in connection with Civil Action No. CIV 97 0206 LH/JHG, United States District Court for the District of New Mexico. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions concerning the report, please contact me.

Sincerely,

S. S. PAPADOPULOS & ASSOCIATES, INC.

Stavros S. Papadopulos, PhD, PE
Founder & Senior Principal

cc: Secretary, Sparton Technology, Inc., c/o Ms. Susan Widener ,w/ 1 copy
Ms. Susan Widener, w/1 copy
Mr. James B. Harris, w/1 copy
Mr. Tony Hurst, w/2 copies
Mr. Gary L. Richardson, w/1 copy

SPARTON TECHNOLOGY, INC.
FORMER COORS ROAD PLANT REMEDIAL PROGRAM

WORK PLAN FOR INSTALLING
A MONITORING/STANDBY-EXTRACTION WELL
IN THE DEEP FLOW ZONE

Prepared by:
S. S. Papadopulos & Associates, Inc. and Metric Corporation
December 6, 2004

INTRODUCTION

The former Coors Road Plant (*Site*) of Sparton Technology, Inc. (*Sparton*) is located at 9621 Coors Boulevard NW, Albuquerque, New Mexico. Past waste management activities at the Site had resulted in the contamination of the groundwater beneath and downgradient from the Site. Under the terms of the Consent Decree signed on March 3, 2000[1], Sparton implemented an off-site and a source containment system to address groundwater contamination, and is currently operating these systems. Each containment system consists of an extraction well, CW-1 and CW-2 (see Figure 1), and associated water treatment and recharge facilities.

The hydrogeologic setting of the Site and its vicinity is discussed in detail in Section 2.3 of the 2003 Annual Report[2] prepared by S. S. Papadopulos & Associates, Inc. (*SSP&A*) in association with Metric Corporation (*Metric*), and of earlier (1999 through 2002) Annual Reports. Briefly, the Site is at an elevation of about 5,050 feet above mean sea level (*ft MSL*); the land slopes towards the Rio Grande on the east and rises to elevations of 5,150-5,200 ft MSL within a short distance to the west of the Site. The

[1] Consent Decree, 2000, *City of Albuquerque and The Board of County Commissioners of the County of Bernalillo, plaintiffs, v. Sparton Technology, Inc., defendant. Civil Action No. CIV 97 0206, U.S. District Court for the District of New Mexico*, filed March 3.
[2] S SP&A, 2004, *Sparton Technology, Inc., Former Coors Road Plant Remedial Program, 2003 Annual Report*, prepared for Sparton in association with Metric, May 28.

upper 1,500 feet of the fill deposits underlying the Site consist primarily of sand and gravel with minor amounts of silt and clay. The water table beneath the Site is at an elevation of 4,975-4,985 ft MSL and slopes towards the northwest to an elevation of about 4,960 ft MSL within about one-half mile of the Site. At an elevation of about 4,800 ft MSL a 2- to 3-foot clay layer, referred to as the 4,800-foot clay unit, has been identified. Monitoring wells screened above this clay unit have been referred to as Upper, Upper Lower, or Lower Lower Flow Zone (UFZ, ULFZ, or LLFZ) wells depending on their completion interval. The aquifer below the 4,800-clay unit has been referred to as the Deep Flow Zone (DFZ).

During remedial investigations only one well, MW-67 (see Figure 1) was completed in the DFZ. This well was free of contaminants when first sampled in July 1996 and continues to be free of contaminants to this date. A second DFZ well, MW-71 was installed in 1998 near the MW-60/61 cluster where high concentrations of contaminants had been detected in the ULFZ. The purpose of installing MW-71 was to determine the vertical extent of contamination in this area, and thus provide data for the design of the off-site containment well. Based on the data obtained during the installation of this well, groundwater contamination was deemed limited to the aquifer above the 4,800-foot clay unit, and the off-site containment well CW-1 was designed with a screened interval that extended from the water table to the top of the 4,800-foot clay.

