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J.N. M8R0209C
September 15, 1988

CITY OF REDLANDS
P.O. Box 280
Redlands, CA 92373

Attn: Mr. Richard Corneille

Subj: **Proposal for Subsurface Evaluation of Salt Brine Contamination**
Brine Evaporation Pond, Redlands Wastewater Plant
Redlands, California

Gentlemen:

It has been requested by Mr. Corneille to submit a response to a request from the California Regional Water Control Board, Santa Ana region, to evaluate salt brine contamination at the referenced facility. To develop an appropriate work program a meeting was held with the above individual to determined the approach the city wished to take regarding the investigation. The directive received was to establish the vertical and relative lateral extent of salt brine contamination above the specified action levels and develop options for its mitigation as required by the referenced agency.

BACKGROUND INFORMATION

During September of 1986, Pioneer Consultants was authorized to perform a preliminary assessment of the integrity of the salt brine impoundment at the referenced facility. The intent was to establish if leakage had occurred and whether terminating the use of the pond through abandonment would be the most logical step to pursue. Additionally, the information contained within this report was to develop a preliminary assessment as to whether the impoundment would meet the guidelines imposed by the California administrative code, Title 23 Waters, sub-chapter 15 of chapter 3. That report was submitted on September 30, 1986.

The finds of the referenced report indicated the salt brine had leaked from the impoundment generating soil salt concentrations above current basin objectives imposed by the referenced agency

Should it be necessary to install a monitoring well, as described above, the well, upon completion, will be developed in accordance with specified EPA procedures. Upon establishing an appropriate level of production, water samples will be collected for chemical analysis in conjunction with field measurements of electrical conductance.

Prior to advancing all exploratory borings for collection of surface samples drilling and sampling equipment will be decontaminated with the use of a pressurized hot water cleaner. Between each individual sample drive within a particular bore hole, the sampling equipment will be decontaminated with the use of a TSP solution scrub and double rinsing with distilled water. All wastewater collected from this operation will be contained on site for our client's disposal.

In addition to the drilling activities conducted by this firm, monitoring well have been previously established on site by Harding Lawson Associates in January, 1988, for use in the solid waste assessment report for the adjacent landfill. Water samples will be collected and analyzed from these wells through that firms work to comply with quarterly monitoring. The information obtained by that firm will be utilized to evaluate the impact subsurface brine contamination has had on the overall water quality of the first encountered groundwater aquifer.

LABORATORY ANALYSIS

Within the laboratory, selected and composite samples will be analyzed to determine the electrical conductance of a soil and distilled water extract at a ratio of one to two, respectively. Additionally, peak concentrations of salt brine identified by this procedure, in the near surface soils, will be analyzed to determine the presence and concentration of CAM metals. This information will be utilized to classify the materials contained the impoundment for appropriate designation for disposal. All analysis will be conducted by a state certified laboratory, assumed at this time to be Centrum Analytical Laboratory in Redlands, California.

We propose at this time to place four to five exploratory bore holes within the impoundment bottom through the liner. The holes will be advanced in the vertical fashion, located at any visible rips or tears in the liner or at a random selected location. Tentative placement is provided on Exhibit 1, attached.

During the advancement of each rotary flight auger boring, samples will be collected at five foot intervals with a California modified split spoon sampler or alternate sampling device, as dictated by subsurface conditions. The samples will be evaluated at the time of collection in the field by performing quick extractions of the salt contained within the soil at a dilution ratio, that will need to be established by the Water Quality Control Board. Previous ratios of 1 part soil to 2 parts water and 1 part soil to 5 parts water have been used. These water samples will be tested using a YSI model no. 32 conductance meter to establish preliminary salt concentrations at the time of drilling. This information will be utilized to designate acceptable exploratory boring depths. It is anticipated at this time that the borings will be advanced to at least fifteen to twenty feet beyond achieving concentrations of 2000 micromohs per centimeter or until groundwater is contacted, whichever is less. Each of the samples retained by this method will be packaged in accordance with current regulatory procedures. The samples will be placed into an appropriate storage containers and retained for analysis by our representative.

