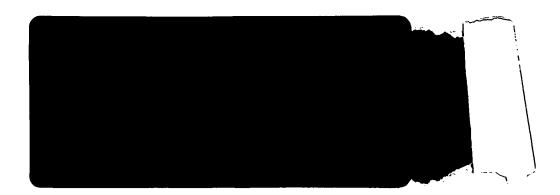
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HE SIMON HYDRO-SEARCH

MACHIAS GRAVEL PIT REMEDIAL INVESTIGATION REPORT SITE NUMBER 905013

August, 1991

Prepared for:

Motorola, Inc. 4000 Commercial Avenue Northbrook, IL 60062

Prepared by:

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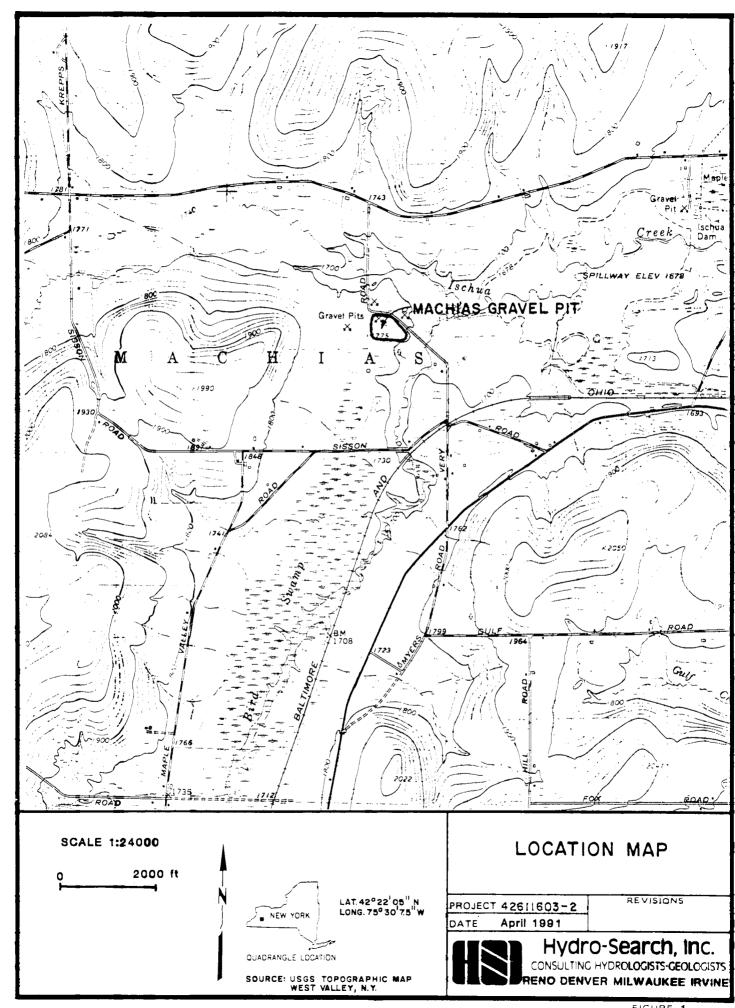
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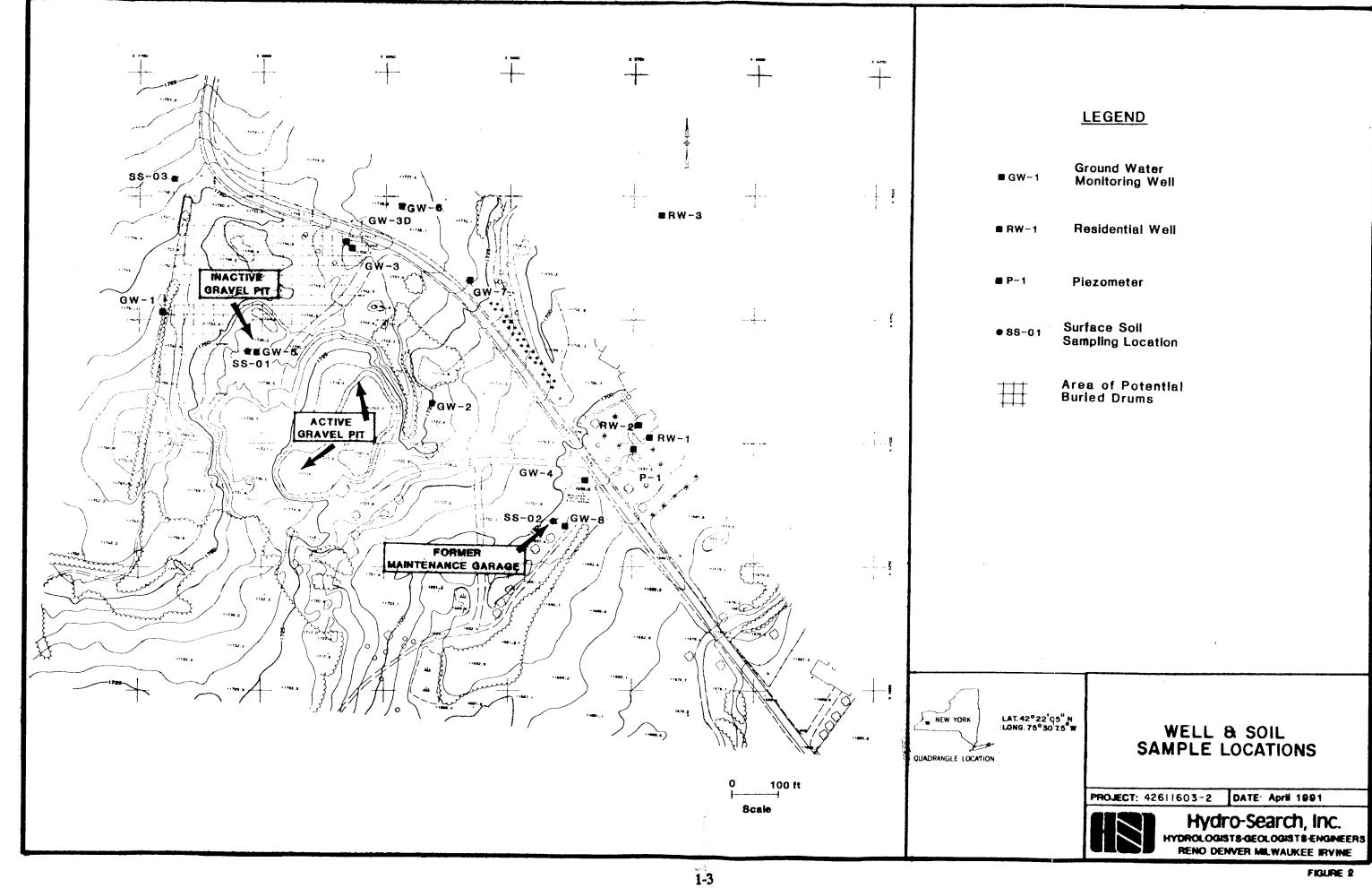
Hydro-Search, Inc. (HSI) was contracted by Motorola, Inc. to conduct a site investigation at the Machias Gravel Pit. The Remedial Investigation (RI) and the engineering evaluation of recommended remedial alternatives was outlined in the New York State Department of Environmental Conservation (NYSDEC) approved Site Investigation Work Plan dated September 1990 and amended on November 16, 1990. This report contains the results of the field investigation and site characterization. The engineering evaluation of remedial alternatives is provided under separate cover.

1.1 Background

The Machias Gravel Pit site (NYSDEC #905013) is located on Very Road approximately 2-miles west of the town of Machias, Cattaraugus County, New York (Figure 1). The site is approximately 20 acres in size and consists of an active gravel pit operation in the southern portion of the site and an inactive gravel pit area in the northern section (Figure 2). The inactive gravel pit area to the north was reportedly used for the storage of approximately 600 drums of waste material from the former Motorola Plant in Arcade, New York, between March and September 1978. The drums were suspected of containing wastes such as epoxy resins, acids, flammable and nonflammable solvents and cutting oils. The oils received at the site were reportedly spread on local roads for dust control by town personnel. The gravel pit was used as the transfer point to fill tank trucks prior to spraying the oil on rural roads. Based on background information, it is estimated that the contents of approximately 300 drums were spilled directly on the ground surface. The remaining drummed wastes were allegedly stacked on the ground surface along the inactive gravel pit wall.

Based on discussions with State and Town personnel, a maintenance garage for municipal trucks was located on the southern portion of the site (Figure 2). It is uncertain if any waste mishandling and spillage occurred on this portion of the site.





In 1986 and 1987 NYSDEC oversaw a drum removal and soil remediation project on the site. An attempt to clean contaminated soil was made by excavating a small portion of soil from directly beneath the drums and placing it on plastic. The soil was to be turned routinely to promote volatization. It is unclear whether this soil was eventually removed from the site and disposed. No records documenting soil disposal have been identified.

Approximately 184 drums were removed from the site for proper disposal by the property owners, the town of Machias. A summary of the number of drums removed and the disposal destination is provided in Table 1. There were no documents available to determine if the remaining drums were spilled, placed within the fill adjacent to the inactive pit area, or moved off-site for proper disposal.

Four ground water monitoring wells were installed and sampled in October 1988 as part of a NYSDEC Phase II investigation. Soil samples were also collected. The purpose of this study was to gather site specific information to further characterize the hydrogeology and evaluate the areal and vertical extent of ground water contamination. Sampling of these wells detected volatile and semi-volatile compounds in the ground water at monitoring well GW-3 (Figure 2).

Results of both soil and ground water sampling from the NYSDEC Phase II Investigation indicate that the compounds of potential concern at this site are volatile organic compounds (VOCs), polynuclear aromatic (PNA) compounds, chromium, nickel and lead. In addition a trace of phenol was also detected in a ground water sample from well GW-3.

Chloroform has been detected in a nearby residential well but may be unrelated to former waste handling activities at the site because chloroform was not found on-site and is not a constituent, or expected degradation component, of the alleged wastes.

TABLE 1

DOCUMENTED DRUM REMOVAL FROM MACHIA GRAVEL PIT*

Date	Number of Drums	Destination
10-31-86	160 (crushed)	CID Landfill, Chaffee, NY Contents from drums shipped in CID tank truck to be disposed by CID.
4 -1 5- 87	10	Waste Management of North America Landfill in Model City, NY.
19 87	10	Lewiston, NY
5-23-88	4	Rollins Environmental, N.J.