The water-quality history of well MW-71 is discussed in the 1999 Annual Report[3]. Briefly, when installed, the well was essentially free of contaminants; however, soon after, significant concentrations of TCE were detected in the well. This led to investigations that indicated the presence of a leak of contaminated water from the shallower zones of the aquifer through a breach in the 4-inch well casing. The well was purged until relatively clean, and recompleted as a 2-inch well within the original 4-inch well. Samples collected after the recompletion of the well, however, continued to contain

[3]SSP&A, 2001, *Sparton Technology, Inc., Coors Road Plant Remedial Program, 1999 Annual Report*, prepared for Sparton. in association with Metric and Pierce L. Chandler, Jr., Original Issue June 1, 2000; Modified Issue February 9, 2001.

contaminants at increasing concentrations that approached 200 ppb of TCE by November 2000.

After further testing in the summer of 2001, the results of which suggested that leakage from the shallower zones may be continuing, the well was plugged and abandoned in October 2001. Monitoring well MW-71R was installed in February 2002 as a replacement DFZ well at a location about 30 feet south of the MW-71, and completed with a 5-foot screen installed at a depth 20 feet below the screen of the abandoned original well. Sampling of MW-71R from February 2002 through August 2004 continues to indicate the presence of TCE and other chlorinated solvents in the DFZ. Concentrations of TCE in samples from the well have ranged from 130 micrograms per liter (µg/l) in February 2002 to 210 µg/l in August 2003 (see Table 1); duplicate samples for August 2004 contained 170 and 180 µg/l of TCE, respectively.

In the 2002 Annual Report[4], Sparton proposed to install a pump-and-treat system by pumping well MW-71R at a rate of about 40 gallons per minute (gpm) for a period of one year and then evaluating the results to assess the severity of the problem associated with the detection of contaminants in this well. Details of this proposed interim action were submitted to the United States Environmental Protection Agency (USEPA) and the New Mexico Environment Department (NMED) in a Work Plan dated January 14, 2004[5]. The USEPA and NMED commented on this Work Plan on August 10, 2004[6]. Some of these comments, however, led Sparton to invoke on September 13, 2004 the dispute resolution mechanism[7] allowed under the terms of the Consent Decree. To resolve the issues that were raised in this dispute, a conference call was held on October 13, 2004 between technical representatives of USEPA, NMED, and Sparton. During this

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[4] SSP&A, 2003, *Sparton Technology, Inc., Former Coors Road Plant Remedial Program, 2002 Annual Report*, prepared for Sparton in association with Metric, May 16.

[5] *Sparton Technology Inc. Former Coors Plant Remedial Program, Work Plan for the Proposed MW-71R Pump-and-Treat System*, prepared by SSP&A and Metric, transmitted to USEPA and NMED by letter dated January 14, 2004 from Stavros S. Papadopulos of SSP&A.

[6] *Technical Review - Sparton Technology Inc. Former Coors Plant Remedial Program, Work Plan for the Proposed MW-71R Pump-and-Treat System, Sparton Technology, Inc. Albuquerque, New Mexico, EPA ID No. NMD083212332*, transmitted by letter dated August 10, 2004 from Charles A. Barnes of USEPA to Tony Hurst of Hurst Engineering Services, Project Coordinator for Sparton.

[7] *Notice of Dispute, Sparton Technology, Inc. Consent Decree, Civil Action No. CIV 97 0206 CH/JHG, EPA ID No. NMD083212332*, September 13, 2004 letter to the Plaintiffs from James B. Harris of Thompson & Knight, counsel to Sparton.

conference call, the parties agreed to abandon the plan for implementing a pump-and-treat system at MW-71R, and instead install a DFZ monitoring/stand-by extraction well near the off-site containment well CW-1. If the well is clean, it will be monitored for water-quality and water level; if the well is significantly contaminated, or becomes significantly contaminated during monitoring, it will be converted to an extraction well pumping about 50 gpm from the DFZ (see minutes[8] of conference call). This Work Plan presents additional information on the installation, testing, monitoring, and/or operation of this well.

WELL INSTALLATION

The proposed location for the well is shown in Figure 1. To prevent cross-contamination from shallower zones during installation, the well will be double cased. A 17-1/2-inch hole will be drilled to a depth a few feet below the bottom of the 4,800-foot clay. (During this drilling, the level of the drilling mud in the hole will be maintained near the land surface to preclude the migration of contaminated water from shallow zones to the DFZ.) A 10-inch diameter casing with centralizers at regular intervals will be installed in the hole and cemented in place by injecting 5 % bentonite-cement grout through the casing and up to the surface through the annulus. After the grout has set, a 9-7/8-inch hole will be drilled (using new drilling mud) through the 10-inch casing to an additional depth of 30 feet. A 6-inch diameter casing with a 30-foot screen will be lowered into the hole. The well will be completed with sand-pack against the screen and bentonite-cement grout between the 6-inch and the10-inch casing. All spent drilling mud will be stored at the source containment well (CW-2) staging area, sampled, and appropriately disposed based on the sampling results.