At the completion of each boring to it's designated depth, the resulting bore hole will be backfilled with a bentonite plug, specifically Beroid Hole Plug, from the base of the boring to the existing ground surface. The near surface hole plug will be hydrated to develop an appropriate seal. All drilling cuttings will be left on site for ultimate disposal at some future date by our client. However, if groundwater is contacted within the exploratory borings and it is determined that electrical conductance through field analysis is above designated concentrations, a single monitoring well will be established in the most down gradient location in accordance with the design specifications presented on Exhibit 2 at 1 to 2 locations.

of 2000 micromohs per centimeter. The exact extend of the salt brine contamination was not completely evaluated. However, two wells installed, (one up-gradient, one down-gradient), did not contain groundwater which had a conductance above the basin objective or out of line with regional anticipated salt concentrations. However, the exact impact of the overlying salt brine contamination on the water table was not completely assessed.

Subsequent to submittal of the referenced report the City of Redlands determined that abandonment of the impoundment was in the best interest of the city. Appropriate notification was given to the users of the pond, and termination occurred, as we understand, during April of 1987. The pond has not been used since that date and we are informed at present that it is dry.

A directive was received from the California Regional Water Quality Control Board authored by Ms. Dixie Lass, which indicated that an additional investigation would be required at the impoundment. The work was to establish the extent of the salt brine contamination and to develop recommendations for it's mitigation where concentration exceeded the basin objective of 2000 micromohs per centimeter, based upon electrical conductance. In response to this request, an appropriate work program has been developed and presented below.

PROPOSED FIELD INVESTIGATIVE PROGRAM

The brine pond in question measures approximately 180 feet in width and 210 feet in length. The pond it contains within it's area a synthetic liner which was used for retention of the fluids contained therein. The previous subsurface investigation performed by Pioneer Consultants was designed so as not to penetrate the implaced liner generating leakage. This was conducted by performing four angle borings around the periphery of the pond, and two groundwater wells, one up-gradient, and one down-gradient. This information indicated peak concentrations of salt brine contamination were identified along the western and southern portions of the impoundment. This area will be focused on during future subsurface work.

REPORT

A report shall be prepared based upon the field and laboratory data collected. This information will be utilized to establish the vertical and potential lateral extent of salt brine contamination above the 2000 micromohs per centimeter criteria used by the regulatory agencies involved. Concentration profiling with depth will be performed utilizing all available information. An assessment of the impact of the underlying groundwater table by migrating salt solutions will also be performed.

The end resultant of the project will be development of a closure plan that will establish viable options for the mitigation of salt brine contamination above regulated concentrations. These formalized recommendations will need to be discussed with the California Regional Water Quality Control board and the County of San Bernardino, to assess the practical options available. The particular options which will be pursued will be for the excavation of high concentration of salt brine contamination and disposal at some designated location with minimal hall distance and disposal cost. Particularly use as a road base, building foundation material, or landfill final cover base. In conjunction with these removal options, the viability of in-situ encapsulation or negotiated concentrations for residual contamination will also be discussed with the regulatory agencies, to pursue all available options.

TIMING

With regard to timing, we will be able to initiate this work within three to five days of notification to proceed. The timing required to complete all of the activities listed above and to submit a final report for your report, would be three weeks from the date the work is initiated.

FEES AND CONDITIONS

Our services will be performed under the conditions indicated with the attached Exhibit A - Conditions.

The fees for our services will be based upon the rates indicated on the attached Exhibit B - Schedule of Fees. The fees for the scope of work described hereon are estimated at $16,925, without the additional charges provided below and on attachment C - Cost Estimate. It should be noted herein, that the variabilities involved with this project, specifically, the need for monitoring well installations, the depth of exploratory borings, bore hole grout backfill and the amount of regulatory contact required for development of appropriate options for mitigation will lead to variability in the cost estimate. As the project progresses, we will keep the client apprised of the charges for budgeting and contractual purposes.

The costs provided herein do not include cost for containment or disposal of contaminated materials generated from the drilling and well production operation. It is assumed that these materials will be left on site for our client's disposal with drums provided by our client for the containment of wastewater generated from well development and decontamination. If it is your desire for our firm to provide these containment vessels, a charge of $45.00 per drum will be added to the project.

It is assumed that after submittal of the report for your review, meetings will be desired to discuss the available options and to present the report to the water quality control board for their final approval and acceptance. Due to the unknown number of meetings required and the duration of time, one meeting has been budgeted for. It is assumed that a addtional meeting will be charged at the fee schedule rates provided herein.