^{*} From telephone conversation 4-1-91 with Edward Morgan, Machias Town Supervisor.

1.2 Objectives of the RI/FS

Motorola, Inc. agreed to conduct a remedial investigation and feasibility study (RI/FS) at the Machias Gravel Pit. The site investigation performed was a streamlined and focused version of a formal CERCLA RI/FS. The objectives of the RI were to:

- Collect additional site information to characterize potential source area(s) of contamination.
- Confirm or refute the presence of buried drums.
- Provide additional delineation of the vertical and horizontal extent of constituent migration.
- Evaluate site specific hydrogeologic conditions and identify the nearest potential ground water receptor.
- Estimate potential constituent concentrations at the receptor using analytical modeling methods.
- Determine whether chloroform present in Cole residence well is originating from the gravel pit area.
- Perform a preliminary risk assessment on the constituents of concern to aid in evaluating appropriate remedial alternatives.
- Provide the data necessary for completing the FS.

The FS focuses on evaluation of the probable remedial alternatives for the site. The FS report will be provided under separate cover.

2.0 FIELD METHODS

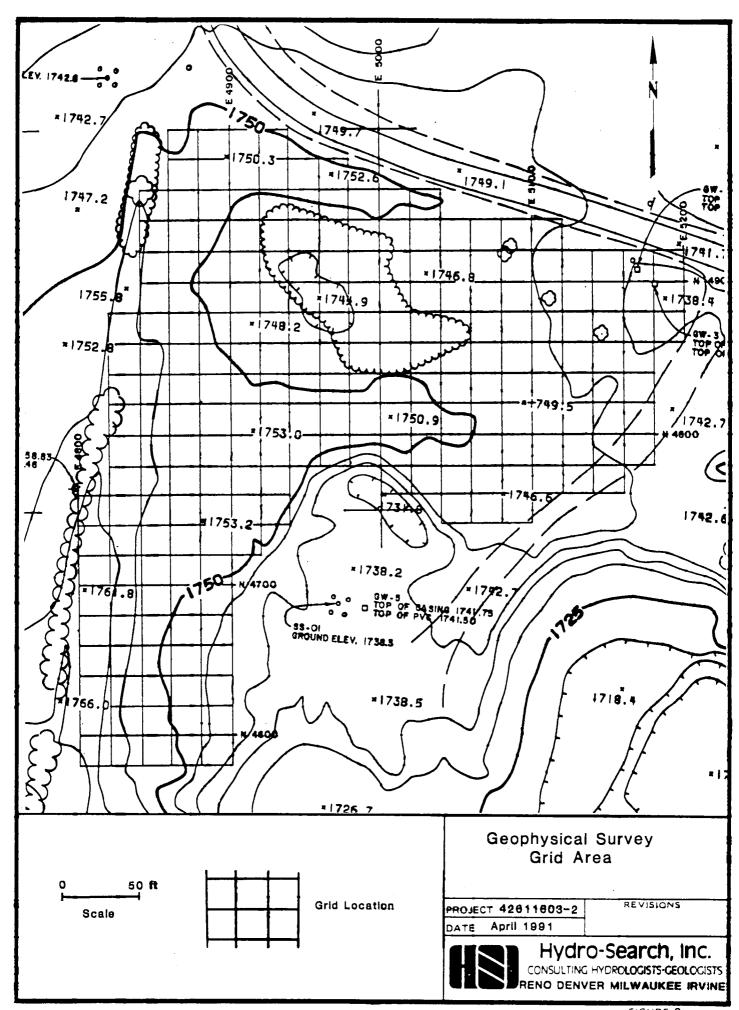
The field investigation closely followed the approach described in the work plan dated September 1990 and an addendum dated November 1990. Seven field tasks were performed to fulfill the study objectives. The field tasks included:

- Task 1 Burial Drum Identification
- Task 2 Test Pit Sampling
- Task 3 Surface and Subsurface Soil Sampling
- Task 4 Monitoring Well Installation and Ground Water Sampling
- Task 5 In-Situ Permeability Tests
- Task 6 Residential Well Sampling
- Task 7 Piezometer Installation and Measurement
- Task 8 Air Quality Sampling

2.1 Task 1 - Burial Drum Identification

A total of approximately 600 drums were sent to the Machias Gravel Pit site. Based on historical information it is estimated that 300 drums were emptied directly onto the ground in the inactive gravel pit area. Documentation shows an additional 184 drums being taken off-site for proper disposal. It was uncertain whether the remaining drums were also spilled or if they were buried in a suspect area just north-northwest of the inactive gravel pit. A magnetic gradiometer survey was performed to confirm or refute the presence of buried drums.

Prior to the magnetic survey, a buildozer scraped the area in order to remove any surface metal and debris. A survey grid was located by McIntosh & McIntosh, P.C. of Lockport, New York, with stakes placed on twenty foot centers and station locations written on each stake (Figure 3). Upon arrival at the Machias Gravel Pit site, the area to be surveyed was visually inspected and any remaining surface metal was removed from the targeted area.



The initial magnetic gradiometer survey included a measurement at each grid node. A contour map was constructed using the magnetic field gradient (refer to Section 5.1). Based on this map, three anomalous areas were identified. These areas were re-surveyed with the magnetic gradiometer on a 10 foot grid. Based on anomalously high magnetic field gradients from both magnetic surveys seven areas were designated for test pitting to identify the source(s) of the noted anomalies.

2.2 Task 2 - Test Pit Sampling

Based on results of the geophysical survey, seven test pit locations were selected by HSI in concurrence with NYSDEC oversight personnel. The purpose of the test pits was to determine the cause of the noted magnetic anomalies and visually confirm or refute the presence of buried drums.

Each test pit was excavated to transect a specific anomaly. Test pits were excavated using a rubber-tired backhoe with a 15 foot bucket arm. Prior to test pitting, the bucket end of the backhoe was steam cleaned thoroughly. The pits were excavated vertically until native materials were encountered. Pits ranged from 15 feet to 30 feet in length. Each pit was logged and metal debris were noted. Test pit logs are provided in Appendix A.

Soil samples were collected from five of the seven test pits from locations chosen by HSI in concurrence with NYSDEC oversight personnel. Samples were collected by scraping the full height of a trench side wall with the bucket of the backhoe. A grab sample was collected directly from the bucket for volatile organics analysis. The remainder of the sample was composited in a stainless steel bowl, mixed and placed directly into laboratory prepared containers for analysis of PAH and total metals.

Subsurface soil sample MGSB02-01, was collected from split spoon samples obtained during the drilling of monitoring well GW-8. All split spoon samples gave background PID readings so a grab sample for VOC analysis was collected immediately above the water table from the 14 to 16 foot interval. Total metals and PAH samples were composited from the 12 to 16 foot intervals.

2.4 Task 4 - Monitoring Well Installation and Ground Water Sampling

2.4.1 Monitoring Well Installation

Five monitoring wells were installed at the Machias Gravel Pit site, including two located across Very Road in neighboring fields. Locations of the monitoring wells are shown on Figure 2 and Plate I. The wells are numbered GW-3D, GW-5, GW-6, GW-7 and GW-8. The rationale for the location of each well is provided in Table 2. Well GW-3D was drilled to a total depth of 77.8 feet and screened from 65 to 75 feet below ground surface. Well GW-3D is nested with GW-3. The screened interval of GW-3D is below the bottom of well GW-3. The other monitoring wells were installed with the screened interval straddling the water table.

Drilling

Empire Soils Company of Hamburg, New York was subcontracted by HSI to perform the drilling and installation of monitoring wells. Two all terrain vehicle track rigs were used to drill the wells. Boreholes were advanced using 4.25-inch inside diameter (I.D.) hollow stem augers.

All boreholes were logged using a 2-foot split spoon sampler with samples collected continuously the entire depth of the boring. A PID was used to field screen each soil sample for total volatile organic vapors. Readings were also taken downhole and in the breathing zone for health and safety purposes. During bad weather conditions, soil samples were jarred, sealed and allowed to equilibrate. The PID was then used to obtain head space measurements.

TABLE 2
WELL PLACEMENT RATIONALE
MACHIAS GRAVEL PIT

Well Number	Approximate Water Table Depth	Approximate Screened Interval	Placement Rationale
GW-5	47′	41′-51′	Located within potential source area. Will also provide additional control on water table to confirm or refute potential mounding as suggested in previous site work.
GW-6	48′	45'-55'	Downgradient of potential drum burial area and documented ground water contamination. Will help delineate areal extent of constituent migration.
GW-7	39′	37'-47'	Monitoring point along flow line between potential source area and Cole residence well. Will help delineate areal extent constituent migration.
GW-8	17′	12'-22'	Downgradient of former garage/ maintenance area which may be a source location. Will also provide control on water table elevation in this area.
GW-3D	50′	65'-75'	Clustered adjacent to existing water table well GW-3 which shows ground water contamination. Will provide data on vertical distribution of contaminants and the vertical component of ground water flow.
P-1	11′	8'-18'	Piezometer located to provide control on water table elevations in the vicinity of the Cole residence well.

Drill rigs, all drilling equipment and well construction materials were steam-cleaned prior to drilling at each well location. Well screen and riser pipe were isolated from contact with surface soils by wrapping them with visqueen immediately after decontamination. An HSI hydrogeologist supervised all drilling and well construction activities. Boring logs are presented in Appendix B.

Well Construction

Monitoring wells were constructed of 2-inch I.D., Schedule 40 PVC riser with 10 feet of 0.010-inch continuous-slot PVC screen. The annular space around the screen was backfilled with clean, well-sorted silica sand to a depth of approximately two feet above the top of the screen. Due to heaving sands, some natural formation may be mixed with the artificial sand pack. All wells were constructed with a minimum 3-foot bentonite-pellet seal placed immediately above the sand pack. The pellets were hydrated and allowed to swell. The remaining annular space was then backfilled with a bentonite/cement grout. Detailed well construction summaries are presented in Appendix B.

PVC riser pipe was extended approximately 1.5 to 2 feet above ground surface, with the exception of GW-7 which was completed flush with ground surface. All wells except GW-7 were covered with locking, protective metal casings with cement run-off aprons. GW-7 was finished with a monitoring well manhole cover with three flush mount bolts and a locking pipe plug in the top of the PVC riser pipe.

Well Development

All new wells were developed using the bail and surge method. A minimum of five casing volumes of water were removed and field measurements of pH, specific conductance and temperature were monitored to document stable conditions. Specific development information for each well is included with the well construction summaries in Appendix B.