The well will be developed using standard development procedures. Water produced during initial development will also be stored at the CW-2 staging area to allow

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[8] Memorandum dated 10/20/2004 to Charles A. Barnes (USEPA), and Baird Swanson and Carolyn Cooper (NMED) from Gary L. Richardson (Metric) and Stavros S. Papadopulos (SSP&A) on the subject of *Sparton Technology, Inc., Former Coors Road Plant Remedial Program – Minutes of the October 13, 2004 Conference Call.*

for the settlement of most of the suspended materials, and then filtered and routed to the on-site treatment facility for treatment and return to the aquifer through the infiltration ponds. The settled materials will be disposed in the same manner as the drilling mud. Water produced in later stages of development will be filtered and routed to the off-site treatment facility for treatment and return to the aquifer through the infiltration gallery.

TESTING OF THE WELL

After the well has stabilized from the effects of development, a temporary pump will be installed in the well to conduct hydrogeologic tests for determining the sustainable pumping rate of the well and the effective transmissivity of the aquifer reflected by the screened interval of the well.

A step-test will be conducted to determine the sustainable pumping rate of the well. The test will consist of three two-hour steps at different pumping rates. Although actual rates will be determined in the field, it is anticipated that the rates for the test steps will be 25 gpm, 50 gpm, and 75 gpm, respectively. The step-test results will be evaluated to determine the appropriate pumping rate for a constant-rate pumping test on the well. During the test, the pumping rate will be monitored at 15-minute intervals by readings of a flow meter installed on the discharge line, and adjusted if necessary. A pressure transducer connected to a data logger will be installed in the well to monitor the water level in the well. The data-logger will be programmed to obtain measurements at logarithmic time intervals starting at the beginning of each step, and at the beginning of the recovery period after the test.

In preparation for the conduct of a constant-rate test, pressure transducers connected to data loggers will also be installed in the two existing DFZ monitoring wells MW-67 and MW-71R. The water levels in all three DFZ wells will be monitored for a period of two days to determine any water-level trends that may be present in the DFZ. A 24-hour constant-rate pumping test will then be conducted at the rate determined from the step-test data.

During the constant-rate test, the pumping rate will be monitored at 15-minute intervals during the first hour, 30-minute intervals during the next two hours, and at

hourly intervals thereafter. The data loggers in the three DFZ wells will be programmed to obtain measurements at logarithmic time intervals starting at the beginning of the test, and at the beginning of the recovery period that follows. During recovery, water levels will be monitored for at least a period equal to the pumping period. The data collected during this test will be evaluated to determine the effective transmissivity of the aquifer, and any other aquifer properties that may be reflected in the data and that may be relevant to the long-term operation of the well.

The water pumped during both tests will be conveyed to the off-site treatment facility for treatment and return to the aquifer through the infiltration gallery. Duplicate samples of the pumped water will be collected near the end of the constant-rate test, specifically at the 18th and the 21st hour into the test and just before the end of the test. One of the duplicate samples collected during each of these three sampling events will be sent to the laboratory for chemical analysis; the other duplicate samples will be preserved for later analysis, if this becomes necessary as discussed below. The samples will be analyzed for trichloroethene (*TCE*), 1,1-dichloroethene (*DCE*), and 1,1,1-trichloroethane (*TCA*) by USEPA Method 8260, and for dissolved chromium (both unfiltered and filtered samples) by USEPA Method 6010. The results of the three samples collected at three-hour intervals are not expected to be significantly different from each other; however, if the results of the analysis indicate significant differences between the samples, one or more of the duplicate samples will be analyzed to confirm the results. The average concentration of each detected contaminant will be determined using the results of the three original samples or the results of the samples that have been confirmed by duplicate analysis.