CLOSURE

Thank you for the opportunity to be of service. Should you have any questions regarding the scope, schedule, or costs of the services described herein, please do not hesitate to contact our office at your convenience.

Please indicate that you have read this proposal, including Exhibits 1 and 2, that you fully accept the scope of services,

authorization to proceed and complete the scope of services by signing the authorization title block in the space provided on the signature page and initialing Exhibits 1 and 2, and returning one signed copy to Schaefer Dixon Associates.

Upon receipt of your acceptance and authorization of this proposal, we shall commence with the scheduling of our work.

Respectfully submitted,

SCHAEFER DIXON ASSOCIATES

Kyle D. Emerson, C.E.G. 1271
Associate

Dean M. White, P.E.
Redlands Branch Manager

KDE/DMW:dmv
Attachments
Addressee (2)

AUTHORIZATION AND ACCEPTANCE OF CONDITIONS

(Signature)	City of Redlands (Firm)
Mayor (Title)	October 5, 1988 (Date)

P. O. Box 2090, Redlands, CA 92373 714-798-7500
(Address/Telephone)

ATTEST:

City Clerk

The Client agrees to review the data, interpretations and recommendations of SDA and notify SDA in writing of such of any failure of SDA to achieve the above standard of care prior to utilizing said data. Within the written project description, objectives of SDA services, and scope of work under this Agreement, SDA shall at SDA's expense, perform remedial professional services as required to achieve the above standard of care.

Client recognizes that subsurface conditions may vary from those encountered at the location where borings, surveys, or explorations are made by SDA and that the data, interpretations and recommendations of SDA are based solely on the information available to SDA. SDA shall not be responsible for the interpretation by others of the information developed. All data obtained during the investigation phase are subject to confirmation of conditions encountered during construction.

Client recognizes that the scope of work under this Agreement is limited by Client's budget for services, and that a more detailed and extensive scope of work at greater cost to the Client may yield more accurate and reliable information regarding conditions at or near the site. Nevertheless, Client recognizes and assumes the inherent risk of the scope of work performed under this Agreement.

Client warrants that all information, studies, plans, specifications, description of underground utilities, or other materials supplied by Client to SDA for SDA's use in completing its services under this Agreement are accurate and sufficient for use by SDA in that SDA can reasonably rely on their sufficiency and accuracy.

Hazardous Materials

The services provided by SDA may require subsurface exploration in areas where the presence of hazardous materials may be discovered. By entering into this Agreement, Client acknowledges and warrants that Client has no knowledge or reason to suspect that hazardous materials are present at the subject site. In the event that hazardous materials are present, whether known or unknown as such by SDA, Client agrees to indemnify, defend and hold harmless SDA, its officers, employees and agents from all claims whether alleged to be as the result, in whole or in part, the fault of SDA in providing their services that involves in whole or in part the presence of hazardous materials. Client also agrees to compensate SDA for time and expenses incurred by SDA in defense of any claim; for storage, transportation and disposal of contaminated samples; disposal of contaminated consumables and decontamination of equipment. All such compensation shall be based upon SDA's prevailing Schedule of Fees.

SDA reserves the right to unilaterally suspend or terminate all services under this Agreement at its sole discretion in the event hazardous materials are discovered. If SDA services are terminated or suspended, SDA agrees to negotiate in good faith a new agreement to continue to meet Client's needs.

Limitation of Liability

SDA'S aggregate liability for damages arising out of the professional services rendered hereunder, whether arising out of tort or contract, is limited to an amount not to exceed $50,000 or the total gross billings of SDA to Client hereunder, whichever is less. Client shall release, defend and indemnify SDA from and against all further liability beyond the above amount, whether arising in contract or otherwise.

Insurance

SDA represents and warrants that it shall maintain in force during the period that services under this Agreement are provided, workers compensation insurance as required by law and Comprehensive General Liability Insurance with aggregate limits of $1,000,000. Costs of special insurance, if available, requested by the Client including, but not limited to, an increase in policy limits and naming additional insured parties on policies of SDA will be charged at cost plus 15%. Evidence of the existence of the above-described insurance, on forms acceptable to the insurer, will be provided to client upon request in writing.