2.4.2 Ground Water Sampling

Ground water samples were collected from each of the new and existing monitoring wells. The following procedures were used to sample all monitoring wells:

- Depth to water and total depth of each well was determined using an electric water level indicator. The volume of water in the well casing was then calculated.
- A minimum of three well volumes of water was purged from the well with the PVC bailer prior to sampling, except well GW-8 which bailed dry and was allowed to recover approximately 30 minutes.
- Purging continued until three successive pH, specific conductance and temperature measurements showed stable conditions to ensure that the sample was representative of formation water.
- The sample was collected using a PVC bailer. Sample water was poured directly into laboratory prepared containers.
- The bailers were decontaminated between each well by scrubbing the bailer with an Alconox solution, followed by thoroughly flushing the bailer with deionized water.

Samples were collected and containerized in the order of the volatization sensitivity of the parameters. The order of collection was VOC, PAH, phenois, total and dissolved metals (i.e. chromium, nickel and lead). Samples for total metals were not filtered prior to preservation with acid. Samples for dissolved metals were field filtered with a 0.45 micron filter prior to preservation with acid. All samples were containerized, preserved, packaged and shipped in accordance with established U.S. EPA protocols. A completed chain of custody form accompanied each sample shipment.

2.5 Task 5 - In-Situ Permeability Tests

Baildown-recovery tests were performed in each of the nine monitoring wells. The tests were performed using In-Situ SE-1000A and SE-1000B data loggers with a 15 psi pressure transducer placed down the well. The following procedure was used for testing:

- Static water level was determined and recorded.
- The pressure transducer was placed approximately 1 foot above the bottom of the well.
- A 4-foot, 1.25-inch I.D. bailer was slowly lowered into the well until it was fully submerged.
- The pressure transducer was activated and the readings monitored to check for reestablishment of static conditions prior to test initiation.
- Once static conditions were documented, the pressure transducer was reset and one full bailer volume of water was removed.
- Water levels in the well were then automatically recorded by the data logger until static conditions were re-established.
- The data was preliminarily evaluated in the field to ensure proper recovery-curve development.

Hydraulic conductivities were calculated using the Bouwer and Rice (1976) method. Recovery-curve plots and calculations are included in Appendix C. Results of the testing are presented in Section 3.2.

2.6 Task 6 - Residential Well Sampling

The Cole residence is located to the east and downgradient of the site (Figure 2 and Plate I). The Cole's have two drinking water wells on their property; one for their residence and one for an occupied cabin located north of the residence. Three water samples were collected from the Cole's wells. Two samples were collected from the Cole residence, one before their filtering system (MGRW01-01) and one sample after filtering (MGRW02-01). The third sample was

collected at the cabin (MGRW03-01). The cabin does not have a filtering system. Before collecting the samples, the size of holding tank was determined along with the flow rate from the spigot using a 2.5 gallon bucket. The water was allowed to flow 10 minutes past the calculated time to empty the holding tank to assure that formation water was being collected. Residential well samples were analyzed for VOCs only. Historical data indicate that metals have not been a problem at the Machias Gravel Pit site and, therefore, the residential wells were not sampled for metals. This was in accordance with the NYSDEC approved Work Plan.

2.7 Task 7 - Piezometer Installation and Measurement

A piezometer, P-1, was installed 40.5 feet from the Cole's residential well (Figure 2). Drilling procedures were identical to those of the monitoring wells. The borehole was advanced approximately 6 feet below the water table and the 10-foot PVC 0.010-inch continuous-slot screen was set straddling the water table. The boring log and the piezometer construction summary are included in Appendix B. Piezometer P-1 was finished flush with the ground surface using a metal manhole cover and locking pipe plug.

The piezometer was used to measure the local effect of the Cole residential well. A pressure transducer attached to a Hermit SE1000A data logger was placed about one foot from the bottom of P-1 and activated to measure drawdown as the outside spigot at the Cole residence was turned on. A 100 foot garden hose discharged the water downgradient of P-1 to minimize the effect of possible recharge. The water flowed from the hose at a rate of 8.3 gallons per minute. This rate remained relatively constant throughout the seven hour pumping test. The flow rate was measured with a stop watch and 2.5 gallon bucket. Water levels in P-1 were measured and recorded on the data logger.

A recovery test was conducted immediately following the shut off of the outside spigot. No one was at the Cole residence during the recovery test so the recovery test was not interrupted by water use in the Cole household.

2.8 Task 8 - Air Quality Sampling

A PID was used to monitor the presence of total organic vapors. Background readings were taken off-site. No organic vapors above background levels were detected in the breathing zone, downhole or during head space measurements on soil samples, with the exception of one reading at well GW-7. A reading was taken downhole at GW-7 immediately after hitting the water table while water vapor (steam) was discharging from the hole. The reading downhole was 7 parts per million (ppm) above background, but remained at background in the breathing zone. Subsequent measurements gave background readings. PID's will commonly be affected by the presence of water vapor in the atmosphere and give a reading as though VOCs had been detected. HSI believes that this is what occurred at well GW-7 and that the 7 ppm reading obtained downhole was erroneous.

3.0 GEOLOGY/HYDROGEOLOGY

3.1 Geologic Setting

Topography and surface geology in the Machias area is largely shaped by Pleistocene glaciation. Older sedimentary rocks were scoured by glaciation leaving behind sands and gravels of variable thickness. W. B. Satterthwaite Associates (1985) quote local driller reports that bedrock is at a depth of 40 feet on the flanks of local stream valleys and up to 350 feet deep along valley axis. Depth to bedrock near the gravel pit is reported to be approximately 90 feet (NYS Water Resource Commission, 1973).

Within the boundaries of the study area, unconsolidated deposits unconformably overlie bedrock consisting of the upper Devonian Age Gowanda Shale Member of the Canadaway Formation. This formation is approximately 275 feet thick and underlain by more shales and siltstones. The overlying unconsolidated deposits are fluvioglacial (i.e., stream deposits associated with continental glacial ablation) in origin, and are comprised primarily of sand and gravel with some silty horizons. The uppermost unit is a sand which is underlain by silt. Beneath the silt is an interlayered sand, and sand and gravel with an underlying silt unit. The bottom of the silt unit was not penetrated by any of the borings.

The general sequence of the unconsolidated units is as follows:

- Unit I Sand: present only in well GW-1. Generally fine sand, some silt, tan, traces of clay in some horizons; unsaturated.
- Unit II <u>Silt</u>: some clay, trace pebbles present in some horizons; tan to brown; unsaturated.
- Unit IIIA <u>Sand and gravel</u>: poorly sorted sands and gravel, grain sizes from fine sand to pebbles, cobble size gravel in some horizons; generally unsaturated, the bottom few feet are saturated in some wells.
- Unit IIIB <u>Sand</u>: interbedded with sand and gravel unit, fine to medium sand, usually well sorted, becoming silty to the southeast and near the bottom of the unit; generally unsaturated.

Unit IV - Silt: brown to gray, fining to the southeast to silty clay; saturated.

Three geologic cross sections were developed from monitoring well boring logs. Section line locations are shown on Figure 4 and the cross-sections are provided on Figures 5 and 6.

3.2 Hydrogeology/Ground Water Flow

The upper most aquifer beneath the site consists of the fluvioglacial sand and gravel deposits. The aquifer is under unconfined conditions and its lower boundary is marked by the low permeability shale bedrock. A water table contour map is provided on Figure 7.

The water table at the site roughly follows ground surface topography, with the exception of the active pit area. Surface runoff ponds in the active pit area may produce a slight mounding effect from additional recharge. The effect can be seen in the shape of the water table defined by the 1693 foot contour line on Figure 7. Ground water flows in a semi-radial pattern from the active pit area ranging from a northeast to southeast direction. Ground water from the old pit area near well GW-5, (the area where dumping of oils and solvents is known to have taken place) flows northeast, curving east toward Ischua Creek. Ground water from the vicinity of GW-2 and GW-8 flows toward the stream draining Bird Swamp. Although no ground water levels were measured adjacent to the stream, projections of the water table map put the water table about the same elevation as the stream, the likely discharge point.

The gradient of the water table across the site ranges from 3×10^4 ft/ft (between GW-5 and GW-2) to 4×10^2 ft/ft upgradient from GW-8. The average water table gradient at the site is approximately 1.5×10^2 ft/ft. Depth to water is greatest east of the site where the water table is approximately 61 feet below ground surface. P-1 was measured as the shallowest depth to water at 11 feet below ground surface. Presumably the water table eventually intersects Ischua Creek and its tributary from Bird Swamp. Comparing head measurements between the shallow and deep well at well cluster GW-3 shows little head change with depth. This suggests a strong preferential horizontal flow component within the aquifer.

2.3 Task 3 - Surface and Subsurface Soil Sampling

Three surface soil and two subsurface soil samples were collected at the site. Surface soil sample locations were surveyed and are shown on Plate I and Figure 2. Subsurface soil samples were collected during the drilling of wells GW-5 and GW-8.