CRITERIA FOR USE AS MONITORING OR EXTRACTION WELL

The decision of whether the well will be used as a DFZ monitoring well (MW-79) or whether it will be operated as a DFZ extraction well (CW-3) will depend on the average concentrations determined from the samples collected during the constant-rate test and/or on the concentrations determined during the next several sampling events that

will be carried out under the Site's groundwater monitoring program. The following criteria will be used in making this decision:

1. If the average concentrations of all contaminants (if any) in the test samples are below the more stringent of their Maximum Contaminant Level (*MCL)* for drinking water or their maximum allowable concentration in groundwater set by the New Mexico Water Quality Control Commission (*NMWQCC*)[9], the well will be used as a monitoring well and put on a semi-annual sampling schedule;
2. If the average concentration of TCE (the dominant contaminant at the Site) in the test samples is above its MCL of 5 µg/L but less than 100 µg/L, the well will be put on a quarterly sampling schedule under the Site's groundwater monitoring program; if these conditions persist, or occur, during three consecutive sampling events, the well will be converted into an extraction well and will begin operating as soon as the conversion is complete;
3. If the average concentration of TCE in the test samples is above 100 µg/L but below 300 µg/L, the well will be put on a quarterly sampling schedule; if these conditions persist, or occur, during two consecutive sampling events, the well will be converted into an extraction well and will begin operating;
4. If the average concentration of TCE in the test samples is above 300 µg/L, the well will be converted into an extraction well and will begin operating;
5. If a sample collected during monitoring, indicates that water-quality conditions in the well have changed from those described in any of the above listed items to those described in another item, a second sample will be obtained from the well within a month of the first sample; if the results of this second sample confirm the change in conditions, then the actions described in the item corresponding to these new conditions will be implemented.

[9] Hereafter in this Work Plan, reference to the MCL for a contaminant will reflect the more stringent of its *MCL* for drinking water or its maximum allowable concentration in groundwater set by the *NMWQCC.*

CONVERSION TO AND OPERATION AS AN EXTRACTION WELL

If the water-quality conditions in the new DFZ well require its conversion to a DFZ extraction well (CW-3), the well will be equipped with a permanent pump capable of producing continuously at the rate of about 50 gpm. Piping will be installed to convey the pumped water to the off-site treatment facility where it will be blended with the water pumped from CW-1, treated, and returned to the aquifer through the infiltration gallery. If chromium concentrations in the blended water are higher than the limits specified in the Site's Groundwater Discharge Permit, chromium treatment will be added to the treatment facility. After the conversion is complete, the well will begin operating on a continuous basis.

The flow rate of the well will be monitored with a totalizing meter. The meter will be read at the same frequency as the meter for the off-site containment well CW-1 (an irregular frequency averaging about once every five days). The water level in the well will be measured quarterly during the regular quarterly measurement rounds at the Site. Samples of the water pumped from the well and of the influent and effluent from the treatment plant will be obtained weekly during the first month of operation, and monthly thereafter. The samples from the well will be analyzed for TCE, DCE, TCA, and total chromium; the influent and effluent samples will be analyzed for these constituents but also for iron and manganese as required by the Site's Groundwater Discharge Permit.

REQUIRED PERMITS

A list of the permits and agreements, and of the approvals that will be required to implement the installation of a new DFZ well and to operate the well as an extraction well as described in this Work Plan is presented below:

Permit/Agreement	Approving Agency
Access Agreement for City Park	City of Albuquerque
Modifications to Groundwater Discharge Permit DP-1184	NMED Groundwater Bureau
Water Rights Permit	New Mexico State Engineer's Office

To access the site for the installation of the new DFZ well a drilling rig must go through a park owned by the City of Albuquerque. Application to obtain an Access Agreement from the City will be made upon approval of this Work Plan by USEPA and NMED. It is expected that approval of the modifications to the Groundwater Discharge Permit may take about six months; therefore, application to modify the permit[10] will also be made upon approval of the Work Plan rather than waiting until a decision has been made to operate the well as a DFZ extraction well. The application for a Water Rights Permit, however, will be made after this decision.