Ownership of Documents

All reports, boring logs, field data and notes, laboratory test data, calculations, estimates and other documents prepared by SDA, as instruments of service, shall remain the property of SDA. Client agrees that all reports and other work furnished to the client or its agents, which are not paid for, will be returned upon demand and will not be used by the Client for any purpose whatsoever.

Disputes

In the event that a dispute arises relating to the performance of the services to be provided under this Agreement, and should that dispute result in litigation, it is agreed that the prevailing party shall be entitled to recover all reasonable costs incurred in connection with such dispute, including SDA's staff time at SDA's Schedule of Fees in effect at the time of such dispute, court costs, attorney's fees and all other claim-related expenses.

Neither the client nor SDA may delegate, assign, sublet or transfer his or its duties or interest in this Agreement without the prior express written consent of the other party.

Testing Charges

Charges for laboratory testing include labor and an additional overhead fee to account for laboratory equipment, maintenance and supplies. Charges for rental of specialized laboratory equipment and tests contracted to others are charged at cost plus 15%.

For routine tests on common soils, unit testing charges may be estimated as follows:

Concrete

Compression Test (includes mold, cap, test and report)	
Normal weight, 6 × 12 cylinder	13.00
Lightweight, 6 × 12 cylinder, includes density	35.00
Core sample, delivered to lab	35.00

Masonry

Compression Test: Grout & Mortar	$ 15.00
Brick	$ 40.00
Block (8″ × 8″ × 16″)	$ 45.00

Asphalt

Asphaltic Stability Test, Premixed	$ 75.00
Marshall Stability Test, Premixed	$100.00
Extraction Percent Asphalt	
without gradation	$ 70.00
with gradation	$110.00

Aggregates

Sieve Analysis	
Fine	$ 40.00
Coarse	$ 40.00
Oversized	$ 80.00
Specific Gravity & Absorption	$ 40.00

Steel

Reinforcing Steel	
Tension, Bend & Physical Measurement	$ 50.00
Structural Steel	
Tension & Bend (coupon prep. not included)	$ 40.00

Soil

Moisture Content	$ 15.00
Particle Size Analysis	$ 40.00
Including Hydrometer	$100.00
Plasticity Index	$ 40.00
Maximum Density — Optimum Moisture	
Full Curve	$100.00
Checkpoint	$ 15.00
Specific Gravity	$ 40.00
Expansion Index	$ 70.00
Consolidation — One Dimensional	$120.00
Direct Shear — Three Loads (Specimens)	$100.00
Triaxial Shear	Will Quote
Permeability	Will Quote
R-Value	$150.00
Sand Equivalent	$ 45.00

If samples are untestable as received from the field, an additional hourly sample preparation fee will be charged at the technicians regular hourly rate.

