R.T. NAHAS COMPANY *Since 1947*
REAL ESTATE DEVELOPERS AND INVESTORS

20630 PATIO DRIVE
CASTRO VALLEY, CALIFORNIA 94546
TELEPHONE (510) 538-9600
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December 13, 1995

Mr. Scott Seery
Hazardous Materials Specialist
Alameda County Health Care Services
1131 Harbor Bay Parkway, Room 250
Oakland, CA 94502-6577

Dear Scott:

Enclosed is a Feasibility Study for the Unocal Station on Redwood Road. Since Alex was out of town for the last month and a half, Frank Tien's insurance company hired Phillip Environmental to prepare a Corrective Action Plan outline as we are in the middle of negotiating with the insurance companies over clean-up costs.

I guess the next thing is for BSK, you and me to meet and discuss the direction of the final Corrective Action Plan.

Please let me know of your desires.

Sincerely,

Randall E. Nahas

REN/hrs

Enclosure

BSK
1181 Quarry Lane, Building 300
Pleasanton, CA 94566
(510) 462-4000 • FAX (510) 462-6283

December 11, 1995

BSK Job No. 04-40-0027

Mr. Randall E. Nahas
R.T. Nahas Company
20630 Patio Drive
Castro Valley, California 94546

Subject: Feasibility Study
Soil and Groundwater Remediation
Tien's Unocal Station
20405 Redwood Road
Castro Valley, California

Dear Mr. Nahas:

BSK & Associates, Inc. (BSK) is pleased to present this report for a Feasibility Study for the Unocal Station located at 20405 Redwood Road in Castro Valley, California. As required by the Alameda County Environmental Protection Division (ACEPD) in their letter of April 13, 1995, the Feasibility Study and Corrective Action Plan would be prepared in accordance with Article 11 (Corrective Action Requirements), Title 23, California Code of Regulations.

The purpose of this Feasibility is to evaluate the feasibility and suitability of corrective action alternatives based on our assessment of the impacts, the characteristics of the contaminant, and the hydrogeological conditions at the site. Using the findings of this Feasibility Study, a Corrective Action Plan would be formulated.

Respectfully submitted,
BSK & Associates

Martin B. Cline, R.G.
Geologist

for
Richard E. Johnson, C.E.G.
Manager, Environmental Services

MC/REJ: (REP\ENV\NAHAS\04400027.FS1)

R0-295

BSK & ASSOCIATES
GEOTECHNICAL CONSULTANTS, INC.
BSK JOB NO. 04400027

Feasibility Study
Soil and Groundwater Remediation
Tien's Unocal Station
20405 Redwood Road
Castro Valley, California

December 11, 1995

BSK

Engineers, Geologists,
Environmental Scientists

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TIEN'S UNOCAL STATION
20405 REDWOOD ROAD
CASTRO VALLEY, CALIFORNIA

1.0 INTRODUCTION

This report presents the findings of our Feasibility Study of remedial alternatives for the clean-up of soil and groundwater at Tien's Unocal Station located at 20405 Redwood Road in Castro Valley, California. Figure 1, the Site Vicinity Map, illustrates the location of the site. This report contains a summary of our study, as well as a summary of the findings of our Aquifer Pump Test conducted at the Site.

Site information is as follows:

Site Name and Location:	Tien's Unocal Station 20405 Redwood Road Castro Valley, California
Property Owner and Contact:	Mr. Randall E. Nahas R.T. Nahas Company 20630 Patio Drive Castro Valley, California 94546

2.0 PROBLEM SUMMARY

BSK & Associates installed three groundwater monitoring wells (MW-2, MW-3 and MW-4) in December 1989 at the Unocal 76 Service Station located at 20405 Redwood Road, Castro Valley, California. The service station location is shown on Figure 1, Vicinity Map. The monitoring facilities were installed in order to comply with the California UST Monitoring requirements of Alternative 6, Subchapter 16, Title 23, California Code of Regulations. The results of well installations, soil sampling and chemical testing of the soil and water samples were summarized in our Report P89134, dated February 5, 1990. An area of soil and groundwater contamination was discovered during installation of groundwater monitoring wells in the vicinity of the southwest corner of the underground gasoline tank cluster. The groundwater monitoring well locations are shown on Figure 2, Site Plan. In a letter dated April 13, 1995, Alameda County Health Care Services requested that a corrective action plan (CAP) be prepared for the Site.

2.1 SOIL CONTAMINATION

BSK performed an assessment of the lateral extent of shallow soil contamination in April 1991 (see our Report P90165, dated April 1991). During the investigation, shallow soil contamination was observed to occur from the pump islands, on the north, to the south property boundary, and within the east and west property boundaries.

A summary of analytical results of the soil samples are present below in Table 1. The locations of the soil borings are presented on Figure 2, Site Plan.

TABLE 1
SUMMARY OF ANALYTICAL RESULTS - SOIL SAMPLES
Results in milligrams per kilogram (mg/kg)

Sample Location	Depth (feet)	THP as Gasoline	Benzene	Toluene	Xylene	Ethyl-Benzene	TPH as Diesel	Oil and Grease	Total Lead	EPA 8010 Compounds
MW-1	5	ND	ND	ND	ND	ND	--	--	--	--
MW--1	10	89	1.8	7.8	20	3.8	--	--	--	--
MW-1	15	ND	0.09	ND	ND	ND	--	--	--	--
MW-1	19	ND	ND	ND	ND	ND	--	--	--	--
MW-1A	5	ND	ND	ND	ND	ND	ND	--	ND	--
MW-1A	10	110	2.2	11	25	5.4	50*	--	ND	--
MW-1A	13	11	0.64	0.71	3.5	0.64	ND	--	ND	--
MW-1A	16.5	ND	ND	ND	ND	ND	ND	--	ND	--
MW-2	5	ND	ND	ND	ND	ND	--	--	--	--
MW-2	10	ND	0.05	ND	0.03	ND	--	--	--	--
MW-2	15	ND	ND	ND	ND	ND	--	--	--	--
MW-2	20	ND	ND	ND	ND	ND	--	--	--	--
MW-3	5	ND	ND	ND	ND	ND	--	--	--	--
MW-3	10	ND	ND	ND	ND	ND	--	--	--	--
MW-3	15	92	ND	ND	4.0	0.97	--	--	--	--
MW-3	19	ND	ND	ND	ND	ND	--	--	--	--
MW-4	5	--	ND	ND	ND	ND	--	--	--	--
MW-4	5	--	--	--	--	--	ND	ND	--	ND
MW-4	8.5	--	ND	ND	ND	ND	ND	ND	--	ND

TABLE 1 (Continued)

Sample Location	Depth (feet)	THP as Gasoline	Benzene	Toluene	Xylene	Ethyl-Benzene	TPH as Diesel	Oil and Grease	Total Lead	EPA 8010 Compounds
MW-4	13	--	ND	ND	ND	ND	ND	ND	--	ND
SB-1	14.5	ND	0.05	0.03	ND	0.06	--	--	--	--
SB-2	10.5	440	4.5	18	11	55	--	--	--	--
SB-2	13	810	5.3	4.2	13	76	340	--	ND	--
SB-3	13.5	15	0.09	0.18	0.19	1.1	ND	--	ND	--
SB-3	17	ND	ND	ND	ND	ND	--	--	--	--
SB-4	14	ND	0.09	0.18	0.19	1.1	ND	--	--	--
SB-5	14.5	ND	ND	ND	ND	ND	--	--	--	--
SB-6	15	310	0.8	15	6.2	36	--	--	--	--
SB-8	20.5	ND	ND	ND	ND	ND	--	--	--	--
SB-10	16	ND	ND	ND	ND	ND	--	--	--	--
SB-11	10.5	31	0.09	0.03	0.49	1.8	--	--	--	--
SB-12	15.5	ND	ND	ND	ND	ND	--	--	--	--
SB-13	10.5	1100	5.5	67	27	140	--	--	--	--
SB-13	14	530	7.8	48	14	73	--	--	--	--
SB-14	21	ND	ND	ND	ND	ND	ND	--	--	--
SB-15	20.5	ND	0.007	0.008	ND	ND	3.0	--	--	--
MW-5	21	ND	ND	ND	ND	ND	ND	--	--	--
MW-6	16	ND	ND	ND	ND	ND	ND	--	--	--
MW-7	15.5	ND	ND	ND	ND	ND	ND	--	--	--
SP-1	16	ND	0.18	ND	0.055	0.075	--	--	--	ND
SP-2	14	9	0.14	0.52	1.0	0.19	--	--	--	ND
MW-101	10	120	ND	0.95	11	2.1	--	--	--	--
MW-101	15	63	ND	1.5	9.8	0.87	--	--	--	--

The estimated volume of hydrocarbon impacted soil with analytical results greater than 10 mg/kg, beneath the subject site, extending to the south property boundary is 3,800 cubic yards. The estimated volume of hydrocarbon impacted soil with analytical results greater than 100 mg/kg beneath the subject site is 1,600 cubic yards.

2.2 GROUNDWATER CONTAMINATION

The seventh quarterly monitoring report included the results of additional lateral contamination characterization in the off-site area to the south (BSK Report P92057.3, dated May 29, 1992). This report indicated the extension of a groundwater contaminant plume south of the site, between Wells MW-6 and MW-5, but north of MW-7. Wells MW-5, MW-6 and MW-7 were installed during this investigation. In our Special Sampling Report of December 23, 1992, BSK determined that concentrations of Total Petroleum Hydrocarbons as Gasoline (TPHg) at MW-7 were related to Perchloroethene contamination, possibly emanating from a nearby dry cleaner.

Petroleum hydrocarbons as gasoline present in the groundwater from well MW-2 have ranged from 5,200 ug/l to none detected during the period of August 1990 to September 1995. TPHg levels in MW-3 have ranged from 3,600 ug/l to none detected during the period of August 1990 to September 1995.

As part of this Feasibility Study a groundwater extraction well (MW-101) was installed south of the gasoline USTs. Analytical results indicate that TPH-g is present at levels of 9,400 micrograms per liter (ug/l) in the groundwater sample collected subsequent to well development.

3.0 SOIL REMEDIATION

The objective of the remediation of the soil is to remove or control the source of groundwater contamination resulting from a release of petroleum hydrocarbons on the subject property. The clean-up level should be agreed upon by the property owner and the local enforcing agency, Alameda County Health Care Services. Cost estimates for two levels of clean-up (10mg/kg and 100mg/kg) are provided for comparison.

Evaluation of appropriate corrective action techniques for soil remediation are presented for various applicable alternatives, as listed below.

1) Soil Vapor Extraction

2) In-situ Bioventing

3) Excavation &:
   Off-haul/disposal

Ex-situ biotreatment
Ex-situ thermal treatment

Each of the remedial alternatives were evaluated based on the following criteria:

1) Applicability to specific site conditions and to the contaminant (gasoline) in the soil.
2) Attainable clean-up levels with the specific alternative.
3) Estimated time to reach clean-up goal.
4) Potential site impact to existing and planned land use.
5) Liability (short-term and long-term) associated with the alternative.
6) Order-of magnitude capital and operating costs.

3.1 Soil Vapor Extraction

3.1.1 Applicability

Soil Vapor Extraction (SVE) is a remediation technique that removes volatile compounds from the subsoils via extraction wells or trenches. Peak performance from a SVE system is typically found in relatively high permeability soils and efficiency is lost to fine-grained soils with low air-permeability. The radius of influence of vapor extraction wells is relatively small in fine-grained soils, resulting in a high number of extraction wells to induce vapor flow and thus remove petroleum hydrocarbons. The low flow rates associated with fine-grained soil may result in long clean-up times to acheive the desired result. The shallow groundwater may present a problem by limiting the depth of the vapors wells. De-watering during operation would likely be required, but would add substantial costs to the system. In order to eliminate the possibility of the drawing perchloroethene, which is present in the groundwater south of the site, during de-watering, a hydraulic barrier would be required on the south property boundary. Based on site conditions (soil type and depth to groundwater) SVE is likely not a viable option due to likely low vapor flow rates. Actual SVE performance can be evaluated based on a pilot study.

3.1.2 Clean-up Level

SVE would likely result in less than complete removal of petroleum hydrocarbons in a reasonable time frame. The removal of low levels of petroleum hydrocarbons would be controlled by the rate of dispersion of the hydrocarbons present in the subsoils. SVE may be effective in reducing the concentrations by an order of magnitude.

3.1.3 Time Frame/Site Impact

The rate of removal of petroleum hydrocarbons from the subsurface could be determined from a pilot study. Generally SVE requires 1 to 5 years to achieve desired results but may require in excess of 5 years in fine-grained soils. The impact to the site would be minimal after the initial construction and installation period. The service station could remain in operation. Surface impact would include a small treatment facility which would not interfere with the site activity, as well as vapor extraction wellheads and near surface piping.

3.1.4 Liability

Because installation and operation of an SVE system results in minimal site disruption, short-term liability associated with the technique is low. The potential for long-term liability can be high if reduction of petroleum hydrocarons in soil is less than adequate. The extent of vapor flow influence and effectiveness of SVE for VOC's removal is difficult to determine, which may lead to residual contamination in areas of low flow or flow stagnation. The residual contamination may lead to potential long-term liability, particularly during real-estate transactions.

3.1.5 Cost

Capital and operating costs associated with the installation and operation of an SVE system for both clean-up levels to 10 mg/kg and 100 mg/kg would be expected to be on the order of $190,000 to $270,000 for an operation period of 3 to 5 years. If de-watering is required, the cost of installation would be on the order of $90,000 to $115,000. Clean-up confirmation sampling and analysis would cost an additional $10,000 to $20,000.