SCHEDULE

Arrangements for the installation of the new DFZ well, and the implementation of the actions described in this Work Plan will be made upon approval of the Work Plan by USEPA and NMED. A schedule for the installation, testing, and sampling of the well and for the evaluation of the data, starting with the approval of this Work Plan and leading to the decision on whether the well will be used as a monitoring well or converted to an extraction well, is shown in Figure 2a. As shown in this figure, this phase of the Work Plan can be completed within 24 weeks (about 6 months) after the Work Plan approval by the agencies. As discussed earlier, the decision to convert the well to an extraction well, and the timing of this decision will depend on the analytical results for samples from the well. The decision could be based on the samples obtained during the testing of the well, or on samples collected for two or three quarters, or on samples collected after several years. A schedule for converting the well to an extraction well, after such a decision has been made, and begin its operation is shown in Figure 2b. As shown in this figure, this conversion could be accomplished within 4 weeks after the decision and the well could begin operating during the fifth week. Note that, if the decision to convert to an extraction well is made after the first samples from the well (the

[10] Sparton applied for the renewal of the Groundwater Discharge Permit DP-1184 about two years ago; however, a new permit has not yet been issued. If approval of this Work Plan is received before the new permit is issued, an attempt will be made to incorporate any modifications needed to accommodate the potential discharge from the DFZ well into the new permit.

test samples) have been analyzed, the schedule in Figure 2b assumes that modifications to the Discharge Permit have also been approved by that time, as shown in Figure 2a.