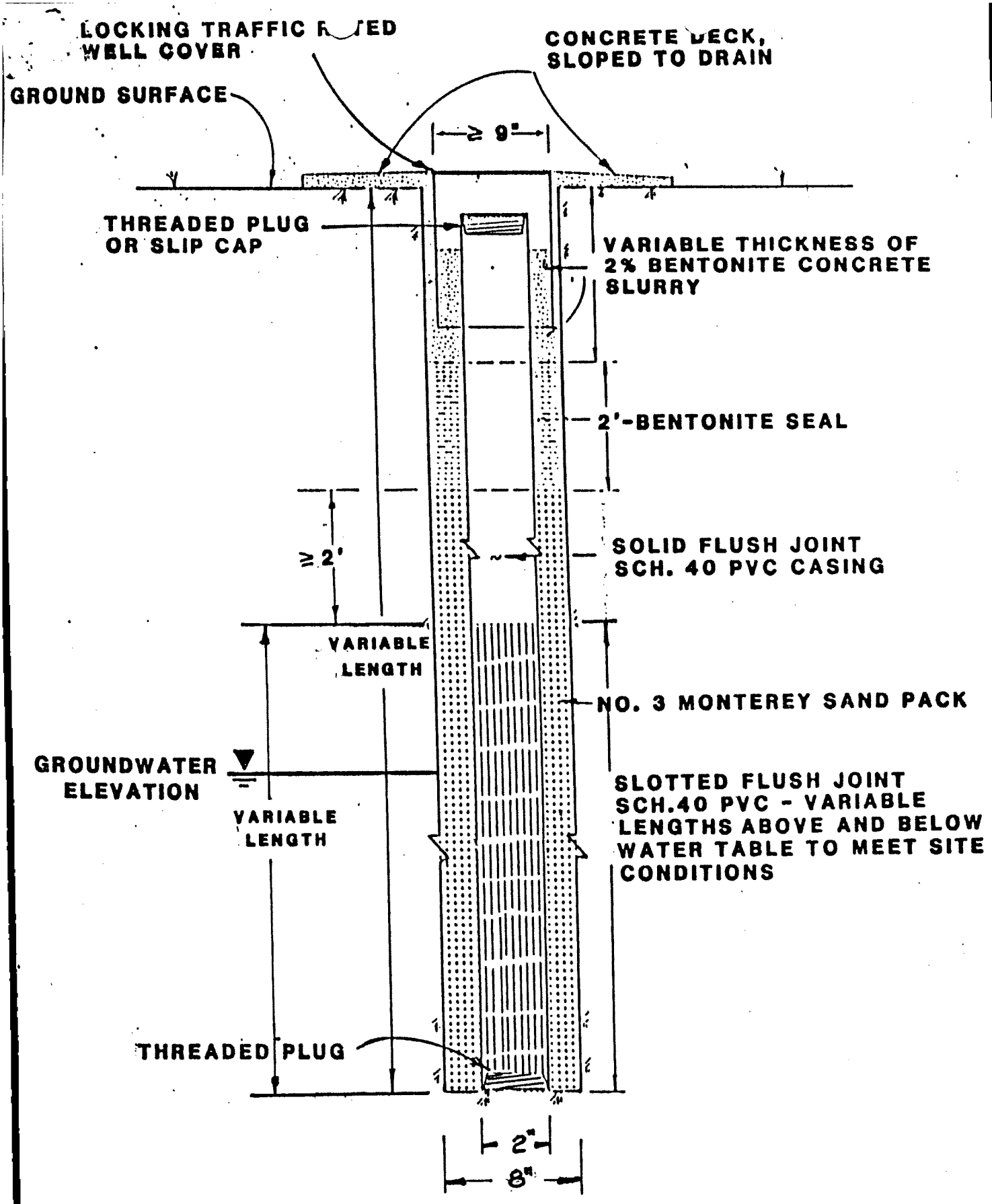
This schedule includes the tests most often requested. A detailed schedule listing all laboratory tests performed is available on request.

City of Redlands
Brine Pond
(Attachment C)

Drilling:	5 holes to 80 feet or refusal	
Soil Borings	25 hours drilling @ $130/hour	= 3250
	25 hours service truck @ $25/hour	= 625
	Steam Cleaner @ $100/day	= 300
Well Installation		
	1 well x (assumed 100 feet) x 40.00/ft	= 4000
Soil boring backfill 5 borings to 80 feet @ 8.00/ft		= 3200
Field Time:		
	Geologist	= 1950
	Vehicle	= 150
	Supplies	= 100
	Conductivity Testing (field)	= 200
		2400
Laboratory:		
	Conductivity test: Eight per boring @ $10/each	= 400
	CAM metals 1 per boring @ $240/each	= 1200
	TDS 1 per boring @ $50	= 250
		1850
Report Preparation with Recommendations with one final meeting		= 1300
	TOTAL	$16,925