3.2 In-Situ Bioventing

3.2.1 Applicability

Bioventing involves the acceleration of the bio-degradation of petroleum hydrocarbons by the addition of oxygen to the subsoils. Air-extraction and injection wells are installed and connected to a closed loop air blower system. The circulation of air in fine grained soils may not be efficient due to low air-permeability. The extraction/injections wells may require close spacing. The benefit of bioventing, over SVE is that soil vapors are not off-gassed in a bioventing system resulting in a substantial emissions control cost savings. As with SVE, the shallow groundwater may present problems in operation of the system and de-watering may be required. Bio-venting is not likely to be a viable remedial remedial technique, but the over-all performance should be based upon a pilot-study.

3.2.2 Clean-up Level

Bio-venting would likely result in less than complete degradation of petroleum hydrocarbons. The degradation of petroleum hydrocarbons would be controlled by the rate of bio-degradation of the hydrocarbons present in the subsoils which, in turn is a function of oxygenation and availibilty of nutrients. Bio-venting would likely be effective in reducing the concentrations by an order of magnitude.

3.1.3 Time Frame/Site Impact

The rate of degradation of petroleum hydrocarbons could be more accurately estimated after a pilot injection study. Generally biodegradation requires long operating times to achieve desired results. We anticipate that low pneumatic conductivity would result in a long-term clean-up operation (in excess of 5 years). The impact to the site would be minimal after the initial construction and installation period. The service station could remain in operation, with a small treatment facility which would not interfere with the site business.

3.1.4 Liability

Because installation and operation of a bio-venting system results in minimal site disruption, short-term liability associated with the technique is low. The potential for long-term liability can be high if remediation results in less than the set clean-up level goal. The extent and effectiveness of biodegradation is difficult to determine, which may lead to residual contamination in areas of low air flow. The residual contamination may lead to potential long-term liability, particulary during real-estate transactions.

3.1.5 Cost

Capital and operating costs associated with the installation and operation of an SVE system for both clean-up levels to 10 mg/kg and 100 mg/kg would be expected to be on the order of $140,000 to $220,000 for an operating period of 3 to 5 years. If de-watering is required, an additional cost of installation would be on the order of $90,000 to $115,000.

3.3 Excavation and Disposal

3.3.1 Applicability

Excavation and disposal at a landfill is a generally accepted method of remediation for petroleum hydrocarbons in soil. If the excavation extends to the southern property boundary, shoring would be required to protect the integrity of the adjacent building. If contamination extends beyond the southern property boundary complete removal of the impacted soil could not be accomplished without demolishion of adjacent buildings. Excavation may require demolition of the on-site service station building, and would require removal of the USTs.

Excavation to a depth of 15 feet below site grade could be accomplished with minimal dewatering if a phased approach to excavation and backfilling is utilized. The estimated flow rate to de-water an excavation of 100 square feet to a depth of 15 feet would be in the range of 9 gpm. The excavation sidewalls would require benching or sloping, resulting a relatively large volume of excavated clean soil.

Excavation can also be limited to removal of source-area impacted soil. This alternative when coupled with a non-attainment zone program can significantly reduce the volume of extracted soil.

3.3.2 Clean-up Level

Excavation and disposal would result in the most complete removal of petroleum hydrocarbons from the site soils. If regulatory agency prescribed clean-up levels require that the soil extending south under the adjacent building be remediated, excavation may not be an alternative in this area.

3.2.3 Time Frame/Site Impact

The time-frame for completing the shoring, excavating and backfilling of the entire property would range from one to two months.

The impact from excavation to the site and the surrounding area would be high. Business at the service station would be disrupted and the surrounding businesses may be disturbed.

Excavation of soil limited to source area impacted soil would have less impact, resulting in excavation and removal of the USTs and surrounding soil. The time-frame would be in the range of one month.

3.3.4 Liability

Short-term liability associated with the excavation would be high, due to the presence of an open excavation, heavy earth moving equipment, volume of trucks entering and exiting the site and the potential for exposure to chemical hazards.

Long-term liability associated with the clean-up of the soils by excavation is relatively low, however, less-than-complete removal of contaminants could present ongoing liability particulary with future real-estate transactions.

3.3.5 Cost

The costs of excavation and disposal of impacted soil to a clean-up level of 10 mg/kg would be on the order of $450,000. Demolition of the service station building and restoration of the underground utilities would result in additional costs.

The costs of excavation and disposal of impacted soil to a clean-up level of 100 mg/kg would be on the order of $200,000. Restoration of the underground utilities would incur additional costs. The cost of excavation, disposal and restoration associated with "source control" efforts would be similar to that of a 100mg/kg clean-up effort.

3.4 Excavation and On-site Treatment

3.4.1 Applicability

Various methods for on site treatment are available for the remediation of petroleum hydrocarbons in soil. If the excavation extends to the southern property boundary, shoring would be required to protect the integrity of the adjacent building. Excavation may require demolition of the on-site service station building, and would require removal of the USTs.

Excavation and passive ex-situ biotreatment or ex-situ vapor extraction would result in an open excavation and large treatment cell (approximately 200 ft. by 200 ft.) area present at the site for a period of 6 to 24 months. The treatment rate for ex-situ biotreatment may be accelerated by the use of soil shredding equipment and designed admixtures.

Excavation and treatment with hot air vapor extraction would require a smaller treatment area and would be accomplished in a shorter period of time. This method involves the treatment in cells of 500 cubic yards in a time frame of approximately one week per cell.

Excavation to a depth of 15 feet below site grade could be accomplished with minimal dewatering if a phased approach to excavation and backfilling is utilized. The excavation sidewalls would require benching or sloping, resulting a relatively large volume of excavated clean soil.

3.4.2 Clean-up Level

Excavation and on-site treatment would result in the nearly complete removal of petroleum hydrocarbons from the site soils. If the regulatory agency prescribed clean-up levels require that the soil extending south under the adjacent building be remediated, excavation may not be an alternative in this area.

3.4.3 Time Frame/Site Impact

The time-frame for completing the shoring, excavating and biotreatment would range from 1 to 2 years for bio-treatment. The use of soil shredding and admixtures would shorten the time to less than 6 months. The time required for treatment by the use of hot air vapor extraction or other thermal treatment would be on the order of 2 to 4 months.

The impact from excavation to the site and the surrounding area would be high. Business at the service station would be disrupted and the surrounding businesses may be disturbed.

3.3.4 Liability

Short-term liability associated with the excavation would be high, due to the presence of an open excavation for relatively long period of time, heavy earth moving equipment and the potential for exposure to chemical hazards.

Long-term liability associated with the clean-up of the soils by excavation and ex-situ treatment is relatively low, however, less-than-complete removal of contaminants could present liability with future real-estate transactions.

3.3.5 Cost

The cost for excavation and biotreatment of impacted soil to a clean-up level of 10 mg/kg, the costs would be on the order of $130,000. If soil shredding and the addition of admixtures are utilized the cost would be on the order of $210,000. Demolition of the service station building and restoration of the underground utilities would result in additional costs.

For excavation and biotreatment of impacted soil to a clean-up level of 100 mg/kg, the costs would be on the order of $55,000. If soil shredding and the addition of admixtures are utilized the cost would be on the order of $90,000.

Excavation and ex-situ hot air vapor extraction of impacted soil to a clean-up level of 10 mg/kg, the costs would be on the order of $300,000. Excavation and hot air vapor extraction of impacted soil to a clean-up level of 100 mg/kg, the costs would be on the order of $140,000.

4.0 GROUNDWATER REMEDIATION

The objective of the remediation of the groundwater would be to remove or control the spread of the groundwater contamination resulting from a release of petroleum hydrocarbons on the subject property. The clean-up level should be agreed upon by the property owner and the local enforcing agency, Alameda County Health Care Services.

Evaluation of appropriate corrective action techniques for groundwater remediation are presented for various applicable alternatives, as listed below.

1) Pump and Treat

2) Air Sparging

3) No Action, Designation as a Non-Attainment Zone

Each of the remedial alternatives were evaluated based on the following criteria:

1) Applicability to specific site conditions and to the contaminant (gasoline) in the groundwater.
2) Attainable clean-up levels with the specific alternative.
3) Estimated time to reach clean-up goal.
4) Potential site impact to existing and planned land use.

5) Liability (short-term and long-term) associated with the alternative.
6) Order-of magnitude capital and operating costs.

4.1 Pump and Treat

4.1.1 Applicability

Pump and treat is a remediation technique that removes groundwater, via pumping, to the surface and treating the groundwater by air-stripping/carbon filtration or other means. The treated groundwater is discharged under permit to the sanitary sewer or re-injected to the aquifer. Pump and treat is most effective on mobile dissolved contaminates and would not be effective for removing contaminants in the capillary zone. Pump and treat is usually not effective in reducing contamination levels, but may be effective in controlling the spread of contamination down-gradient. Based upon a zone of capture analysis, pumping at a rate of 1870 gallons per day would contain the estimated width of the impacted groundwater plume (refer to Figure A-14).

4.1.2 Clean-up Level

Pump and treat would likely result in less than complete removal of petroleum hydrocarbons. Further, petroleum hydrocarbons which are trapped in the capillary zone would be a continuing source of groundwater contamination.

4.1.3 Time Frame/Site Impact

If the source of groundwater contaimination is removed and assuming that the pump and treat system is 100% effective in removing petroleum hydrocarbons from the aquifer, the system would be in operation for a period of six to nine years. The actual operating period would likely be on the order of 15 to 30 years for complete clean-up.

The impact to the site would be minimal after the initial construction and installation period. The service station could remain in operation, with a small treatment facility which would not interfere with the site business.

4.1.4 Liability

Because installation and operation of a pump and treat system results in minimal site disruption, short-term liability associated with the technique is low. The potential for long-term liability can be high if remediation results in less than the clean-up goal. Residual contamination present in the capillary zone may lead to potential long-term liability during real-estate transactions.

4.1.5 Cost

Capital and operating costs associated with the installation and operation of a pump and treat for a period of one year would be on the order of $55,000. The cost of operation and groundwater monitoring for a period of six to nine years range from $125,000 to $190,000, with an outside estimated cost of $545,000. The estimate does not include sewer permit fees.

4.2 Air Sparging

4.2.1 Applicability

Air sparging is a remediation technique that involves the injection of air into the aquifer which strips volatile organic compounds (VOCs) from the groundwater, causing them to rise to the vadose zone where SVE removes the the VOCs from the subsurface. Vapor Extraction and treatment would be required with the use of air sparging. The use of air sparging may be effective in removing petroleum hydrocarbons from the capillary zone if used in conjunction with SVE, however low permeability soils makes it unlikely.

4.2.2 Clean-up Level

Air sparging would likely result in less than complete removal of petroleum hydrocarbons due to low permeability soils and the likelyhood of channeling of the air in isolated pathways.

4.2.3 Time Frame/Site Impact

The rate of removal of petroleum hydrocarbons from the subsurface could be determined from a pilot study. Generally 1 to 5 years may be required to achieve desired results under optimal conditions. The soils present at the site would likely require that the system be in operation for a period in excess of five years. The impact to the site would be minimal after the initial construction and installation period. The service station could remain in operation, with a small treatment facility which would not interfere with the site business.

4.2.4 Liability

Because installation and operation of an air sparging system results in minimal site disruption, short-term liability associated with the technique is low. The potential for long-term liability can be high if remediation results in less than the clean-up goal. Residual contamination remaining after the system has removed what it can may lead to potential long-term liability during real-estate transactions.

4.2.5 Cost

Capital and operating costs associated with the installation of an air sparging system and SVE system would cost on the order of $240,000 to $340,000 for an operating period of 3 to 5 years.

4.3 No Action, Designation as a Non-Attainment Zone

4.3.1 Applicability

The designation as a non-attainment zone (NAZ) would involve a semi-quantitative risk assessment to evaluate the risks associated with no action at the Site and continued groundwater monitoring. Approval would be granted from the Regional Water Quality Control Board based upon the risk assessment. Due to the presence of a perchloroethene release down gradient from the Site and to the fact that the groundwater in the vicinity of the Site is shallow and not currently used as a drinking water source, the NAZ classification may be warranted. NAZ also typically requires a level of source remediation, i.e. excavation.

4.3.2 Clean-up Level

The designation as a NAZ would entail remediating soil to a set level and the remaining petroleum hydocarbons in the soil and groundwater would be degraded by natural bio-degradation.

4.3.3 Time Frame/Site Impact

The service station could remain in operation with the only impact being from installation of additional groundwater monitoring wells and periodic groundwater monitoring.

4.2.4 Liability

Minimal site disruption would occur, therefore the short-term liability is low. The designation as a NAZ may require deed restrictions and the remaining soil and groundwater contamination could impact the marketability of the site.