2.3.1 Surface Soil Sampling

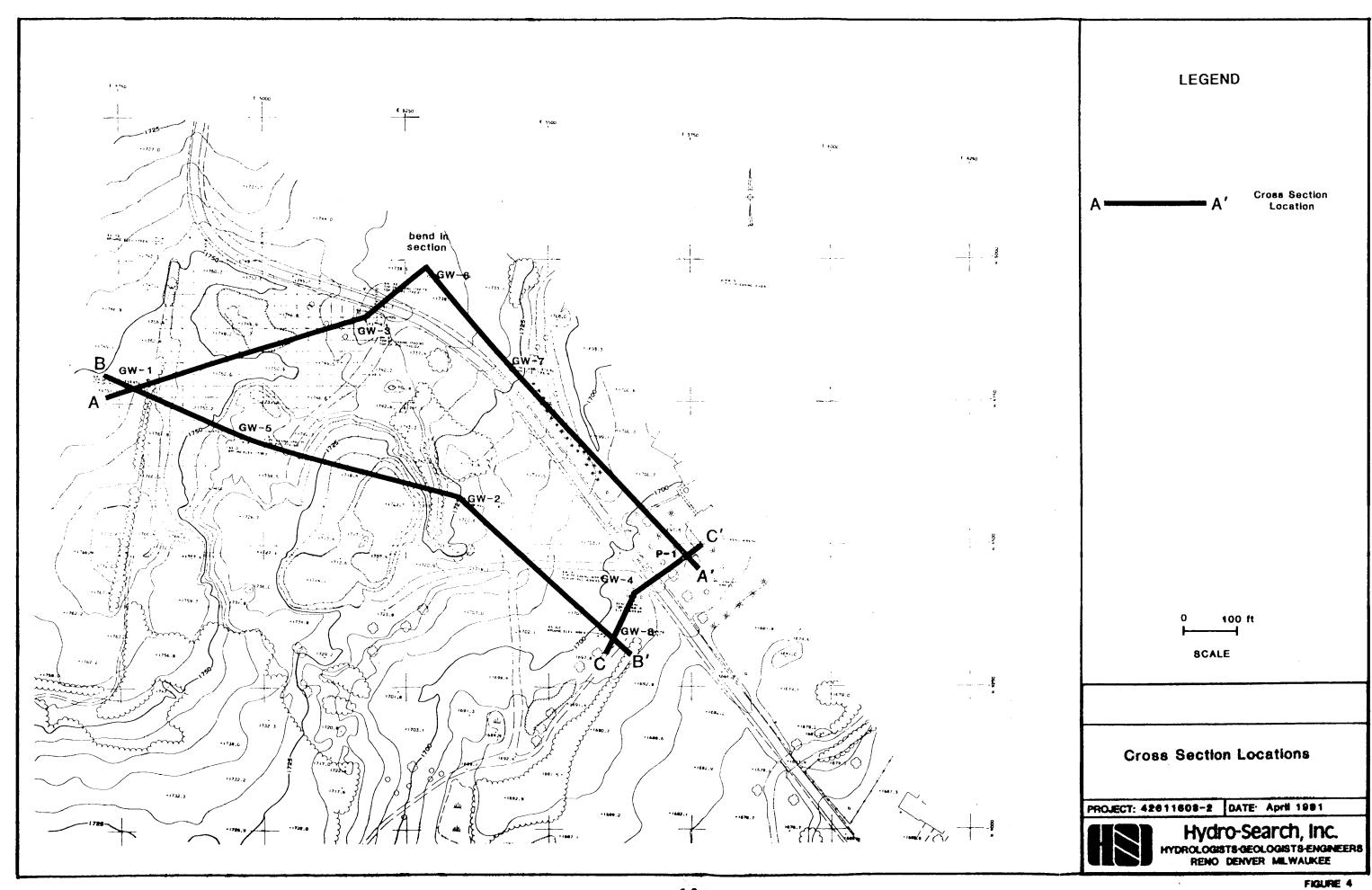
Surface soil samples were collected by first removing surface vegetation and debris with a decontaminated shovel. Actual samples were collected with a stainless steel trowel. Samples were collected at the four corners of a 10 foot by 10 foot square, with an additional sampling point at the center of the square. The samples were placed into a stainless steel mixing bowl and composited. Appropriate proportions were then placed into wide mouth jars for total metals and PAH analysis. Sample aliquots for volatile organic compound (VOC) analysis were obtained as grab samples from the center point at each of three respective locations.

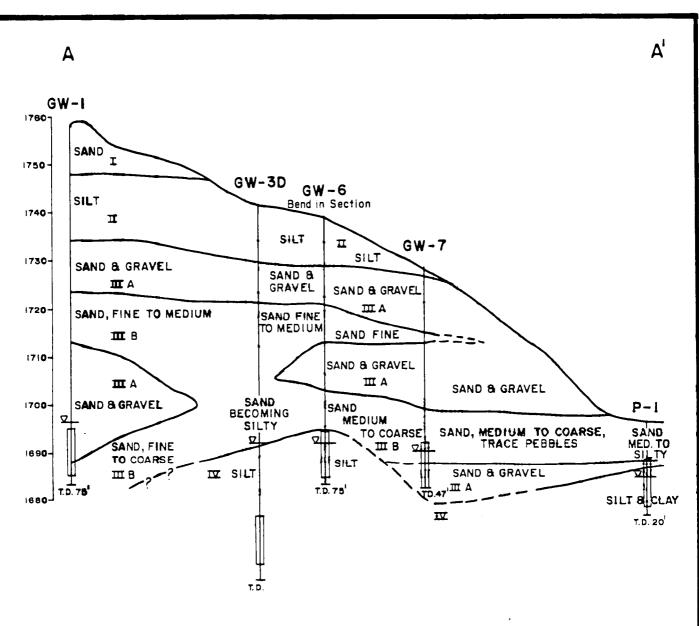
Field notes were kept, recording the date, time and a description of each surface soil sample. MGSS01-01 consisted of a well graded sand and gravel. Sample MGSS02-01 was well graded with clay to gravel size grains and MGSS03-01 consisted of clay and gravel.

2.3.2 Subsurface Soil Samples

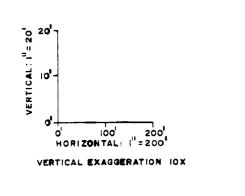
Subsurface soil sample MGSB01-01 was collected from split spoon samples taken during the drilling of monitoring well GW-5. Photoionization detector (PID) readings remained at background levels from the surface to total depth of GW-5. The soil sample was, therefore, collected from just above the water table. VOC grab samples were collected from the interval of 42 to 44 feet below ground surface. Total metals and PAH samples were a composite of split spoon samples from the interval of 40 to 44 feet. The sampled soil was a mixture of fine sand, silt and clay.

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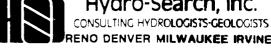


CROSS-SECTION A-A'

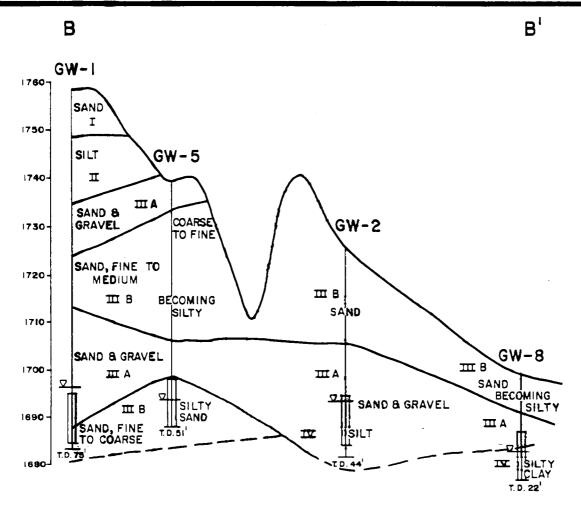
PROJECT 42611603-2

REVISIONS

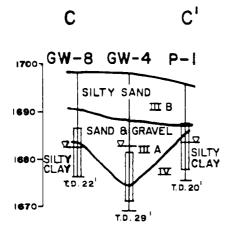
DATE April 1991



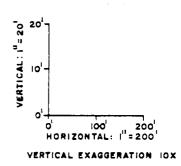
Hydro-Search, inc. CONSULTING HYDROLOGISTS-GEOLOGISTS



CROSS - SECTION B-B'



CROSS-SECTION C-C'



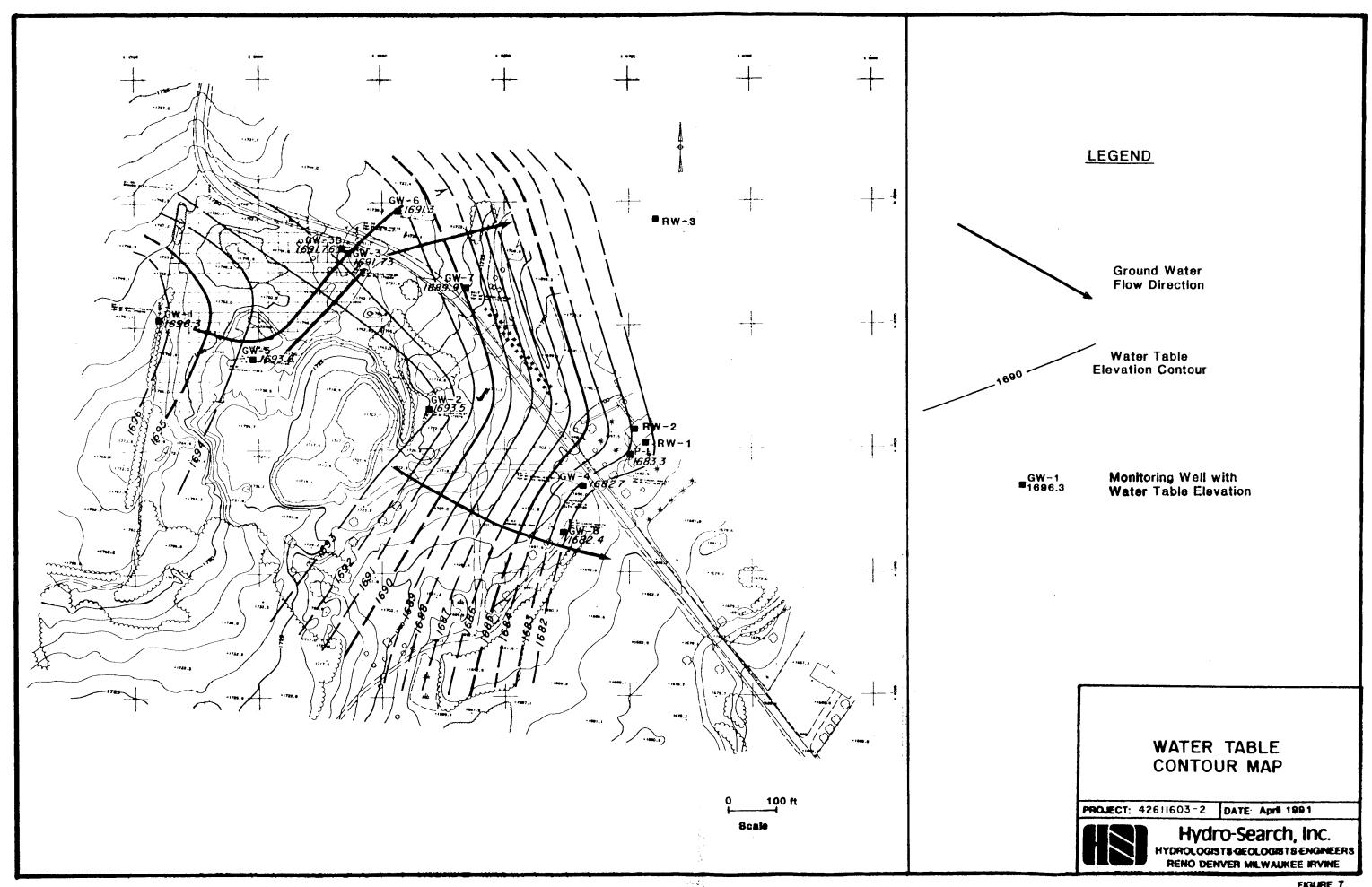
CROSS-SECTIONS B-B' & C-C'

PROJECT 42611603-2

REVISIONS

DATE April 1991





In order to estimate horizontal hydraulic conductivities, baildown-recovery tests were performed on all new and existing monitoring wells. (Test results of well GW-3D are not included in this report as closer examination of the data revealed a problem with the data logger and the results were deemed unreliable and unusable.) Test procedures are defined in Sectiony 2.4 and resulting recovery curves are provided in Appendix C. The data was analyzed using the Bouwer and Rice method (1976) and the results are summarized on Table 3. The conductivities range from 4.46×10^4 ft/sec to 5.74×10^4 ft/sec. The average hydraulic conductivity of the eight wells is 6.2×10^{-5} ft/sec. These values are consistent with previous test results performed during the Phase II NYSDEC investigation.