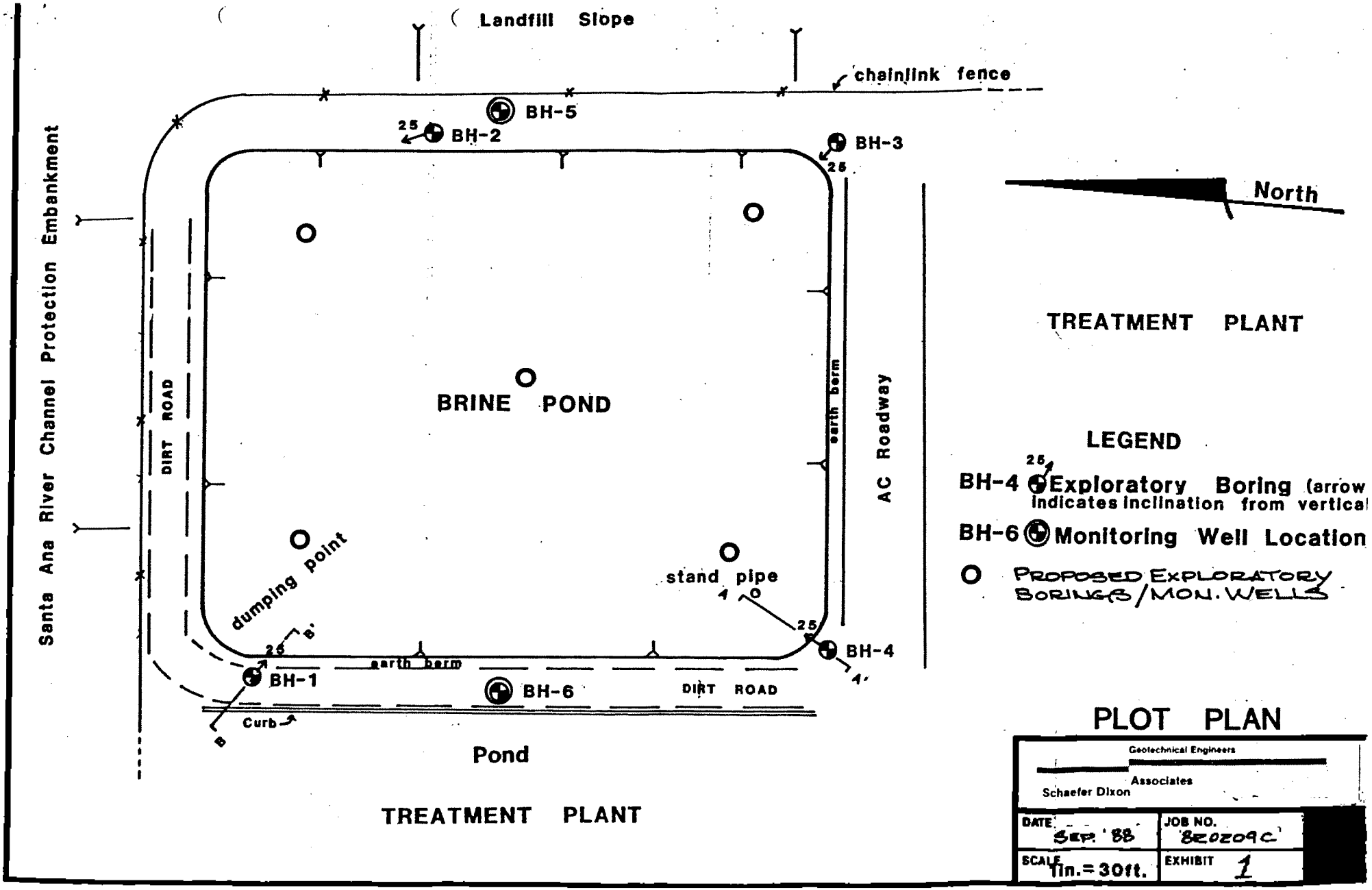
NOTE: Charges do not include costs for containment or disposal of contaminated drilling cuttings or waste water. Charges are not included for meetings beyond one final meeting with the client or water quality board.

Charges may be adjusted to a lower total dependent upon the volume of needed bentonite backfill and the single well installation.



TYPICAL MONITORING WELL DESIGN

Geotechnical Engineers Schaefer Dixon Associates	DATE SEPT. '88	JOB NO. 8R0209C	
	SCALE NONE	EXHIBIT 2	


Landfill Slope
chainlink fence
BH-5
BH-2
25
BH-3
25
North
Santa Ana River Channel Protection Embankment
DIRT ROAD
BRINE POND
earth berm
AC Roadway
TREATMENT PLANT
LEGEND
BH-4 Exploratory Boring (arrow indicates inclination from vertical
BH-6 Monitoring Well Location
O PROPOSED EXPLORATORY BORINGS/MON. WELLS
dumping point
stand pipe
25
BH-4
BH-1
earth berm
BH-6
DIRT ROAD
Curb
Pond
TREATMENT PLANT
PLOT PLAN
Geotechnical Engineers
Schaefer Dixon Associates
DATE Sep. '88
JOB NO. 8E0209C
SCALE 1in.=30ft.
EXHIBIT 1