4.3.5 Cost

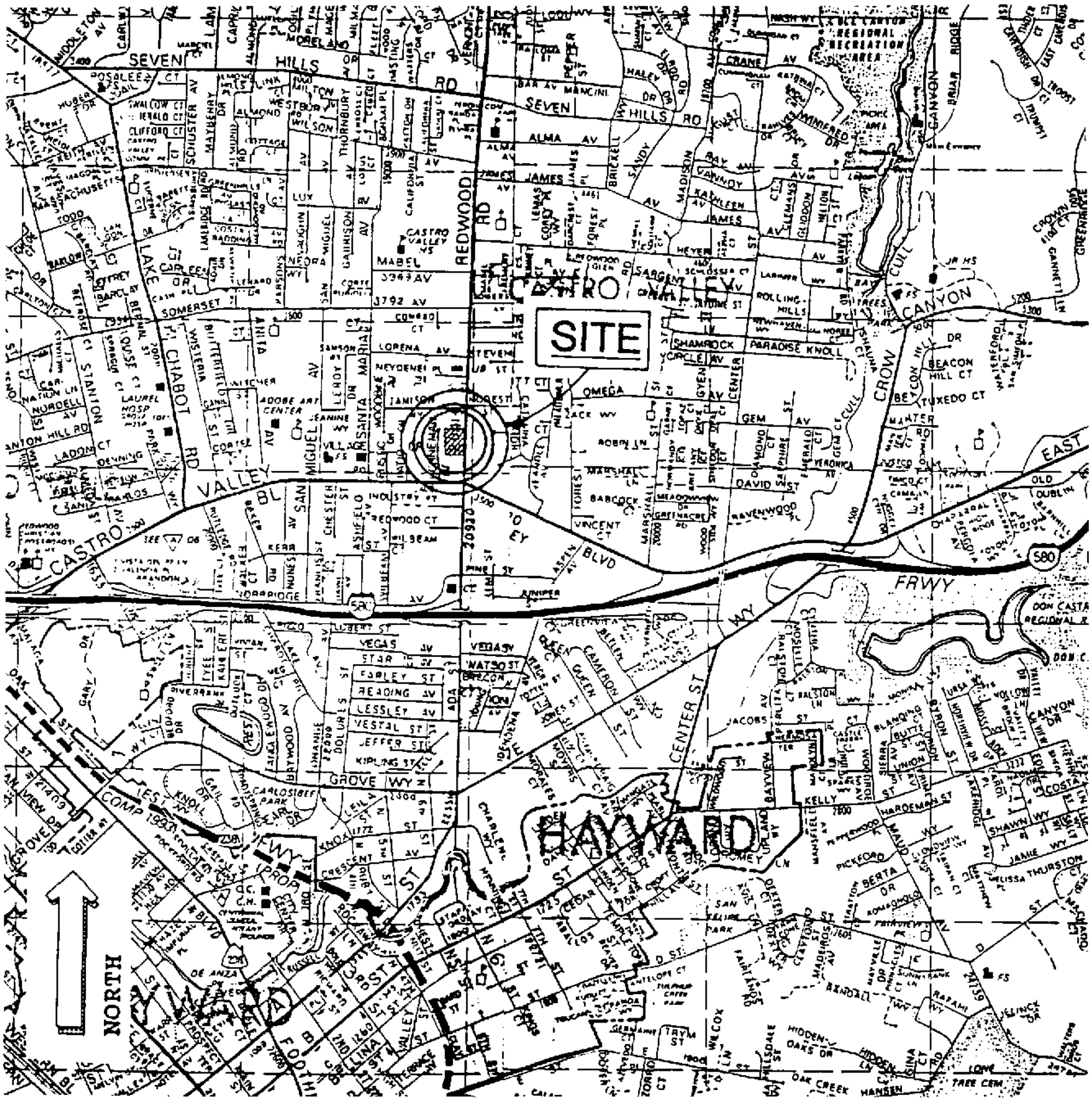
The cost which would occur from the installation of additional groundwater monitoring wells and the risk assessment would be on the order of $20,000. The cost of groundwater monitoring, would add a cost on the order of $10,000 per year. Source remediation, if required, would add cost as estimated in Section 3.0.

5.0 SUMMARY

The foregoing evaluation presents remedial options for the clean-up of soil and groundwater at the Site. Each of the methods described is considered a viable alternative for site remediation. However, each also has limitations and associated potential liabilities. The alternatives and associated criteria discussed herein are provided for planning purposes only.

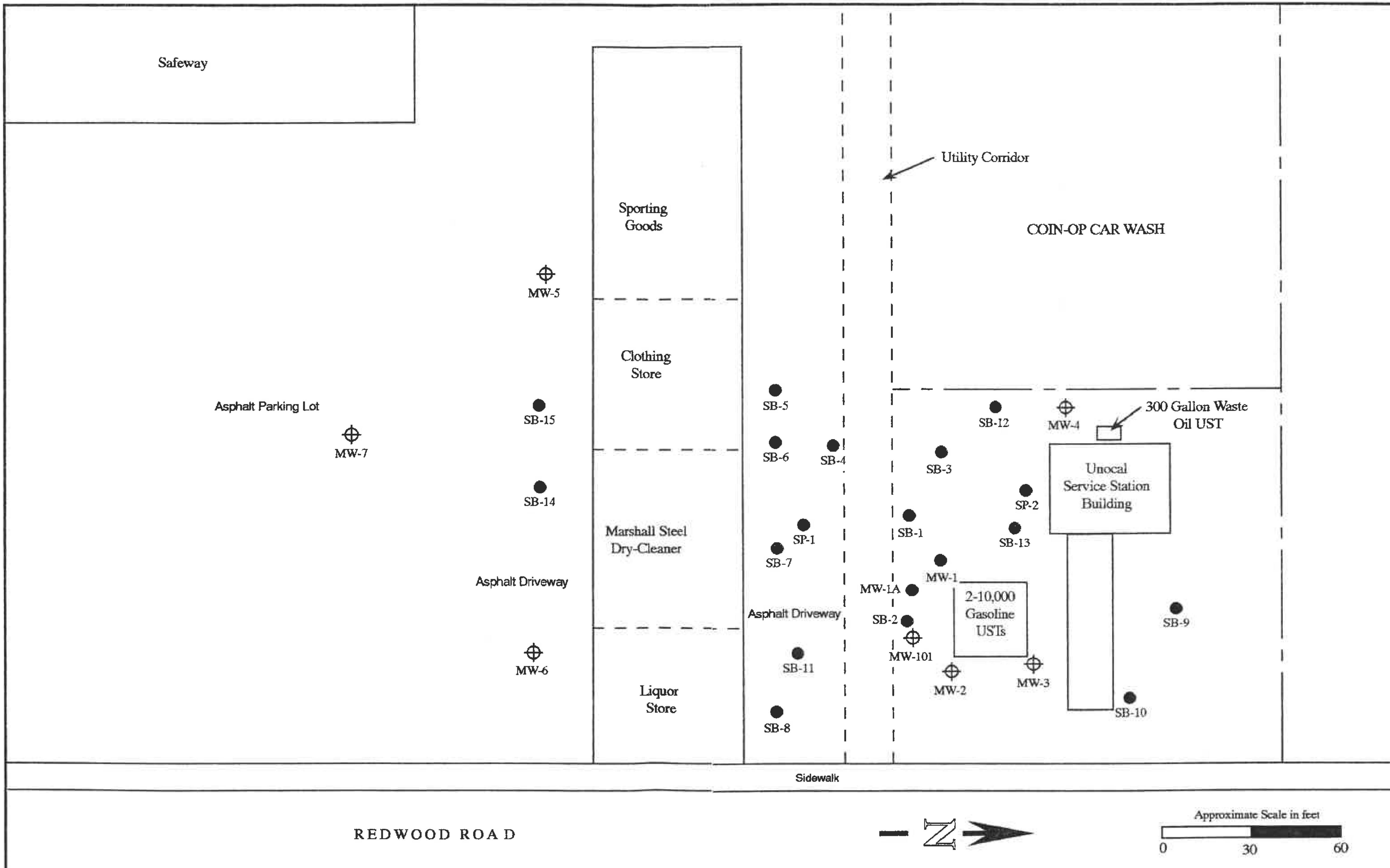
BSK will prepare a Corrective Action Plan (CAP) for the site, after consultation with R.T. Nahas

Company and the appropriate regulatory agencies. The CAP will present a remediation approach for the site, as well as a system design including well and treatment system locations, operation and maintenance plans, and monitoring plans.



Source: Thomas Guide, 1992, Alameda and Contra Costa Counties

TIEN'S UNOCAL STATION 20405 REDWOOD ROAD CASTRO VALLEY, CALIFORNIA	VICINITY MAP BSK Job No. 04400027 DECEMBER 1995 FIGURE: 1	BSK & ASSOCIATES



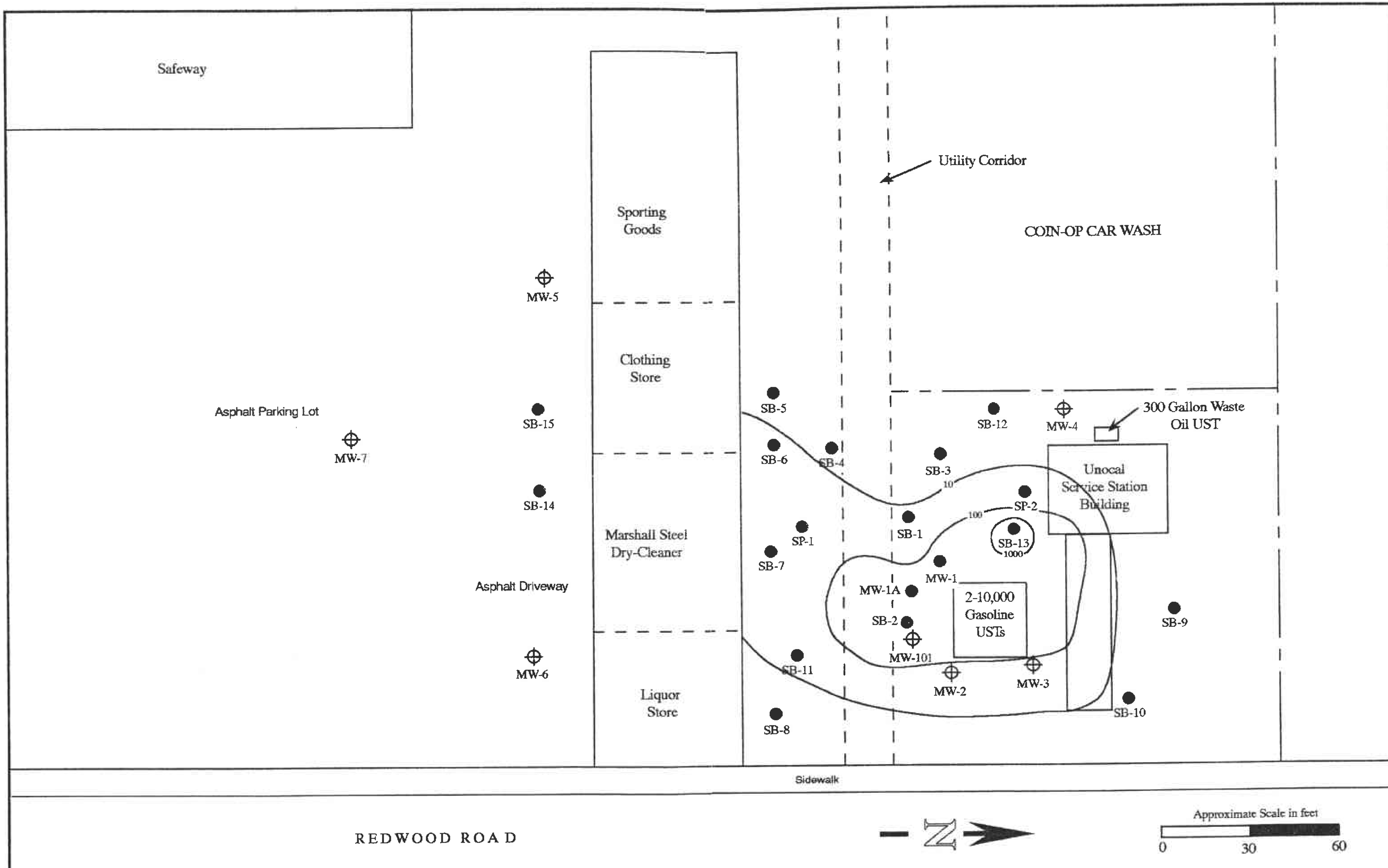
MW-6 Approximate Location of Groundwater Monitoring Well

SB-14 Approximate Location of Soil Boring

SITE PLAN

Job No. 04400027
FIGURE 2

BSK & ASSOCIATES



MW-6 Approximate Location of Groundwater Monitoring Well	SB-14 Approximate Location of Soil Boring	—100— Contours of Total Petoleum Hydrocarons as Gasoline in Soil, Based on Highest Result From Soil Samples Taken at Depth of 10 to 15 feet, Results in mg/kg

PETROLEUM HYDROCARBONS AS GASOLINE IN SOIL

Job No. 04400027

FIGURE 3

BSK & ASSOCIATES

APPENDIX A
AQUIFER PUMP TEST
TIEN'S UNOCAL STATION
20405 REDWOOD ROAD
CASTRO VALLEY, CALIFORNIA

1.0 PURPOSE AND SCOPE

The purpose of the aquifer pump test was to determine the aquifer characteristics and provide data to aid in the development of a corrective action plan. The work was performed under the guidelines set in the approved workplan prepared by BSK, dated August 8, 1995. The scope of work included installation of a groundwater extraction well, development of the well, performing a step drawdown aquifer test, performing a 48 hour constant rate drawdown aquifer test, evaluation of the data and preparation of a report.

2.0 AQUIFER PUMP TEST SUMMARY

A groundwater extraction well was installed on September 26, 1995 at a location south of the UST cluster (Refer to Figure 2). The well was developed by surging and pumping until the water was free of sand and silt. A groundwater sample was collected subsequent to development and submitted for laboratory analysis for TPH-G and BTEX. Two soil samples were collected at depths of 10 and 15 feet below the existing grade and submitted for laboratory analysis for TPH-G and BTEX. Results of the analysis for the soil and groundwater samples are summarized in Table A-1. The laboratory data sheets and chain-of-custody are provided at the end of this report.