The pumping test at the residential well gave transmissivities of 15,100 gpd/ft and 14,600 gpd/ft for the drawdown and recovery test, respectively. Assuming a 50 foot thick aquifer, the hydraulic conductivity determined from the residential well pump test is 4.7×10^4 ft/sec and 4.5×10^4 ft/sec respectively for the drawdown and recovery portions of the test. These values are in the same range as calculated using bail-down recovery tests. It should be noted, however, that the values for the constant discharge test may be biased low due to limits on pumping rate associated with the residential well pump and time constraints.

Ground water flow rates can be estimated using Darcy's Law. Assuming the average gradient of 1.5×10^{-2} ft/ft and the average hydraulic conductivity of 6.2×10^{-5} ft/sec, the average flow rate is 9.3×10^{-7} ft/sec. The seepage velocity (Darcy velocity/effective porosity) is 3.1×10^{-6} ft/sec, assuming an effective porosity of 0.3 which is in the common range for sands and gravels (Fetter, 1980).

TABLE 3

HYDRAULIC CONDUCTIVITIES OF MONITORING WELLS
AT THE MACHIAS GRAVEL PIT

	HYDRAULIC CONDU	CTIVITY
<u>WELL</u>	<u> </u>	LM&S*
G W -1	5.74 × 10 ⁻⁶ ft/sec	1.00×10^4 ft/sec
G W -2	4.46×10^{-4} ft/sec	$2.30 \times 10^{-3} \text{ ft/sec}$
G W -3	2.05×10^{-5} ft/sec	2.37×10^{-5} ft/sec
G W -4	2.51×10^{-5} ft/sec	1.40×10^{-5} ft/sec
G W -5	4.82×10^{-5} ft/sec	
G W -6	1.33×10^4 ft/sec	
G W -7	1.02×10^4 ft/sec	
G W -8	2.61×10^4 ft/sec	

^{*} Lawler, Matusky and Skelly Engineers (Contractor for NYSDEC Phase II Investigation)

4.0 ANALYTICAL CHEMISTRY RESULTS

In accordance with the approved RI/FS Work Plan for the Machias Gravel Pit site, samples were collected from the following groups:

- Soils (Test pit, surface, and subsurface).
- Ground water (monitoring well and residential well).

Details of the sample and analysis program is provided in Table 4. Chemistry results are provided in the following subsections. Raw data are on file at the HSI office in Golden, Colorado. Third party data validation was performed by NUS Corporation. Results of the data validation are provided in Appendix D.

4.1 Soil Analytical Results

Three types of soil samples were collected during the RI/FS:

- Test pit soil samples.
- Subsurface soil samples.
- Surface soil samples.

Sample collection techniques are provided in Section 2.0 of this report. All soil samples were analyzed for Hazardous Substance List (HSL) volatile organic compounds (VOCs), polyaromatic hydrocarbons (PAHs), chromium, nickel and lead. Analytical results are summarized in Tables 5 through 7.

Volatile Organic Compounds

Table 5 provides a summary of VOCs detected in soil samples. The only soil sample in which VOCs were detected was sample SB01-01. This soil sample was collected during drilling of monitoring well GW-5 in the old gravel pit. The soil sample analyzed was collected from 42 to 44 feet below the surface, just above the water table. The only VOCs detected were trichloroethene (TCE, 291 ug/kg) and 1,1,1-trichloroethane (1,1,1-TCA, 27 ug/kg).

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TABLE 4
SAMPLING AND ANALYSIS MATRIX
MACHIAS GRAVEL PIT SITE

Sample Matrix	Investigative Samples	Duplicate Samples	Field Blanks	Total
Soil				
Surface Soil	3	1		4
Subsurface Soil	2			2
Test Pit	5	1		6
Water				
Ground Water	11	1 .	1	13
TOTAL	21	3	1	25

Note: All samples were analyzed for VOCs, PNAs, total chromium, total lead and total nickel. Ground water samples from monitoring wells were also analyzed for total phenols and total and dissolved chromium, total and dissolved lead and total and dissolved nickel. Ground water samples from residential wells were only be analyzed for VOCs.

TABLE 5 – SUMMARY O	F SOIL SAM	PLE VOLAT	TILE ORGAN	IC COMPO	UND ANAL	YSES
		Machias,	New York			
SAMPLE DESIGNATION TP01-01 TP02-01 TP02-01-DP TP03-01 TP04-01 TP05-01						TP05-01
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
VOLATILE ORGANIC COMPOUNDS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
1,1,1-Trichloroethane	ND	ND	N D	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND

SAMPLE DESIGNATION	SS01-01	SS02-01	SS03-01	SB01-01	SB02-01
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
VOLATILE ORGANIC COMPOUNDS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
1,1,1-Trichloroethanc	ND	ND	ND	27	ND
Trichloroethene	ND	ND	ND	291	ND

Notes: ND - Not detected.

TP - Test pit.
SB - Soil boring.

SS - Surface soil.

DP - Duplicate.

TABLE 6 – SUMMA	RY OF PO		TIC HYDRO New York	CARBON A	AN	ALYSES		
SAMPLE DESIGNATION	TP01-01	TP02-01	TP02-01DP	TP03-01		TP04-01	TP05-01	
MATRIX	SOIL	SOIL	SOIL	SOIL		SOIL	SOIL	
SEMI-VOLATILE ORGANIC COMPOUNDS	ug/kg	ug/kg	ug/kg	ug/kg		ug/kg	ug/kg	
Acenaphthylene	ND	ND	ND	ND		ND	280	1
Fluorene	ND	ND	ND	ND		ND	220	J
Phenanthrene	ND	ND	ND	ND		ND	1900	ı
Anthracene	ND	ND	ND	ND		ND	220	JX
Fluoranthene	ND	ND	ND	340	J	ND	1500	
Pyrene	ND	ND	ND	260	J	ND	1100	l
Benzo(a)anthracene	ND	ND	ND	ND		DИ	490	1
Benzo(b)fluoranthene	ND	ND	ND	ND		ND	570	
Benzo(k)fluoranthene	ND	ND	ND	ND		ND	410	J
Benzo(a)pyrene	ND	ND	ND	ND	Ì	ND	470]]
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	l	ND	400	1
Benzo(g,h,i)perylene	ND	ND	ND	ND	ŀ	DN	250	JX

SAMPLE DESIGNATION	SB01-01	SB02-01	SS01-01	SS02-01	SS03-01
MATRIX	SOIL	son	son	SOIL	son
SEMI-VOLATILE ORGANIC COMPOUNDS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Acenaphthylene	ND	ND	ND	ND	ND
Fluorene	ND	ND	DN D	ND	ND
Phenanthrene	ND	ND	ДИ	ND	ND
Anthracene	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ИD	ND
Benzo(a)anthracene	ИD	ND	ND	ND	ND
Benzo(b)fluoranthene	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	מא	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND .	ND	ND	ND
Benzo(g,h,i)perylene	ND	מא	ND	ND	ND

Notes:

ND - Not detected.

ND - Not detected.

TP - Test pit.

SB - Soil boring.

SS - Surface soil.

DP - Duplicate.

J - Estimated value.

X - Mass spectrometer does not meet EPA CLP criteria for confirmation, but compound presence is strongly suspected.

TABLE 7	- SUMMARY O	F SOIL SAM	PLE INORG	ANIC ANA	LYSES	
	ľ	Machias, Nev	w York			
SAMPLE DESIGNATION	TP01-01	TP02-01	TP02-01DP	TP03-01	TP04-01	TP05-01
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
METALS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Chro mium	3.7	5.0	4.8	6.5	8.2	5.5
Lead	•	• 1	· •	•	*	+
Nickel	11.0	13.2	13.3	14.0	23	17.3

SAMPLE DESIGNATION	SB01-01	SB02-01	\$\$01-01	SS02-01	SS03-01
MATRIX	RIX SOIL SOIL SOIL		SOIL	SOIL	SOIL
METALS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Chromium	ND	3.1	2.5	4.6	6.0
Lead	5.5		608	19.7	13.6
Nickel	9.6	13.3	11.7	10.2	13.3

Notes:

ND - Not detected.

TP - Test pit.

SB - Soil boring.

SS - Surface soil.

DP - Duplicate.

+ - Analyzed but results rejected by third party data validation due to spike recovery problems.

Polyaromatic Hydrocarbons

Table 6 provides the results of PAH analyses. Only the soil samples collected from test pits 3 and 5 (i.e., TP03-01 and TP05-01) were shown to contain PAHs. A review of test pit logs for each location indicates the presence of construction debris within the fill. The construction debris included asphalt type material. The suite of PAHs detected are typical components of asphalt.

Metals

Results of soil analyses for chromium, nickel and lead are summarized on Table 7. Chromium was found to range in concentration from non-detected to 8.2 mg/kg. Background soil sample SS03-01 collected in the farm field north of the study area showed chromium at 6 mg/kg. Nickel was found to range from 9.6 to 23 mg/kg with a background concentration of 13.3 mg/kg.