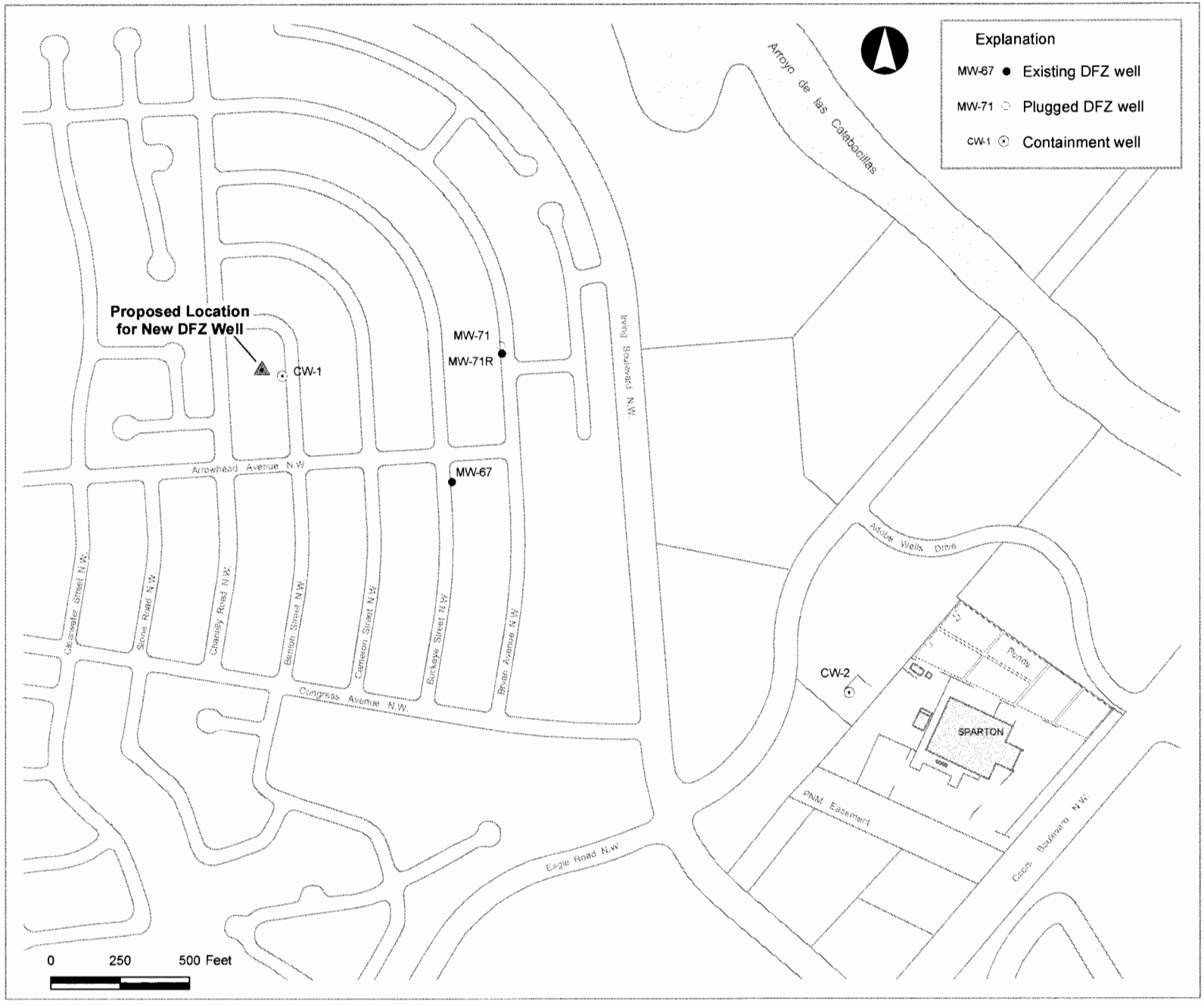

Figure 1 Proposed Location of the New DFZ Well

Figure 2a Schedule for the Installation, Testing, and Sampling of the Well

(Period between Work Plan Approval and Decision on Well Use)

Task	Description	Duration, weeks	Weeks after Approval of the Work Plan
1	Obtain City Access Approval	9	
2	Obtain State Discharge Permit Modification Approval	25	
3	Prepare Well Specs	2	
4	Schedule Driller	4	
5	Drill Well	4	
6	Pump Test and Sample Well	2	
7	Evaluate Pump Test Results	4	
8	Obtain Analytical Results	4	
10	Decision to Monitor or Convert to Extraction Well	1	

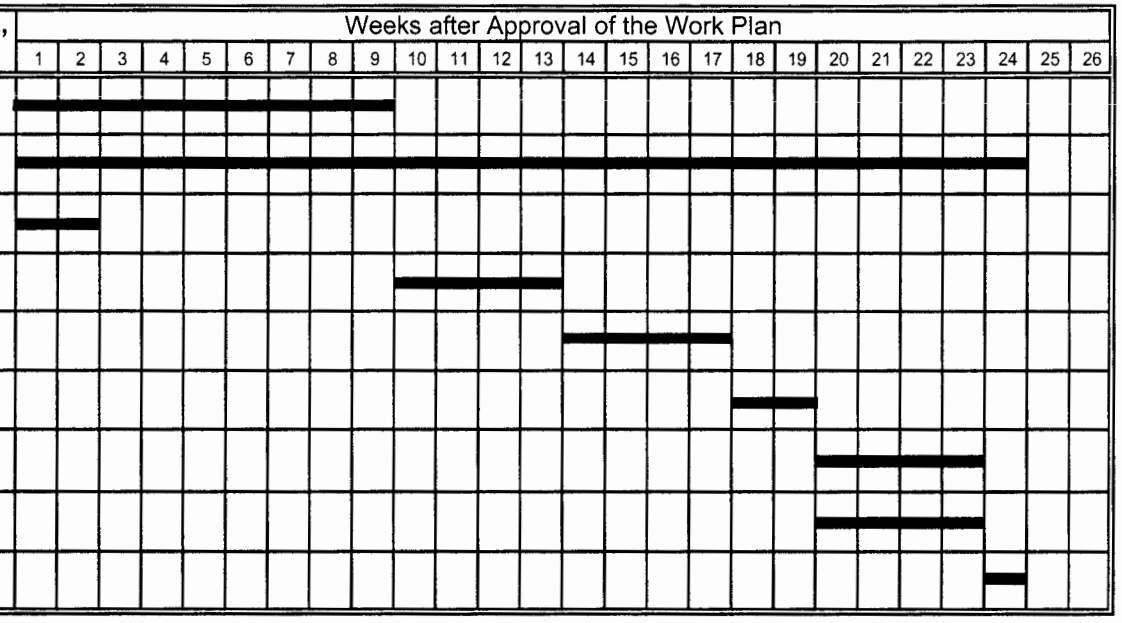

Figure 2b Schedule for Converting Well to an Extraction Well

(Period between Decision to Convert to an Extraction Well and Start of Operation)

Task	Description	Duration, weeks	Weeks after Decision to Convert
1	Obtain State Emergency Water Rights Permit	4	
2	Order/Install Pump	2	
3	Obtain Construction Permits	2	
4	Install Piping and Modify Pump House	2	
5	Begin Well Operation	0.2