TABLE A-1
SUMMARY OF ANALYTICAL RESULTS
SOIL AND GROUNDWATER SAMPLES
Soil Results in mg/kg
Water Results in ug/l

Sample Location/Type	Depth (Feet)	TPH as Gasoline	Benzene	Toluene	Xylene	Ethyl-Benzene
MW-101 Soil	10	120	ND	0.95	11	2.1
MW-101 Soil	15	63	ND	1.5	9.8	0.87
MW-101 Water	14	9400	170	94	710	150

2.1 STEP DRAWDOWN AQUIFER TEST

The step drawdown aquifer test was performed by pumping the groundwater extraction well at three different pumping rates, or steps, and measuring the drawdown in the well at various time intervals. Pumping was performed using a variable flow submersible pump equipped with a check valve to prevent back-flow. The groundwater produced during pumping was stored in 55-gallon drums until disposal by Romic Environmental Technologies Corp. of Palo Alto, California.

Each step was maintained for at least 45 minutes in duration. The drawdown measurements for each step were made at the pumping well by use of an electric sounding device.

It was determined based upon available drawdown versus flow rates, that a flow rate of 1.3 gallons per minute would be suffcient for the 48 hour constant rate aquifer test.

2.2 CONSTANT RATE DRAWDOWN TEST

It was determined from the step drawdown test that a pumping rate of 1.3 gpm would be sufficient for the constant rate drawdown test. The groundwater extraction well was pumped at a constant rate of 1.3 gpm for 45 hours and the depth-to-groundwater measurements (drawdown) were taken at observation wells (MW-2 through MW-7) and the pumping well (MW-101). The depth to groundwater was measured relative to the top of the well casing using a well sounder with an accuracy of 0.01 foot. The drawdown measurements were measured in the wells MW-101 (pumping well) and MW-2 (closest well) by use of pressure transducers and a datalogger. After pumping for the well for 45 hours, the pumping was stopped and residual drawdown measurements were made for 100 minutes. The data collected during the pump test and the residual drawdown are graphic plotted on Figures A-4 through A-12. Water was pumped from the well with a variable rate 2-inch submersible pump into a 6,900 gallon capacity polyethylene holding tank. The flow rate was measured by use of an in-line flow meter and a totalizer. Following completion of the pump test, a sample of the groundwater was collected from the holding tank. Results of the analysis for the groundwater sample are summarized in Table A-2. The laboratory data sheets and chain-of-custody are provided at the end of this report. The groundwater in the holding tank, the groundwater produced from development and the step drawdown test was disposed of by Romic Environmental Technologies Corp. of Palo Alto, California.

TABLE A-2
SUMMARY OF ANALYTICAL RESULTS
HOLDING TANK GROUNDWATER SAMPLES
Results in ug/l

Sample Location/Type	TPH as Gasoline	Benzene	Toluene	Xylene	Ethyl-Benzene
Holding Tank	320	0.9	0.4	ND	ND

BSK

2.3 AQUIFER CHARACTERISTICS

The method of analysis used for the pump test data utilized was the distance-drawdown method, which is a variation of the Jacob straight-line method. The drawdown in wells MW-2, MW-3 and MW-4, after 45 hours of pumping, was utilized in the determination of the aquifer characteristics.

Transmissivity (T) is defined as the capacity of an aquifer to transmit water of the prevailing kinematic viscosity. Transmissivity is reported in units of either gallons/day/ft or ft^2/day. The transmissivity was determined using the following equation:

$$T \text{ (in } ft^2\text{/day)} = 70Q/ds \text{ or } T \text{ (in gpd/ft)} = 528Q/ds$$

Hydraulic conductivity (K) is defined as the capacity of a porous medium to transmit water. Hydraulic conductivity is reported in units of ft/day or gallons/day/ft^2. The hydraulic conductivity was determined using the following equation:

$$K = T/b$$

Storativity (S) is defined as the volume of water that an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. The units for storativity are dimensionless. Generally values of storativity less than 0.001 indicate that the aquifer is confined. The storativity was determined using the following equation:

$$S = Tt/640r_0^2 \text{ where T is in } ft^2\text{/day}$$

Q = Pumping rate in gallons per minutes.
ds = Drawdown in feet determined over one log cycle of distance from pumping well.
b = Aquifer thickness in feet.
r_0 = Radius graphically determined in which the pumped well has no effect.
t = Time of drawdown measurement made since pumping began.

The distance-drawdown meaurements are graphically plotted on Figure A-13. The aquifer parameters determined from the constant rate pump test are summarized in Table A-3, below.

TABLE A-3
AQUIFER CHARACTERISTICS

Parameter	Value
Transmissivity	114 ft^2/day or 858 gpd/ft
Hydraulic Conductivity	7.6 ft/day or 57 gpd/ft^2
Storativity	0.019

2.4 Zone of Capture Analysis

An analysis of the zone of capture was performed to determine the dimensions of the zone which would be influenced by pumping the extraction well MW-101 at a rate of 1.3 gpm. The following equations were utilized in the capture zone analysis (Grubb, 1993):

$X_o = Q/2\pi TI$
$W_o = Q/2TI$
$W = Q/TI$

X_o = Distance from the pumped well along the capture zone axis to the down-gradient extent of the capture zone, measured in feet.
W_o = Width of the capture zone in the vicinity cross-gradient to the pumped well, measured in feet.
W = The maximum width of the capture zone, up-gradient from the pumped well.
Q = Flow rate of pumped well, (1.3 gpm)
T = Transmissivity, (858 gpd/ft)
I = Hydraulic gradient (0.009)

The estimated zone of capture for the site while pumping well MW-101 at 1.3 gpm, is shown graphically on Figure A-13.

3.0 SUMMARY OF FINDINGS

Based on the data and analysis obtained during the aquifer, pump and treat would be a feasible method for controlling the spread of petroleum hydrocarbon impacted groundwater. Based upon the capture zone analysis, the groundwater impacted by the Perchloroethane release down-gradient of the site would not impact pumping the extraction well at 1.3 gpm. Higher pumping rates may cause the zone of capture to extend down-gradient such that perchloroethane would have the potential to be drawn toward the pumping well. This should be considered when designing a de-watering system for excavations.

The use of pump and treat as a method to achieve groundwater clean-up goals may not be an efficient method due to 1) petroleum hydrocarbons trapped in the capillary zone which would continue to impact groundwater, 2) the increase in gradient would cause up-gradient non-impacted groundwater to be flushed through the impacted zone resulting in large treatment volumes to achieve the desired result 3) the pumping time estimated using a batch flush model (Cushman and Ball, 1993) would be on the order of 6 to 9 years of pumping to reduce the levels of petroleum hydrocarbons in the groundwater by an order of magnitude.

4.0 LIMITATIONS

The findings and conclusions presented in this report are based on field review and observations, and from the limited testing program described in this report. This report has been prepared in accordance with generally accepted methodologies and standards of practice in the area. No other warranties, expressed or implied, are made as to the findings, conclusions and recommendations included in the report.

The findings of this report are valid as of the present. The passage of time, natural processes or human intervention on the property or adjacent property can cause changed conditions which can invalidate the findings and conclusions presented in this report.

5.0 REFERENCES

Cushman, D.J. and Ball S.D. 1993. Groundwater Modeling for Risk Assessment Purposes: Use of a Gaussian-Distributed Transport Model and a Batch Flush Model, Groundwater Monitoring & Remediation, Vol XIII, No. 4

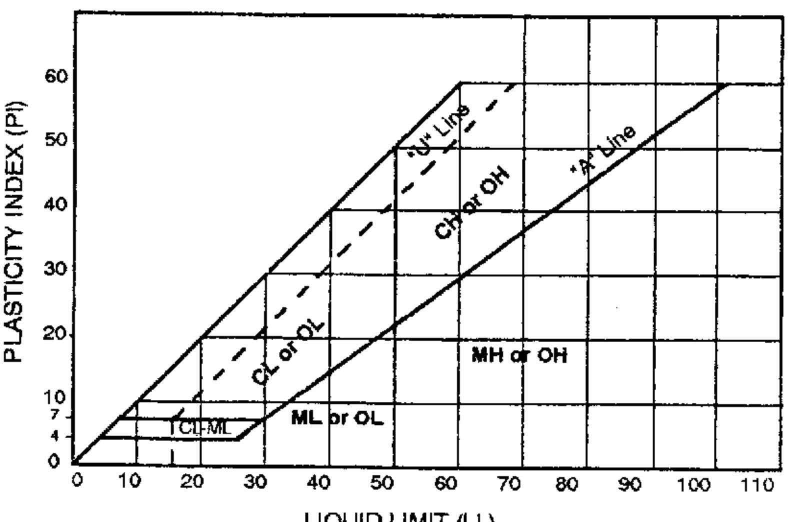
Grubb, S. 1993 Analytical Model for Estimation of Steady-State Capture Zones of Pumping Wells in Confined and Unconfined Aquifers, Groundwater, Vol 31, No. 1

UNIFIED SOIL CLASSIFICATION CHART

SYMBOL	LETTER	DESCRIPTION	MAJOR DIVISIONS			
	GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	CLEAN GRAVELS (LITTLE OR NO FINES)	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO.4 SIEVE SIZE	FOR VISUAL CLASSIFICATION, THE 1/4" SIZE MAY BE USED AS EQUIVALENT TO THE NO.4 SIEVE SIZE	COARSE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO.200 SIEVE SIZE
	GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES				
	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)			
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES				
	SW	WELL-GRADED SAND OR GRAVELLY SANDS, LITTLE OR NO FINES	CLEAN SANDS (LITTLE OR NO FINES)	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO.4 SIEVE SIZE		
	SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES				
	SM	SILTY SANDS, SAND-SILT MIXTURES	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)			
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES				
	ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	SILTS & CLAYS LIQUID LIMIT LESS THAN 50			FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO.200 SIEVE SIZE
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS				
	OL	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY				
	MH	ELASTIC SILTS, SANDY ELASTIC SILTS	SILTS & CLAYS LIQUID LIMIT GREATER THAN 50			
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS				
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS				
	PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS			

THE NO.200 U.S. STANDARD SIEVE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE

SOIL PLASTICITY CHART



TYPES OF SAMPLERS

SPT–Standard Penetration Test (SPT), 1.4" ID Split Spoon Sampler
CS–2" ID Split Spoon Sampler
MC–2.5" ID Modified California Sampler
SH–2.8" ID Thin-Wall (Shelby Tube)
CC–2.7" ID Double Tube Continuous Coring Sampler

Tien's UNOCAL Station 20405 Redwood Road Castro Valley, California	BSK Job No. 04400027 FIGURE A-1	BSK & ASSOCIATES

BORING LOG: MW-101	FIGURE: A-2
DATE: 9/26/95	JOB NUMBER: 04400027
LOGGED BY: M. Cline	**Tien's UNOCAL Station** **20405 Redwood Road** **Castro Valley, California**
ELEVATION: --	
WATER LEVEL: Intially at 15 ft. below the ground surface	
EQUIPMENT: Mobile Drill, 10" Hollow Stem Auger	

Depth	PID Reading (ppm)	Time	Type of Sampler	Blows Per Foot	Sample No.	Graphic Log	U.S.C.S.	Description	Notes
0							PMT	3" Asphalt Concrete over Aggregate Baserock	Monitoring Well Installed with 4" PVC Casing From 0 to 10 ft., 0.02" Slotted PVC from 10 to 30, 2/12 sand from 8 to 30 ft., Bentonite from 7 to 8 ft., Neat cement from 7 to 1 ft.
1							CL	SILTY CLAY: Dark gray, very moist	
2									
3									
4									
5	0	9:45	MC	16	1		CL	SILTY CLAY trace sand: Brown-mottled grey,moist, no odor	
6									
7									
8									
9									
10	1036	10:00	MC	15	2		CL	SILTY CLAY with some sand: Brown-trace grey mottles, moist, fine to very fine grained sand, slight hydrocarbon odor	
11									
12									
13									
14									
15	109	10:15	MC	48	3		CL	SANDY CLAY: Brown to grey in thin lenses, moist to wet in pockets, no odor	
16									
17									
18									
19								grades brown, very moist to wet in lenses, no odor	
20	45	10:30	MC	19	4				