The lead data for one batch of samples which included the test pit soil samples and one subsurface soil sample (SB02-01; collected at well location GW-8 from right above the water table) were rejected and qualified as unusable for project purposes by third party data validation due to matrix spike recovery problems (Appendix D). The remaining analyses showed lead to range from 13.6 mg/kg at the background sample location to 608 mg/kg at surface soil sample location SS01-01 located within the inactive gravel pit area.

4.2 Ground Water Analytical Results

Two types of ground water samples were collected during the RI/FS:

- Monitoring well samples.
- Residential well samples.

All monitoring well samples were analyzed for HSL volatile organic compounds, phenols, total chromium, nickel, iron and lead, dissolved chromium, nickel, iron and lead and hardness. Based on the results of previous sampling, VOC's were the only contaminant of concern found in the residential wells, and therefore, residential well samples were analyzed only for HSL volatile organics. Analytical results for ground water samples are provided in Tables 8 through 10.

Volatile Organic Compounds

Tables 8 and 9 summarize the VOCs detected in both monitoring well and residential well samples. VOCs were detected in monitoring wells GW-3, GW-3D, GW-5, GW-6 and GW-7. No VOCs were detected in the other monitoring well or in residential well samples.

The VOCs detected most frequently and in the highest concentrations were TCE and 1,1,1-TCA. TCE ranged in concentration from non-detected to approximately 720 ug/l with the highest concentration detected in well GW-5 located within the old gravel pit area. 1,1,1-TCA concentrations ranged from non-detected to 390 ug/l with the highest concentration detected in well GW-3, approximately 300 feet downgradient of the old gravel pit area.

Phenol (60 ug/l) and benzene (9 ug/l) were detected only in well GW-3. The benzene detection is an estimated value below method detection limit but above the instrument quantification limit. Previous sampling at this location performed by the NYSDEC showed the presence of phenol but no benzene was detected.

Acetone (13 ug/l) was detected only in well GW-3D. It was identified at a low concentration, just slightly above the method detection limit. Acetone is a common laboratory introduced contaminant (U.S. EPA, 1988) and although it was not detected in the laboratory method blank, at such low concentrations and low frequency of detection it may not be representative of actual site conditions.

TABLE 8 - SUMMARY OF GROUND WATER VOLATILE ORGANIC COMPOUNDS AND PHENOL ANALYSES Machias, New York GW04-01 GW05-01 GW01-01 GW02-01 GW02-01-DP GW03-01 GW03D-01 SAMPLE DESIGNATION WATER WATER WATER WATER WATER WATER WATER MATRIX ug/l VOLATILE ORGANIC COMPOUNDS ug/l ug/l ug/l ug/l ug/l ug/l 13 ND ND ND ND ND ND Acetone

ND

ND

ND

ND

J

390

44 60 ND

ND

160

ND

ND

ND

ND

ND

ND

120

720 J

SAMPLE DESIGNATION MATRIX	GW06-01 WATER	GW07-01 WATER	GW08-01 WATER	FIELD BLANK WATER	TRIP BLANK #1 WATER	TRIP BLANK #2 WATER
VOLATILE ORGANIC COMPOUNDS	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Acetone	ND	ND	ND	ND	ND	ND
Benzene	ND	ИD	D D	ND	מא	ND
1,1,1-Trichloroethane	51	13	ND	ND	ND	ND
Trichloroethene	ND	33	ND	ND	ND	ND
Total Phenois	ND	ND	ND	ND	ND	ND

ND

ND

ND

ND

ND

ND

ND

ND

Notes:

ND - Not detected.

Benzene

1,1,1-Trichloroethane

Trichloroethene

Total Phenols

GW - Ground water.
DP - Duplicate.

J - Estimated value.

TABLE 9 – RESIDENTIAL WE		New York		
SAMPLE DESI GN ATION	RW01-01	RW02-01	RW03-01	TRIP BLANK
MATRIX	WATER	WATER	WATER	WATER
VOLATILE ORGANIC COMPOUNDS	ug/I	ug/l	ug/l	ug/l
Acetone	ND	ND	ND	ND
Be nz ene	ND	ND	ND	QN
Bromodichioromethane	DN	ND	ND	ND
Br o moform	ND	ИD	ND	ND
Bromomethane	ND	ND	ND	ND
2-Butanone	ND	ND	ND	QN
Carbon Disulfide	ND	ND	מא	dи
Carbon Tetrachloride	ND	ND	ND	ND
Ch lo robenzene	ND	ND	ND	ND
Chloroethane	ND	מא	ND	В
Ch lo roform	מא	ND	ND	ďИ
Chloromethane	ND	ND	ND	ďΩ
Di bro mochloromethane	מא	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	מא	ND
1, I-Dichloroethene	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND
1,2-Dichloropropane	ND	מא	ND	ND
trans-1,3-Dichloropropene	ND	ND	מא	ND
cis-1,3-Dichloropropene	ND	סמ	מא	ND
Ethylbenzene	ND	ND	ND	ND
2- He xanone	NÐ	ND	ND	ND
4-Methyl-2-Pentanone	DN	ND	ND	ND
Methylene Chloride	מא	ND	מא	ND
Sty re ne	ND	סא	מא	DN
1,1,2,2-Tetrachloroethane	NÐ	DN	ND	ND
Tetrachloroethene	ND	ND	מא	ДN
Toluene	ND	ND	ND	מא
1,1,1-Tri chl oroethane	ND	ND	סא	מא
1,1,2-Trichloroethane	DN	ND	מא	מא
Trichloroethene	ND	ND	מא	ND
Vinyl Acetate	ND	ND	מא	מא
Vinyi Chloride	ND	ND	סא	מא
Xy lenc (total)	ND	ND	ND	ДИ

RW01 - Cole residence prior to carbon filter.
RW02 - Cole residence after carbon filter.
RW03 - Cabin well.
ND - Not Detected.

TABLE 10 – SU	TABLE 10 – SUMMARY OF GROUND WATER INORGANIC RESULTS (TOTAL AND DISSOLVED)										
			Machias,	New York							
SAMPLE DESIGNATION	GV	GW01-01		W02-01	G\	V02-01DP	GW03-01				
	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED			
MATRIX	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER			
METALS	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l			
Chromium	54.4 J	ND	53.5	ND	47.4	ND	ND	ND			
Lead	69.0	ND	131.0	ND	154.0	ND	21.3	ND			
Nickel	41.3	ND	155.0	ND	161.0	ND	ND	ND			
Iron	53700.0 J	23.3	J 120000.0	N/A	125000.0	N/A	16500.0	N/A			
Hardness	546.0	N/A	680.0	N/A	730.0	N/A	399.0	N/A			

SAMPLE DESIGNATION			GW03D-01			GW04-01				GW	05-01		GW06-01			
MATRIX		TOTAL WATER		DISSOLVE WATER	D	TOTAL WATER		DISSOLVED WATER	TOTAL WATER		DISSOLVE WATER	Q	TOTAL WATER		DISSOLVE WATER	₹ D
METALS		ug/1		ug/l		ug/l		ug/l	ug/1		ug/l		ug/l		ug/l	
C	Chromium	37.6	J	7.3	j	50.0		ND	37.8	J	ND		51.2	J	ND	
1	Lead	124.0		ND		16.4	S	ND	75.7		ND		54.9	ŀ	ND	1
1	Nickel	133.0		ND		96.8		ND	120.0		ND		83.9		ND	1
1	lron	150000.0	J	41.3	J	120000.0		N/A	137000.0	J	86.2	J	85400.0	J	83.1	J
* }	Hardness	913.0		N/A		635.0		N/A	643.0		N/A		682.0		N/A	丄

SAMPLE DESIGNATION		GW07-01			GW08-01				FIELD BLANK			
MATRIX	TOTAL WATER		DISSOLVE WATER	D	TOTAL WATER		DISSOLVED WATER		TOTAL WATER		DISSOLVE WATER	D
METALS	ug/i		ug/l		ug/l		ug/l		ug/l		ug/l	
Chromium	31.3	j	ND		7.2	J	ND		ND		ND	
Lead	82.9		ND		29.0		ИD		ДN		ND	
Nickel	90.5		ND		ND		ИD		ДИ		ND	l
Iron	106000.0	I	27.2	J	61700.0	J	68.5	1	36.7	J	26.4	1
* Hardness	616.0		N/A		569.0		N/A		0.78		N/A	

Notes: • - Hardness = mg equivalent CaCO3/L

ND - Not detected.

DP - Duplicate.
GW - Ground water.

S - Value presented was calculated using method of standard addition.

J - Estimated value.

N/A - Not applicable.

No chloroform was detected in any of the monitoring or residential wells during this sampling event.

Metals

Table 10 summarizes the total and dissolved metals concentrations. Ground water samples from all monitoring wells were sampled and analyzed for select total and dissolved metals. Total chromium ranged from non-detected to approximately 54 ug/l, with dissolved chromium (i.e., the portion truly mobile in the ground water system) being detected only at well GW-3D at an estimated concentration of 7.3 ug/l. It should be noted that the highest total chromium value was for background well GW-1.

Total lead was found to range from 16.4 ug/l to 154 ug/l. Background well GW-l had a total lead concentration of 69 ug/l. No dissolved lead was detected in any of the ground water samples.

Total nickel concentrations ranged from non-detected to 155 ug/l. Background well GW-1 had a total nickel concentration of 41.3 ug/l. No dissolved nickel was detected in any of the ground water samples.

Total iron concentrations ranged from 16,500 ug/l to 150,000 ug/l. Background well GW-1 had a total iron concentration of 53,700 ug/l. Dissolved iron concentrations ranged from approximately 23 ug/l to 86 ug/l. It should be noted that not all samples were analyzed for dissolved iron as this analysis was only requested for a portion of the samples to aid in subsequent engineering evaluations.