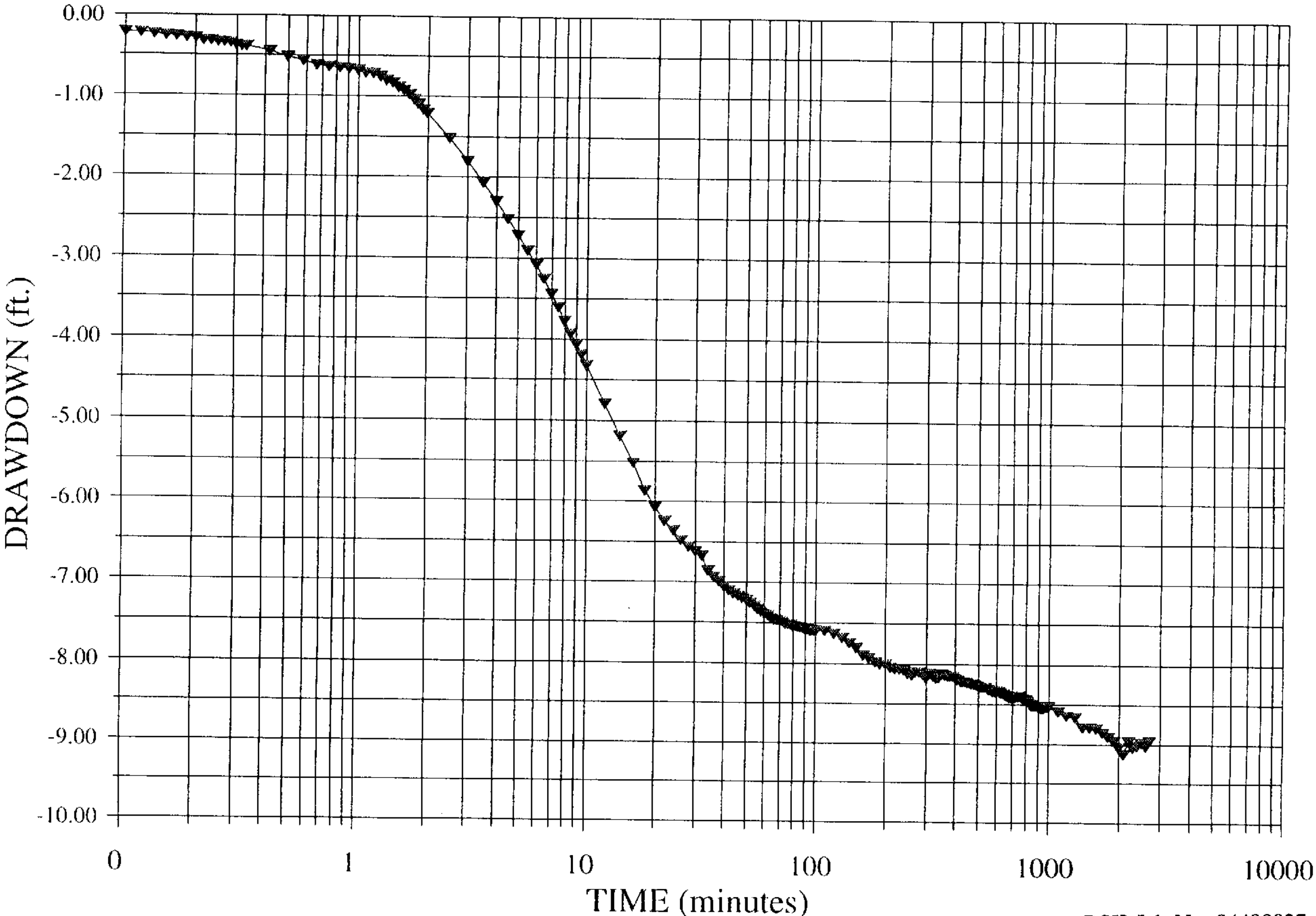
BSK

BORING LOG: MW-101 (CONT.)	FIGURE: A-3
DATE: 9/26/95	JOB NUMBER: 04400027
LOGGED BY: M. Cline	**Tien's UNOCAL Station** **20405 Redwood Road** **Castro Valley, California**
ELEVATION:	
WATER LEVEL: Initially at 15 ft. below the ground surface	
EQUIPMENT: mobile Drill, 10" Hollow Stem Auger	

Depth	PID Reading (ppm)	Time	Type of Sampler	Blows Per Foot	Sample No.	Graphic Log	U.S.C.S.	Description	Notes
21									
22									
23									
24									
25	0	10:53	MC	13	5		CL	SILTY CLAY: Brown, very moist, no odor	
26									
27									
28									
29									
30	0	11:15	MC	30	6		CL	SILTY CLAY: Brown, mottled reddish brown, moist, no odor	Boring Terminated at 30 ft.
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

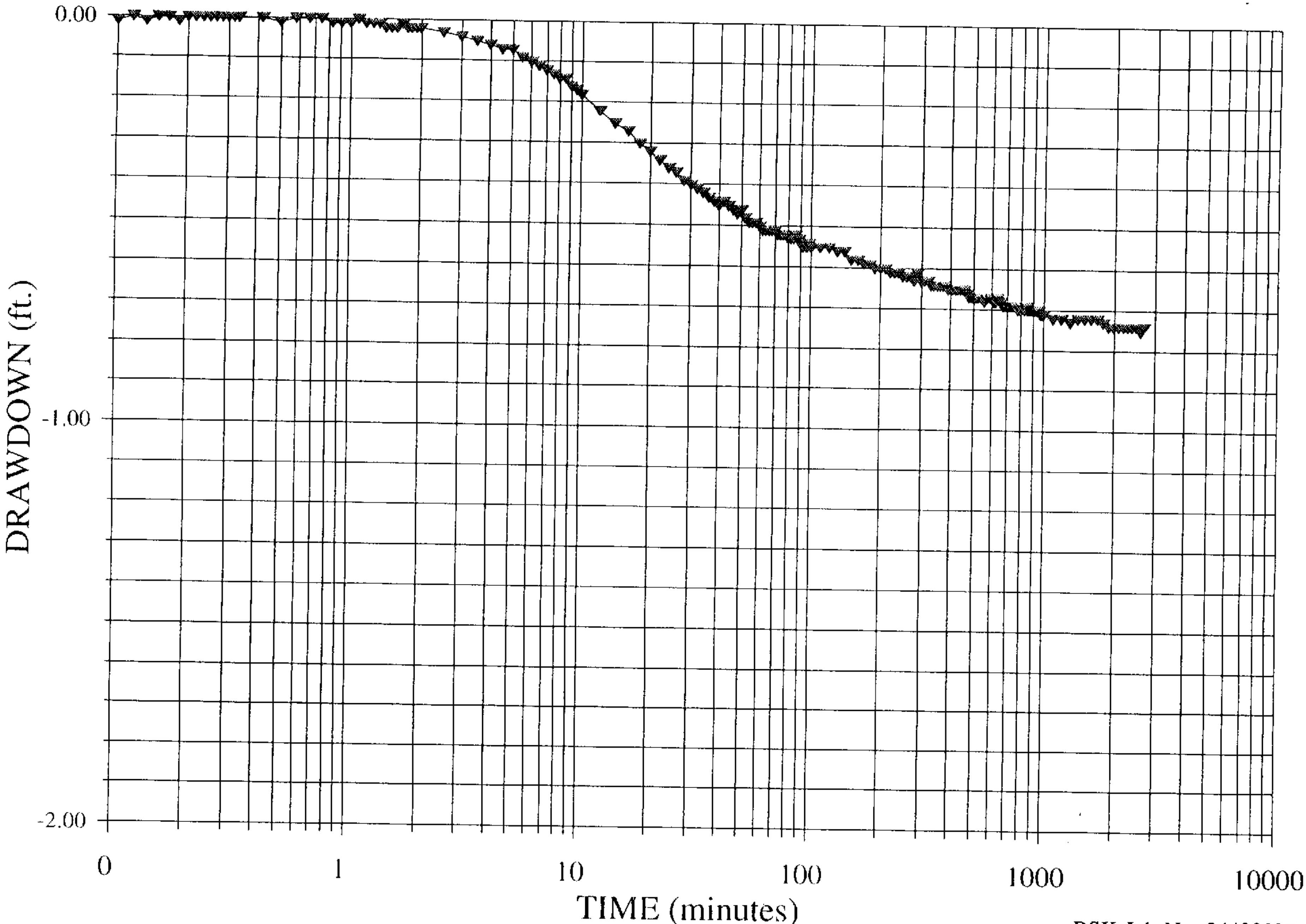
BSK

TIME-DRAWDOWN DATA MW-101



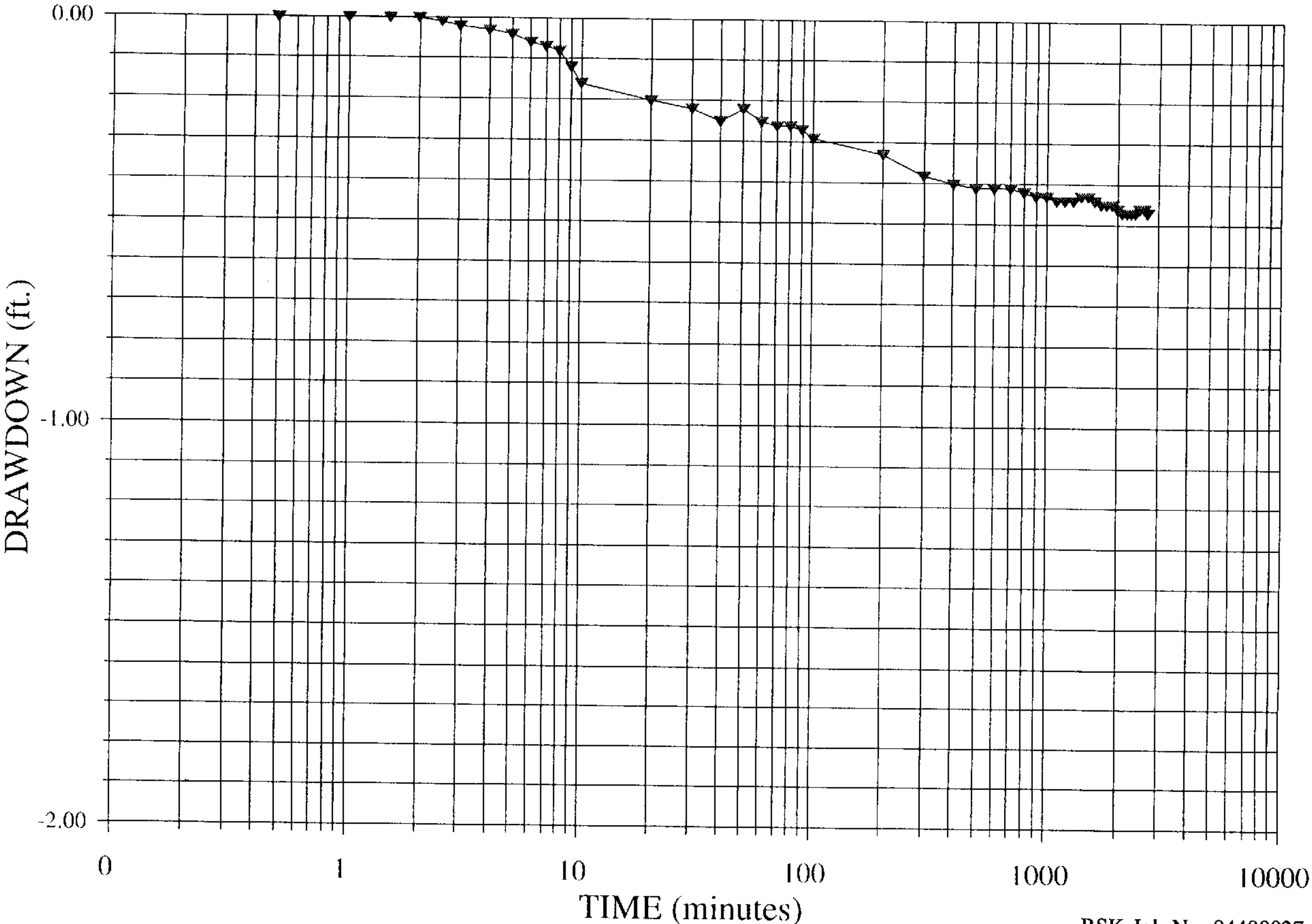
BSK Job No. 04400027
FIGURE A-4

TIME-DRAWDOWN DATA MW-2



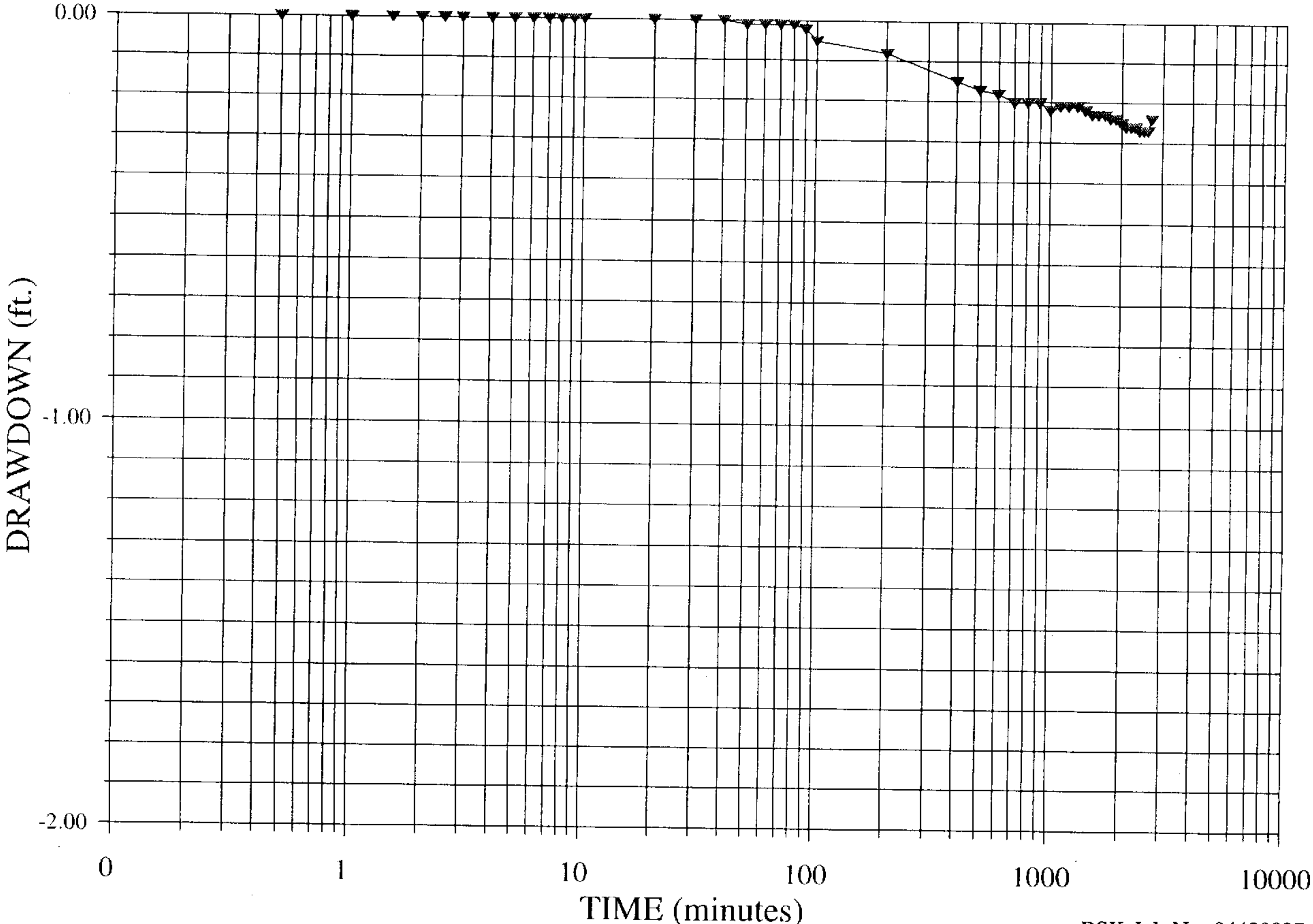
BSK Job No. 04400027
FIGURE A-5

TIME-DRAWDOWN DATA MW-3

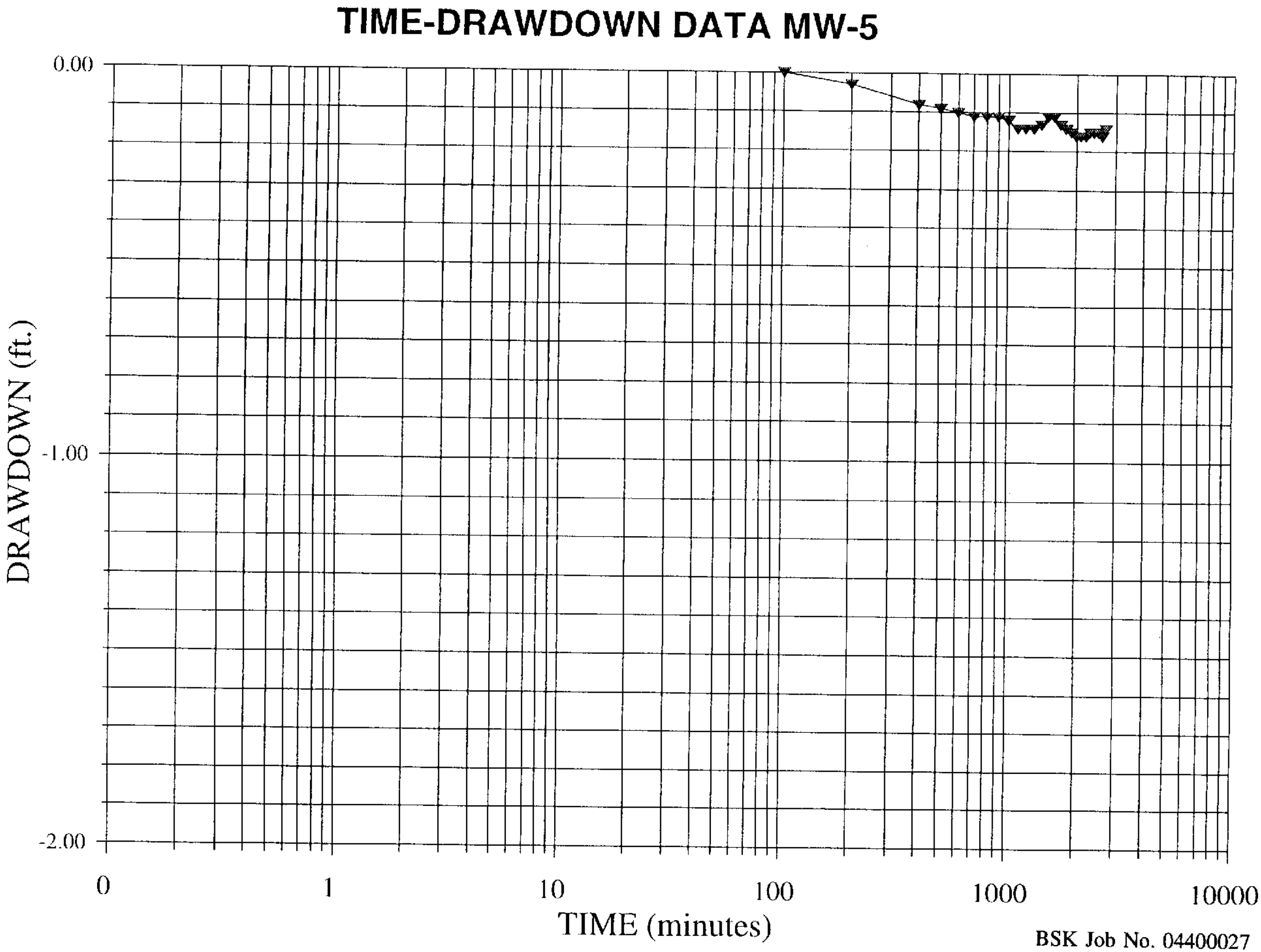


BSK Job No. 04400027
FIGURE A-6

TIME-DRAWDOWN DATA MW-4

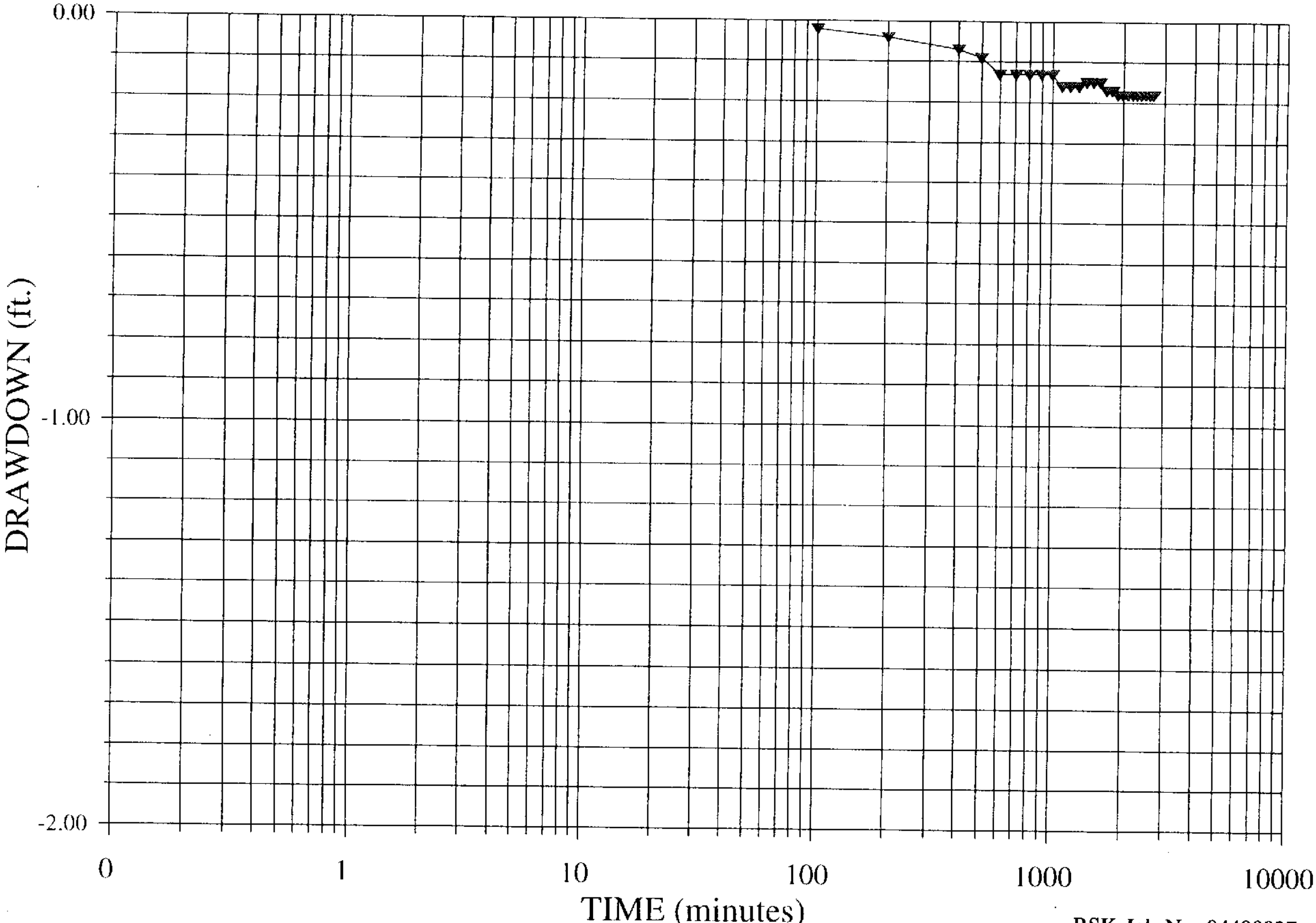


BSK Job No. 04400027
FIGURE A-7