5.0 DATA INTERPRETATION

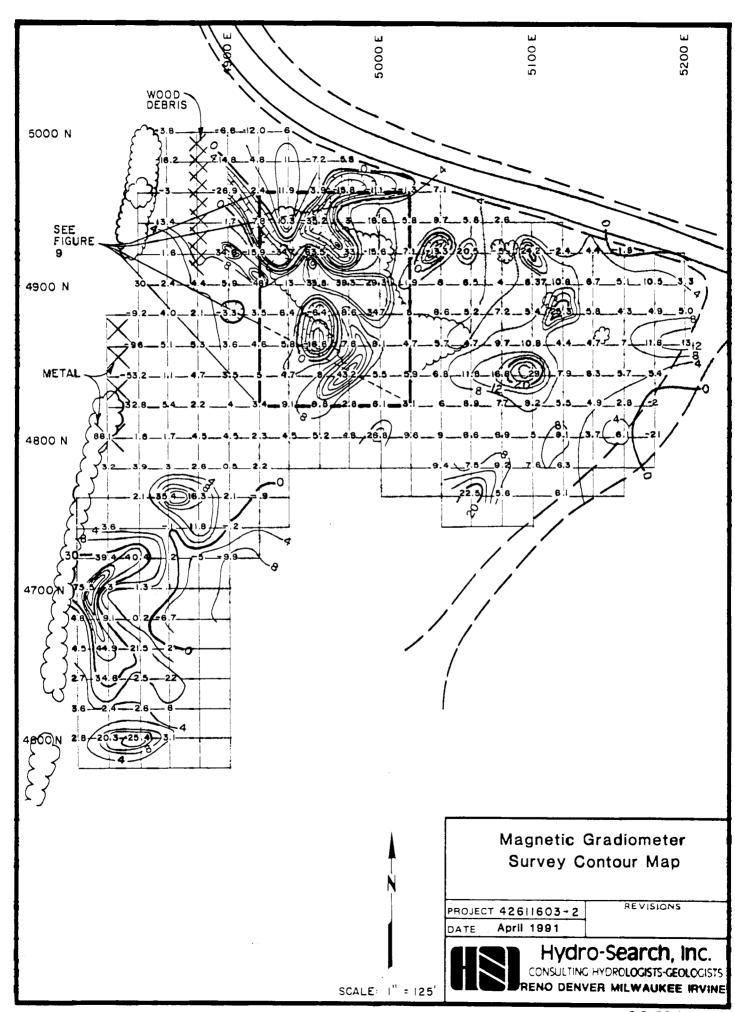
Physical and chemical data were generated during this site investigation to further characterize the site and to aid in a preliminary risk assessment and engineering evaluation of remedial alternatives. Interpretation of the data with respect to project objectives and site conditions is provided below.

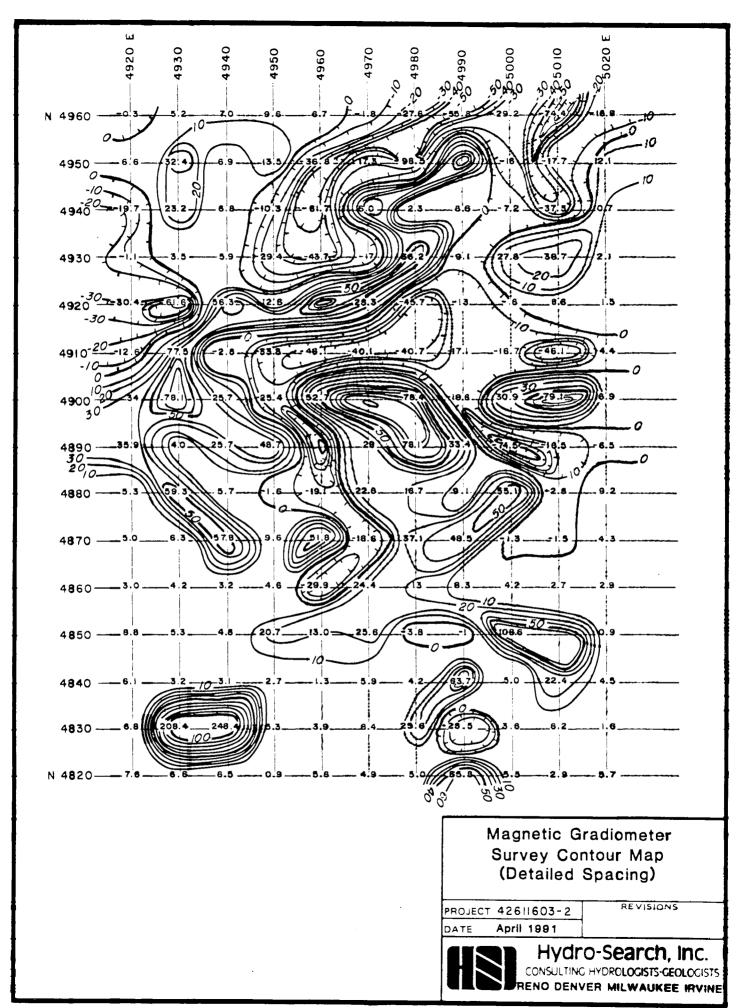
5.1 Geophysical Survey Interpretations/Test Pit Results

A magnetic gradiometer survey was conducted over a portion of the site which reportedly contained buried drums. This method has been used successfully at other similar sites for the location of buried wastes. Results of the survey are provided on Figures 8 and 9. It should be noted that the contour interval on Figure 8 may increase at the anomalies due to the high magnetic gradient. This increase was made for clarity of presentation. As can be seen on the figures, a number of anomalous areas were noted with magnetic gradient signatures (i.e., peaktrough) typical of buried metal.

Seven test pit locations were chosen transecting the various anomalies to confirm or refute the presence of buried drums. Test pit locations and observation summaries are provided on Table 11 and Figure 10. Test pit logs are provided in Appendix A.

At most anomaly/test pit locations, metal debris such as pipe, culvert pieces, wire, etc. were found. Two test pit locations (TP-4 and TP-7) did not show any quantities of metal, however, major changes in lithology were noted from silty materials to gravel and cobbles. Test pits were excavated to depths sufficient to encounter native soils. There was no evidence or indication of buried drums (i.e., pieces of drums, sludges, etc.). Soil samples were collected and analyzed from five of the seven test pits. Analytical results presented in Section 4.1 show sample concentrations to be within or below background levels except for PAHs in test pits TP-3 and TP-5. Test pit logs for both locations indicate the presence of asphalt debris. PAHs are





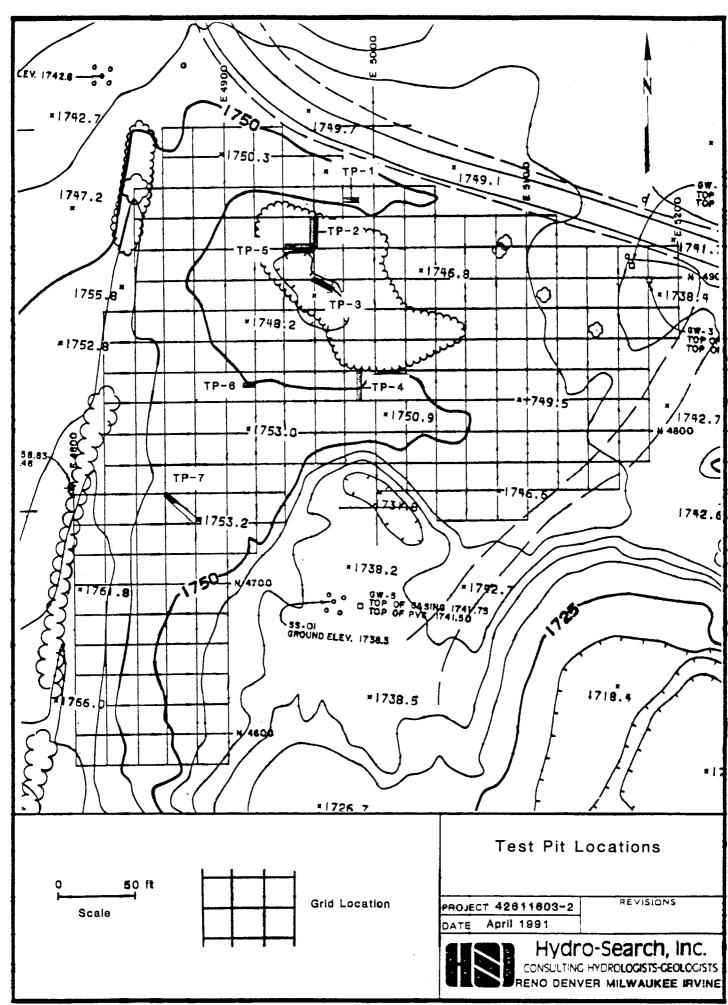


TABLE 11
SUMMARY OF TEST PIT OBSERVATIONS
MACHIAS GRAVEL PIT SITE

	Coord	linate	
Test Pit No.	North	East	Observations
T P -1	4950	4990 - 4980	Metal pipe and pieces of sheet metal. Wood debris.
T P -2	4940 - 4920	4960	Two pieces of metal culvert and wire. Wood debris.
T P -3	4900 - 48 9 0	49 60 - 4970	Piece of wire wrap fiber hose. Asphalt pieces.
T P -4	4840 - 4820	4990	No significant metal. Change in lithology as pit transects from native loamy soil to gravelly fill.
T P -5	4920	4960 - 4940	Pieces of concrete with rebar. Miscellaneous small pieces of metal. Asphalt debris.
T P -6	4830	4940 - 493 0	Wood boards with nails.
T P -7	4760 - 4740	4860 - 4880	No significant metal. Major change in fill type from sandy to gravel and cobbles.

common asphalt constituents. The chemical data, therefore, supports the visual observations that no drums have been buried within the suspect area of the site.

5.2 Surface/Subsurface Soil Sample Results

Analytical results for all surface and subsurface soil samples show background conditions except for lead in surface soil sample SS01-01 (608 mg/kg) and two VOCs (trichloroethene, 291 ug/kg and 1,1,1 trichloroethane, 27 ug/kg) in subsurface soil sample SB01-01.

Surface soil sample SS01-01 was collected from the inactive gravel pit area suspected to be the primary location of past spills/drum storage. The elevated lead level (608 mg/kg) at this location may be associated with the surface spillage. Based on the non-detection of all VOCs and PAHs in surface soil within the inactive gravel pit area, previous cleanup work performed by the NYSDEC (refer to Section 1.1) appears to have been successful in removing any surface source of organics contamination associated with past activities.

Subsurface soil sample SB01-01 was collected during the drilling of monitoring well GW-5 within the old gravel pit area. During the drilling of well GW-5 all split spoon samples were field screened for volatile organic vapors. No readings above background were detected. The soil sample chosen for chemical analysis was therefore, in accordance with the work plan, from immediately above the water table. The soil sample showed the presence of TCE and 1,1,1-TCA in the same relative proportions as the ground water sample from the same location (Table 12).

There is no evidence of surface or subsurface soil contamination in the vicinity of the former maintenance garage suggesting that spillage of wastes did not occur in this area.