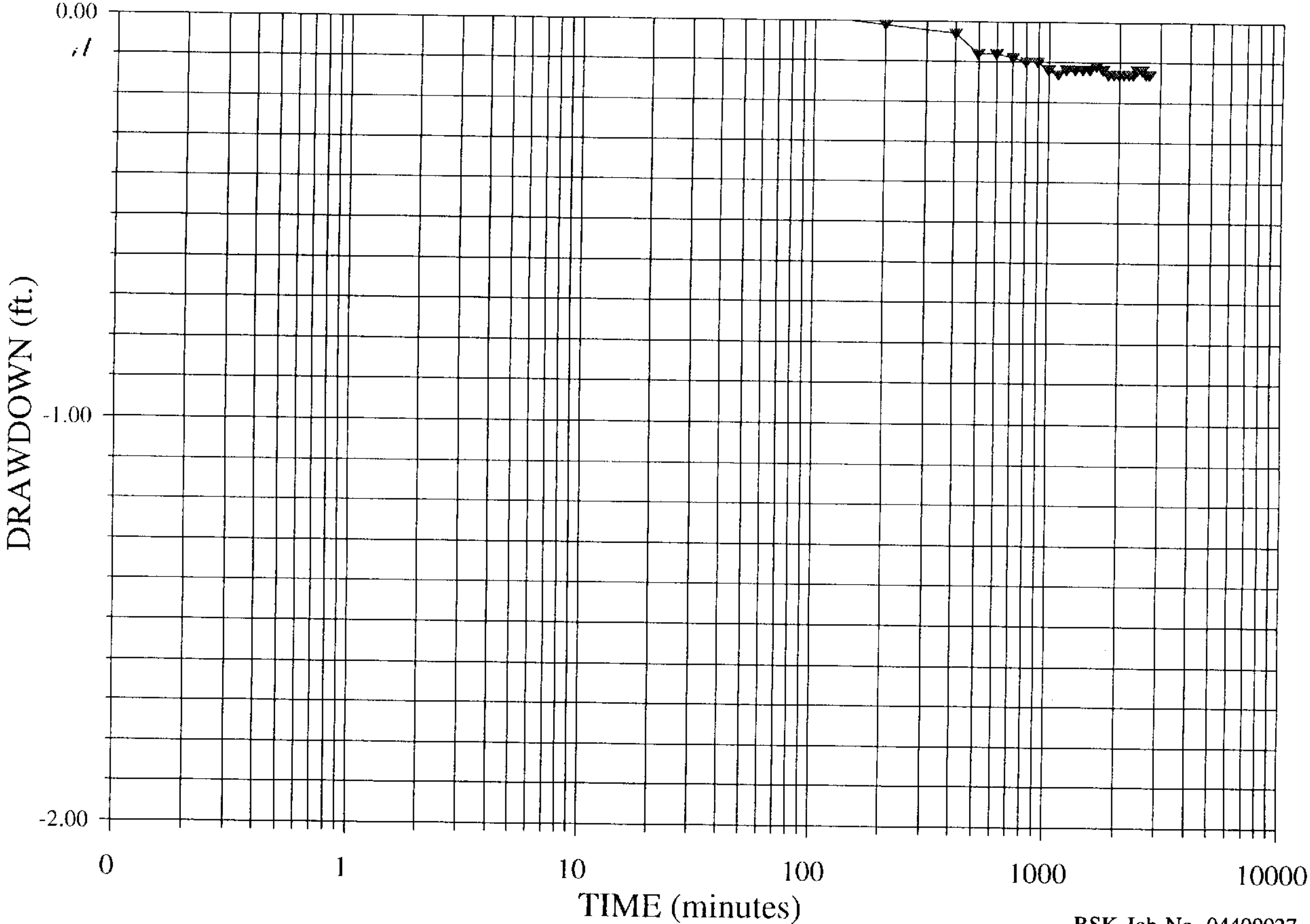
BSK Job No. 04400027
FIGURE A-8

TIME-DRAWDOWN DATA MW-6

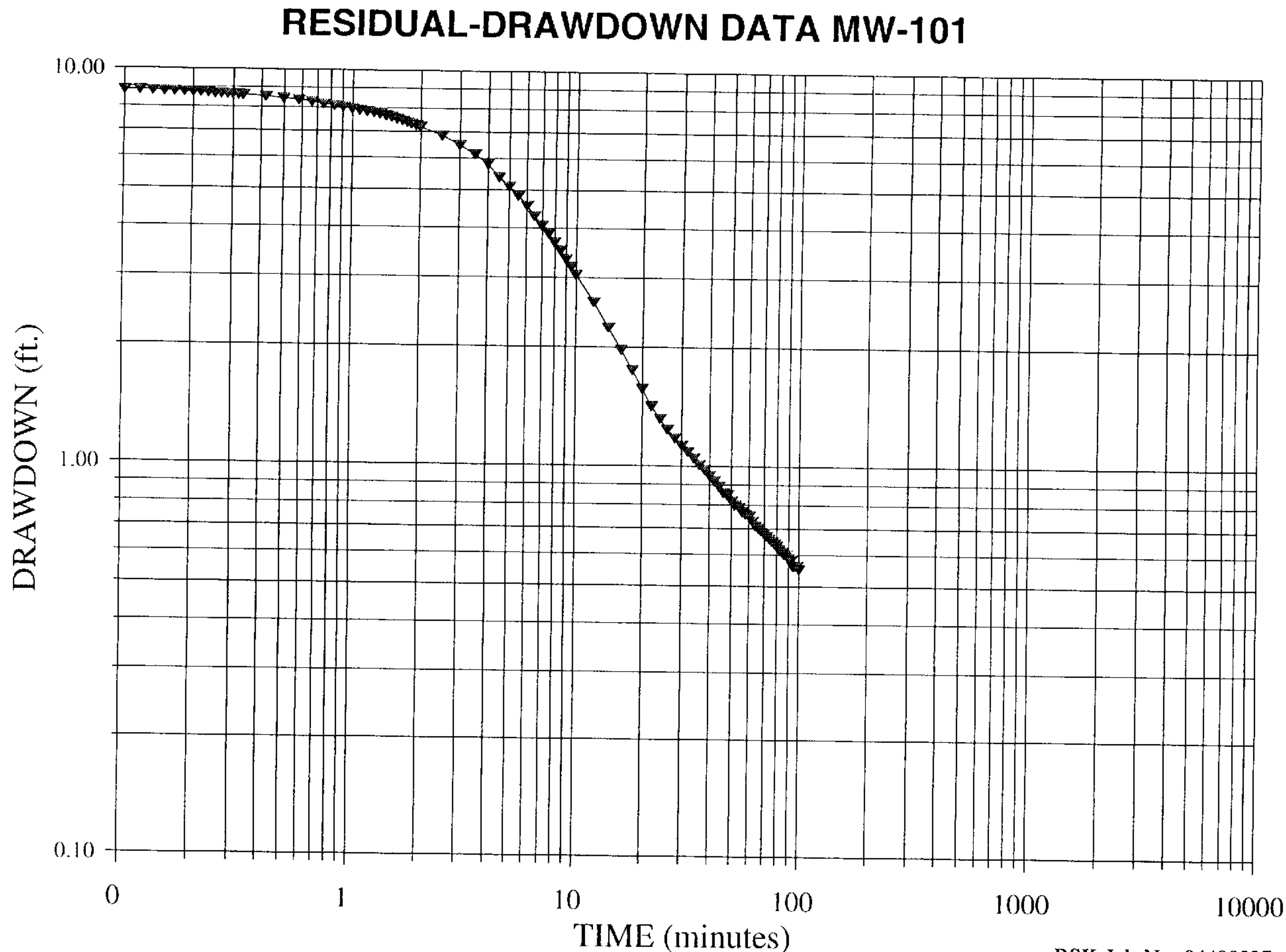


BSK Job No. 04400027
FIGURE A-9

TIME-DRAWDOWN DATA MW-7

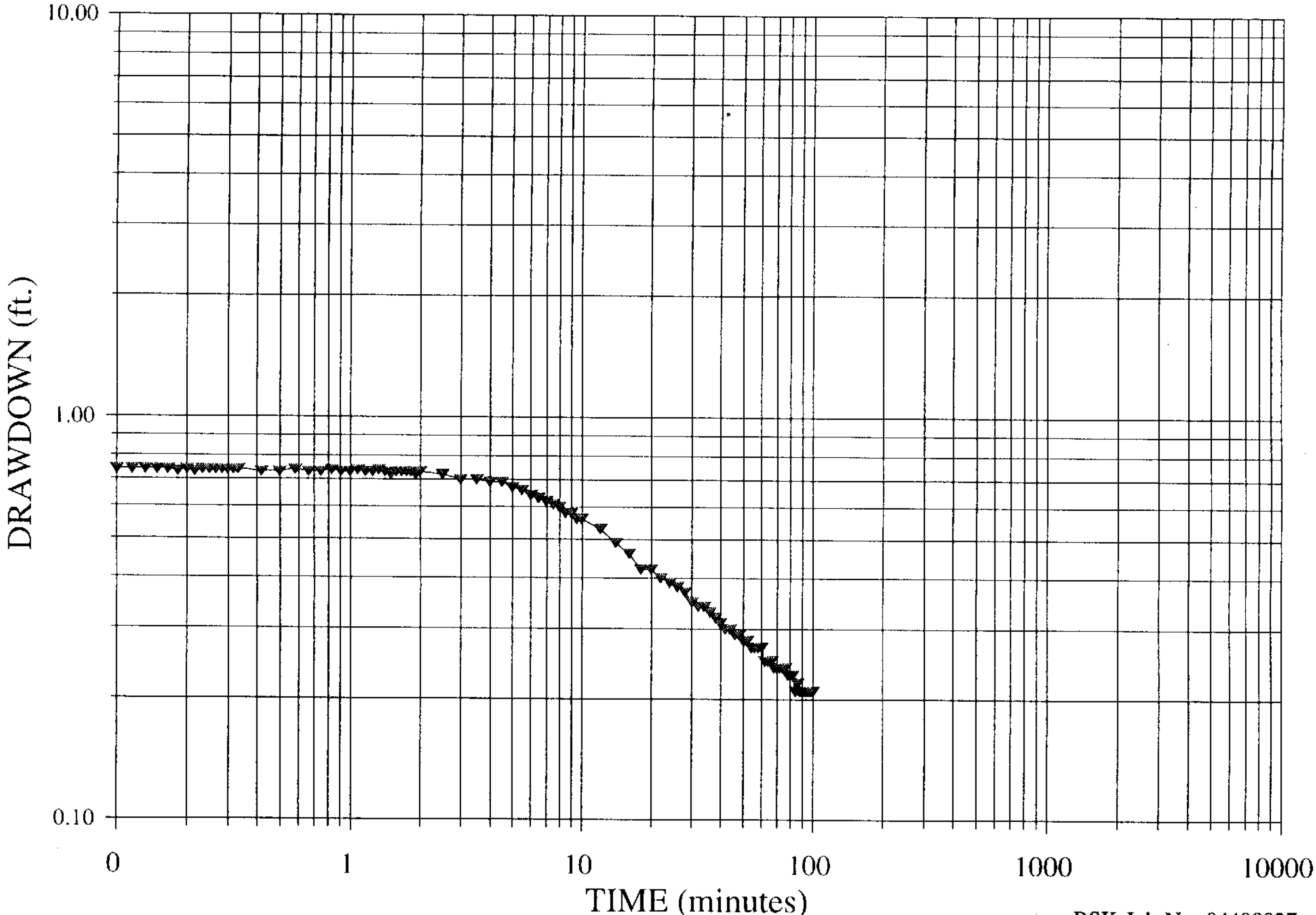


BSK Job No. 04400027
FIGURE A-10



BSK Job No. 04400027
FIGURE A-11

RESIDUAL-DRAWDOWN DATA MW-2



BSK Job No. 04400027
FIGURE A-12

DISTANCE-DRAWDOWN

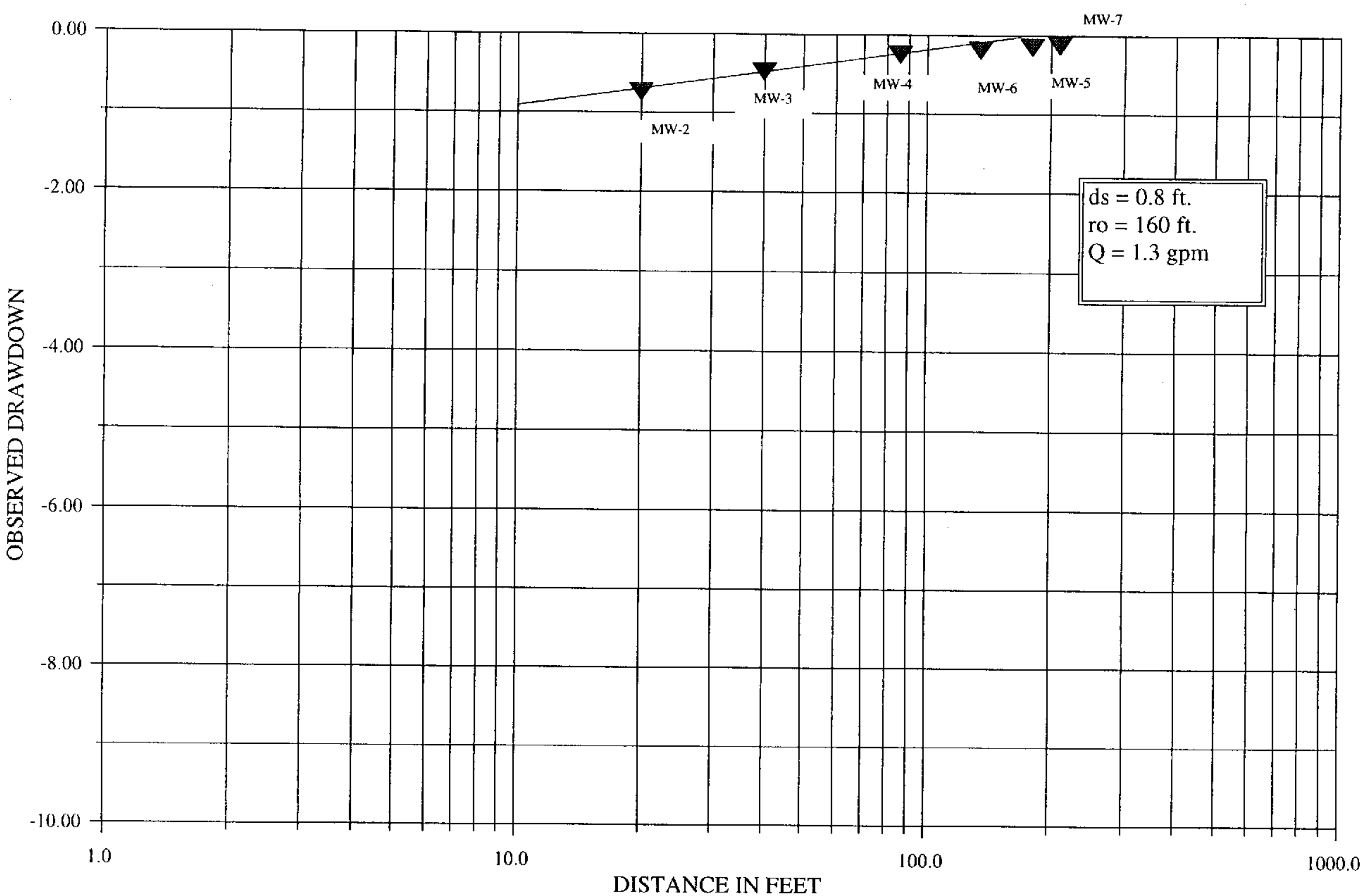
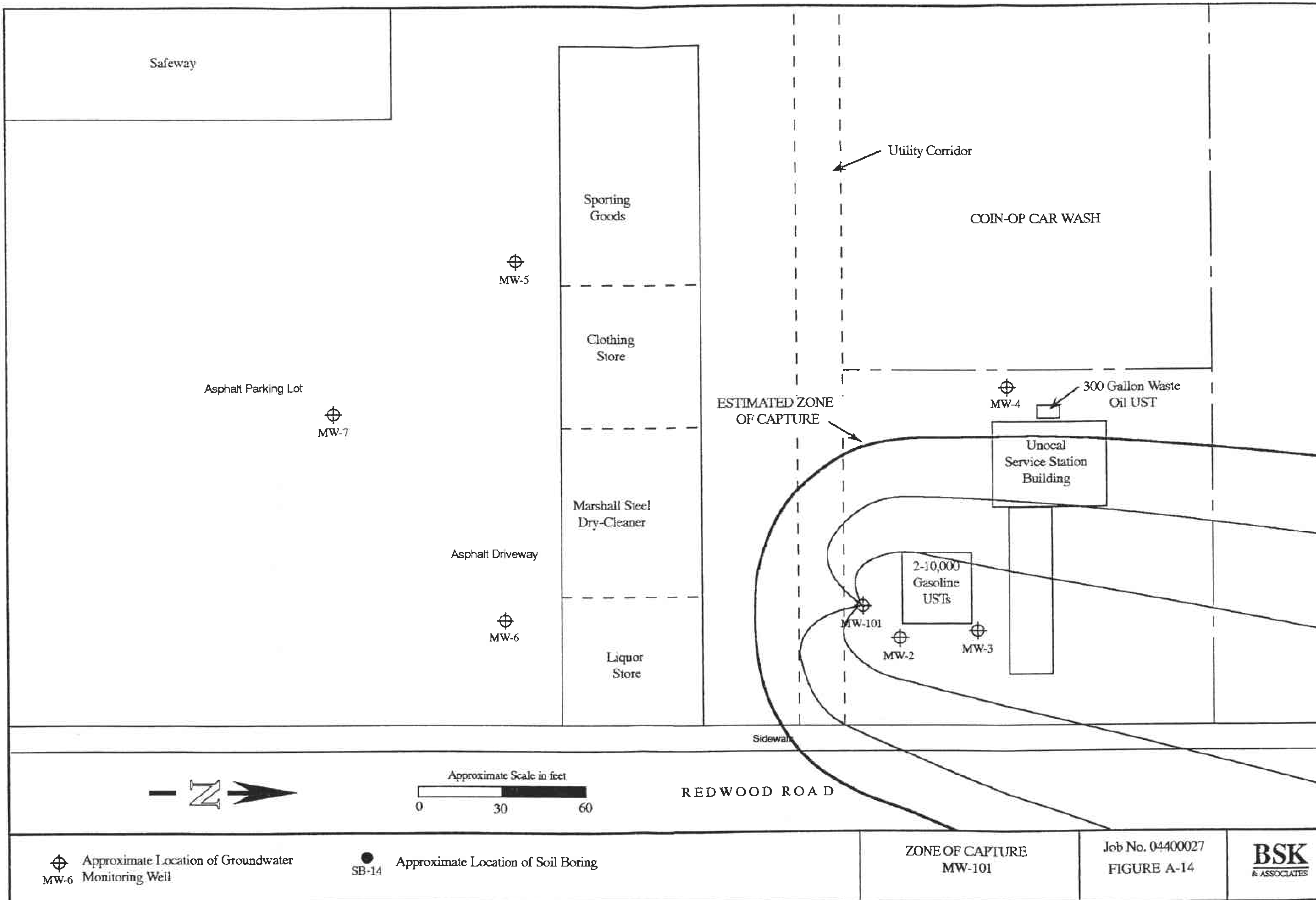


FIGURE A-13



Safeway
Sporting Goods
Clothing Store
Marshall Steel Dry-Cleaner
Liquor Store
Utility Corridor
COIN-OP CAR WASH
MW-5
Asphalt Parking Lot
MW-7
Asphalt Driveway
MW-6
ESTIMATED ZONE OF CAPTURE
MW-4
300 Gallon Waste Oil UST
Unocal Service Station Building
2-10,000 Gasoline USTs
MW-101
MW-2
MW-3
Sidewalk
N
Approximate Scale in feet
0
30
60
REDWOOD ROAD
MW-6 Approximate Location of Groundwater Monitoring Well
SB-14 Approximate Location of Soil Boring
ZONE OF CAPTURE MW-101
Job No. 04400027
FIGURE A-14
BSK & ASSOCIATES

BSK ANALYTICAL LABORATORIES

BSK-Pleasanton
Nahas

Date Sampled : 09/26/95
Time Sampled : 1000
Date Received : 09/28/95
Date of Analysis : 10/04/95
Report Issue Date: 10/12/95

Case Number : Ch952665
Lab ID Number : 2665-1
Project Number : 04-40-0027
Sample Description: MW-101 #2 at 10 ft.

Sample Type: SOLID

Analyses for BTEX by EPA Method 8020
and TPH(G) by EPA Method 8015
Prepared by Method 5030
Results Reported in Milligrams per Kilogram (mg/kg)

Compound	Results	DLR
Benzene	ND	0.005
Toluene	0.95	0.005
Ethylbenzene	2.1	0.005
Total Xylene Isomers	11	0.005
Total Petroleum Hydrocarbons (G)	120	1

Sample DLR = DLR x DLR Multiplier, DLR Multiplier = 100

NOTE:
ydrocarbons in the gasoline boiling point range are reported, in accordance with the ethod, as gasoline.
Chromatography for this sample is described as inconsistent with the gasoline standard ecause early (light) boiling point range is missing or significantly decreased.

LEGEND:
DLR: Detection Limit for the Purposes of Reporting.
Exceptional sample conditions or matrix interferences may result in higher detection limits.
ND: None Detected

Cynthia Pigman, QA/QC Supervisor

40721 BTXTPHGs.T

BSK ANALYTICAL LABORATORIES

BSK-Pleasanton
Nahas

Date Sampled : 09/26/95
Time Sampled : 1015
Date Received : 09/28/95
Date of Analysis : 10/04/95
Report Issue Date: 10/12/95

Case Number : Ch952665
Lab ID Number : 2665-2
Project Number : 04-40-0027
Sample Description: MW-101 #3 at 15 ft.

Sample Type: SOLID

Analyses for BTEX by EPA Method 8020 and TPH(G) by EPA Method 8015 Prepared by Method 5030

Results Reported in Milligrams per Kilogram (mg/kg)

Compound	Results	DLR
Benzene	ND	0.005
Toluene	1.5	0.005
Ethylbenzene	0.87	0.005
Total Xylene Isomers	9.8	0.005
Total Petroleum Hydrocarbons (G)	63	1

Sample DLR = DLR x DLR Multiplier, DLR Multiplier = 50

NOTE:
Hydrocarbons in the gasoline boiling point range are reported, in accordance with the method, as gasoline.
Chromatography for this sample is described as inconsistent with the gasoline standard because early (light) boiling point range is missing or significantly decreased.

LEGEND:
DLR: Detection Limit for the Purposes of Reporting.
Exceptional sample conditions or matrix interferences may result in higher detection limits.
ND: None Detected

Cynthia Pigman, QA/QC Supervisor

R940721 BTXTPHGS.T

1414 Stanisalus Street Fresno, CA 93706 Phone 209-497-2888, In CA 800-877-8310 · Fax 209-485-6935

BSK ANALYTICAL LABORATORIES

BSK-Pleasanton
Nahas

Date Sampled : 09/27/95
Time Sampled : 1605
Date Received : 09/28/95
Date of Analysis : 10/02/95
Report Issue Date: 10/05/95

Case Number : Ch952664
Lab ID Number : 2664
Project Number : 04-40-0027
Sample Description: MW-101 Dev.

Sample Type: LIQUID

Analyses for BTEX by EPA Method 8020 and TPH(G) by EPA Method 8015 Prepared by Method 5030

Results Reported in Micrograms per Liter (ug/L)

Compound	Results	DLR
Benzene	170	0.3
Toluene	94	0.3
Ethylbenzene	150	0.3
Total Xylene Iscmers	710	0.3
Total Petroleum Hydrocarbons (G)	9400	50

Sample DLR = DLR x DLR Multiplier, DLR Multiplier = 1

NOTE:
Hydrocarbons in the gasoline boiling point range are reported, in accordance with the method, as gasoline.
Chromatography for this sample is described as inconsistent with the gasoline standard because early (light) boiling point range is missing or significantly decreased.

LEGEND:
DLR: Detection Limit for the Purposes of Reporting. Exceptional sample conditions or matrix interferences may result in higher detection limits.
ND: None Detected

Cynthia Pigman, QA/QC Supervisor

BSK ANALYTICAL LABORATORIES

BSK-Pleasanton
Nahas

Date Sampled : 10/20/95
Time Sampled : 1200
Date Received : 10/23/95
Date of Analysis : 10/24/95
Report Issue Date: 10/25/95

Case Number : Ch952897
Lab ID Number : 2897
Project Number : 04-40-0027
Sample Description: Holding Tank

Sample Type: LIQUID

Analyses for BTEX by EPA Method 8020
and TPH(G) by EPA Method 8015
Prepared by Method 5030
Results Reported in Micrograms per Liter (ug/L)

Compound	Results	DLR
Benzene	0.9	0.3
Toluene	0.4	0.3
Ethylbenzene	ND	0.3
Total Xylene Isomers	ND	0.3
Total Petroleum Hydrocarbons (G)	320	50

Sample DLR = DLR x DLR Multiplier, DLR Multiplier = 1

NOTE:
Hydrocarbons in the gasoline boiling point range are reported, in accordance with the method, as gasoline.
Chromatography for this sample is described as inconsistent with the gasoline standard.

LEGEND:
DLR: Detection Limit for the Purposes of Reporting.
Exceptional sample conditions or matrix interferences may result in higher detection limits.
ND: None Detected

Cynthia Pigman, QA/QC Supervisor

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[redacted]NA[redacted]IC[redacted] 1414 Stanislaus Street
Fresno, CA 93706
(209) 485-8310
(800) 877-8310
(209) 485-6935 FAX

BSK LABORATORIES

Environmental Services

Analyses Request / Chain of Custody

BSK Log Number: [illegible]

Analytical Due Date:

Shaded areas for LAB use only

Requested Analyses

Client Name: ~~Nahas~~ Nahas	Report Attention: Martin Cline	Phone # (510) 462-4000	
Address: C/C BSK-P	Project, Quote or PO#: 04400027	FAX #	
City, State Zip:	Copy to:	System #:	

Sampled by: M. Cline

LAB use only: Sample #	Type	# Cont.	Date Sampled	Time Sampled	Sample Description Location	Comment or Station Code	TPH-G, BTEX										
			9/26/95	10:00	MW-101 #2 at 10FT		X										
			9/26/95	10:15	MW-101 #3 at 15ft		X										
		✓	9/27/95	16:05	MW-101 Cev		X										

Matrix Type: L - Liquid S - Solid G - Gas
Type of Hazards Associated with Samples:

Additional Services: /
Rush Priority: [ ] - 2 Day [X] - 5 Day
[ ] - Formal Chain of Custody [ ] - QC Data package

Additional Services Authorized by:

(Signature)

Payment Received with Delivery
Date: ______ Amount: $ ______
Check # ______ Initials ______
Reciept # ______

	Signature	Print Name	Company	Date	Time
Requested Relinquished by:	[signature]	Martin Cline	BSK-P	9/28/95	0900
Received Relinquished by:					
Received Relinquished by:					
Received Relinquished by:					
Received at Laboratory by:	[signature]	[illegible]	BSK Labs	9/28/95	1710

[redacted] AL [redacted] CA [redacted] 414 S[redacted]us Str[redacted]
Fresno, CA 93706
(209) 485-8310
(800) 877-8310
(209) 485-6935 FAX

BSK LABORATORIES
Environmental Services

BSK Log Number: 2877

Analyses Request / Chain of Custody

Analytical Due Date:

Shaded areas for LAB use only

Requested Analyses

Client Name: NAHAS % BSK	Report Attention: MARTY CLINE	Phone #
Address: 1181 QUARRY LN #3100	Project, Quote or PO #: 04.40.0027	FAX #
City, State, Zip: PLEASANTON, CA 94566	Copy to:	System #

Sampled by: MC/RSS

Sample # (LAB use only)	Type (LAB use only)	# Cont. (LAB use only)	Date Sampled	Time Sampled	Sample Description/Location	Comment or Station Code	BTEX	TPH-g								
1	L	4	10/20/95	1200	HOLDING TANK		X	X								

Matrix Type: (L) - Liquid S - Solid G - Gas
Type of Hazards Associated with Samples:

Additional Services:
Rush Priority: [ ] - 2 Day [ ] - 5 Day
[ ] - Formal Chain of Custody [ ] - QC Data package

Additional Services Authorized by:

(Signature)

Payment Received with Delivery
Date: ______ Amount: $ ______
Check # ______ Initials ______
Reciept # ______

	Signature	Print Name	Company	Date	Time
Requested / Relinquished by:	Rifaat Salem	RIFAAT SALEM	BSK - P	10/23	900
Received / Relinquished by:					
Received / Relinquished by:					
Received / Relinquished by:					
Received for Laboratory by:	[signature]	Jamiego Gerras	BSK Labs	10/23/95	1530

A L [redacted] C A [redacted] 414 S[redacted]us Stre[redacted]
Fresno, CA 93706
(209) 485-8310
(800) 877-8310
(209) 485-6935 FAX

BSK LABORATORIES

Environmental Services

Analyses Request / Chain of Custody

BSK Log Number: 2663

Analytical Due Date:

Shaded areas for LAB use only

Requested Analyses

Client Name: Nabus	Report Attention: Martin Cline	Phone #: (510) 462-4000
Address: C/O BSK-P	Project, Quote or PO #: 04400027	FAX #
City, State, Zip	Copy to:	System #

Sampled by: M. Cline

Sample # (LAB use only)	Type (LAB use only)	# Cont. (LAB use only)	Date Sampled	Time Sampled	Sample Description/Location	Comment or Station Code	TPH-G, BTEX
			9/26/95	10:00	MW-101 #2 at 10FT		X
			9/26/95	10:15	MW-101 #3 at 15ft		X
			9/27/95	16:05	MW-101 Dev.	(struck through)	X

Matrix Type: L - Liquid S - Solid G - Gas
Type of Hazards Associated with Samples:

Additional Services:
Rush Priority: [ ] - 2 Day [ ] - 5 Day
[ ] - Formal Chain of Custody [ ] - QC Data package

Additional Services Authorized by:

(Signature)

Payment Received with Delivery
Date: ______ Amount: $ ______
Check # ______ Initials ______
Reciept # ______

	Signature	Print Name	Company	Date	Time
Requested / Relinquished by:	Marty Cline	Martin Cline	BSK-P	9/28/95	0900
Received / Relinquished by:					
Received / Relinquished by:					
Received / Relinquished by:					
Received for Laboratory by:	Jameee Torres	Jameee Torres	BSK Lab	9/28/95	1210