TABLE 12

COMPARISON OF SOIL BORING SAMPLE AND GROUND WATER SAMPLE DATA AT WELL GW-5
MACHIAS GRAVEL PIT

Sam pl e Ty pe	Sample Number	TCE	1,1,1-TCA	Remarks
Subsurface Soil	SB01-01	291 ug/k g	27 ug/kg	Immediately above water table.
Gro un d Wa ter	GW05-01	720 ug/1	120 ug/l	Water table well.

TCE - trichloroethene 1,1,1-TCA - trichloroethane

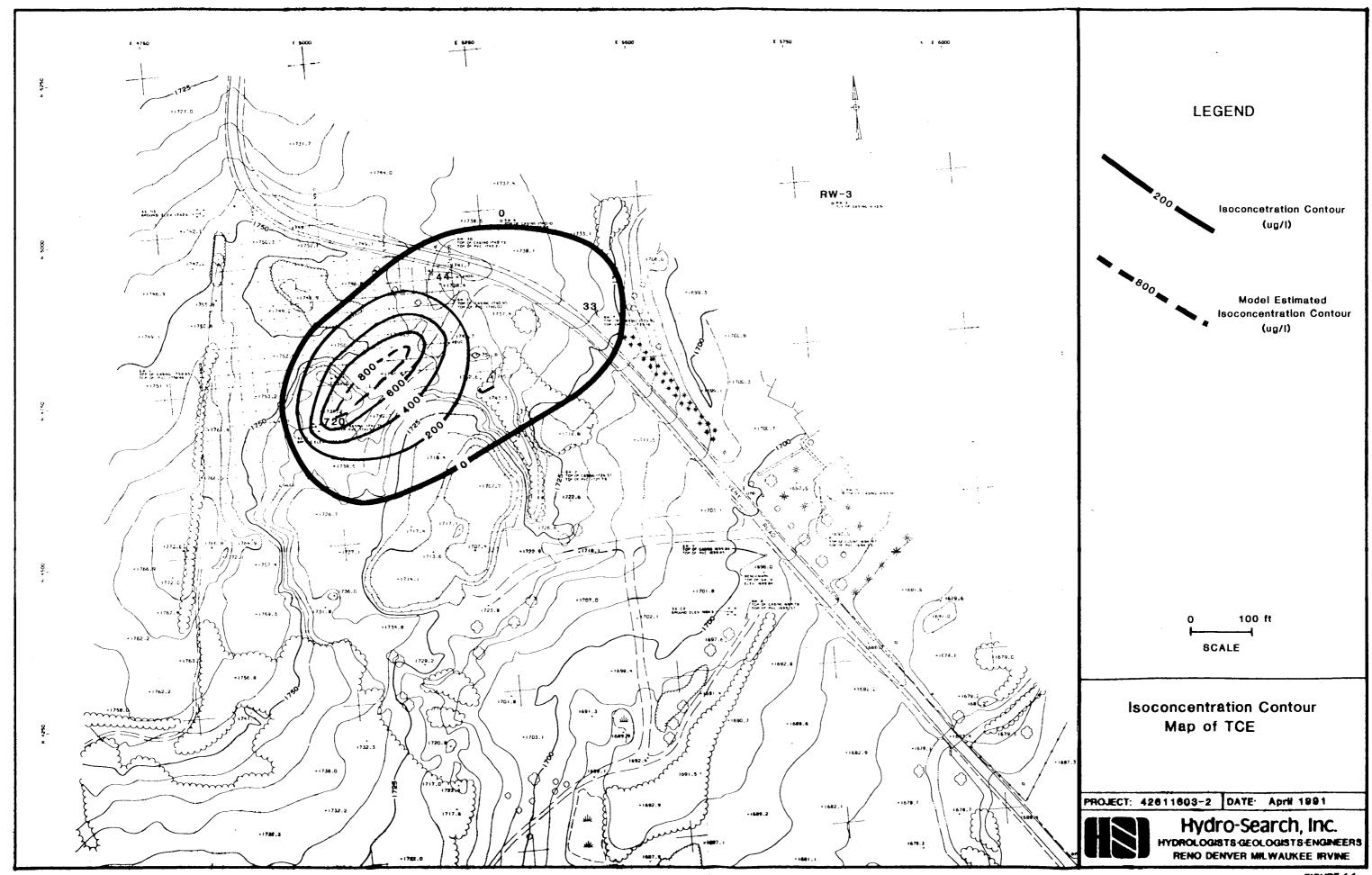
5.3 Ground Water Results

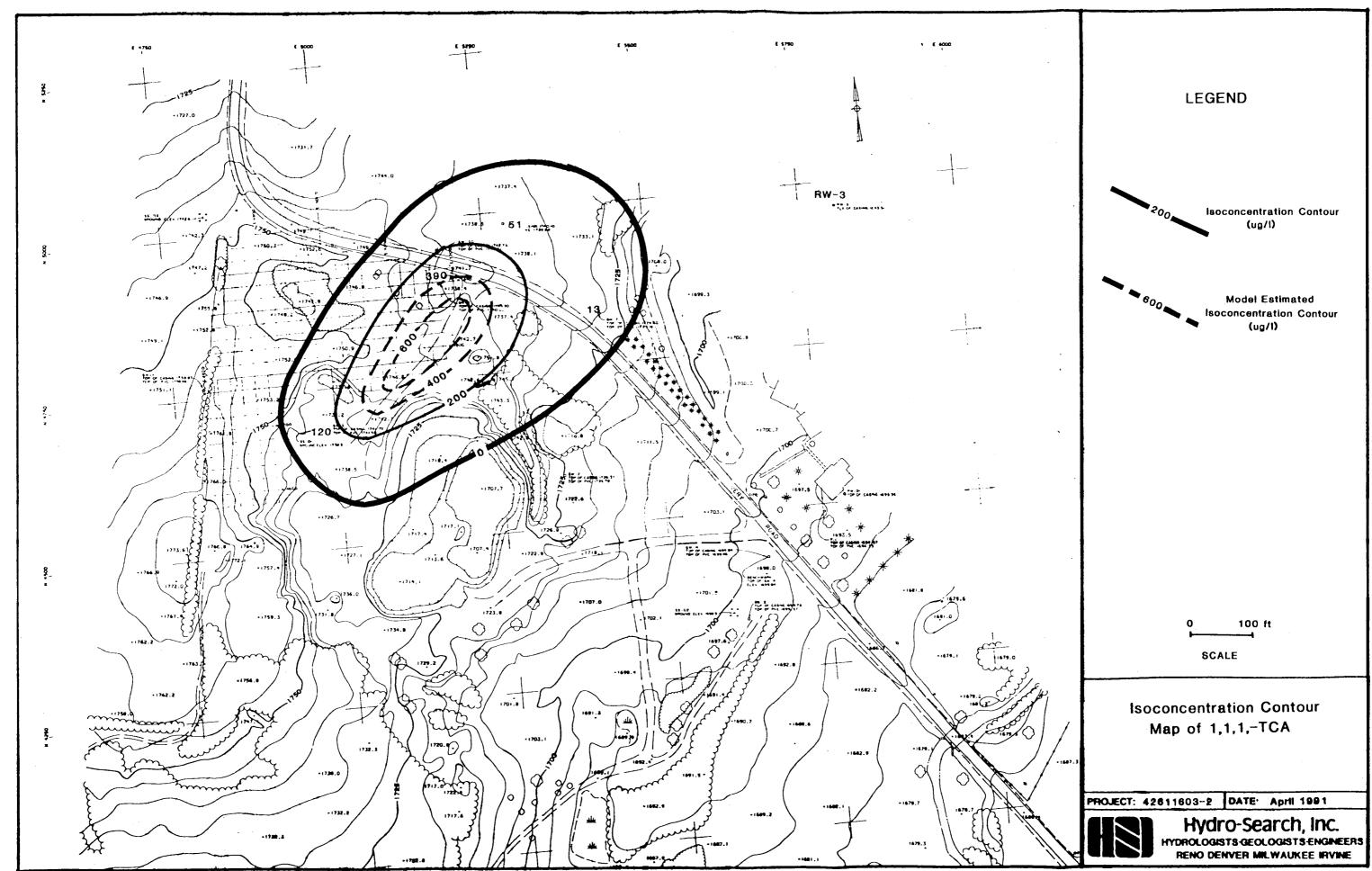
Analytical data for ground water samples summarized, in Section 4.2, indicates that ground water beneath the site has been impacted by past site activities. A slug of VOC contaminants is moving away from the inactive gravel pit area which is known to be an area of past waste spillage/storage. The plume consists primarily of dissolved phase TCE and 1,1,1-TCA. Isoconcentration contour maps for both constituents are provided on Figures 11 and 12.

The main contaminant slug axis is trending in a northeasterly direction, directly downgradient of the inactive gravel pit source area. The width of the plume was inferred based the areal distribution of observations and results of analytical modeling as discussed below in Section 5.4. Ground water contamination extends to at least 25 feet below the water table at location GW-3D (i.e., 75 feet below the ground surface).

While VOC ground contamination is apparent, a comparison of upgradient and downgradient total metals values does not reveal a negative impact on ground water. For example, a comparison of total lead values reveals that although well GW-3D is higher in total lead than background, other downgradient wells, specifically GW-3 and GW-6 have lower than background total lead levels. Other downgradient (GW-5 and GW-7) wells are nearly equal to background levels. The highest total lead value is detected in GW-2 (124 ug/l) which has no indication of VOC continuation and is not considered to be directly downgradient of the contaminant source area. The total lead in GW-2 is less than twice the background level. Total lead (and total metals) is most likely correlated to the amount of suspended sediments in the sample rather than an indication of the mobilization of metals in the ground water system. Dissolved lead concentrations from this location show lead to be non-detected, supporting the observation that lead is not mobile in the ground water system.

The ground water sample collected from well GW-8, located downgradient of the former maintenance garage area, showed no contamination. This is consistent with surface and





subsurface soil sample results from the area (refer to Section 5.2) indicating clean conditions. These data suggest that there was probably no mishandling or spillage of material in the vicinity of the former maintenance garage.

With respect to the chloroform issue associated with the Cole residence well, the data from this study suggest that the chloroform is a localized problem and not associated with past spillage/waste storage activities at the Machias Gravel Pit site. This conclusion is based on the following:

- Chloroform was not detected in any of the on-site monitoring wells during this sampling or during the initial round of sampling performed in 1989 by the NYSDEC.
- Chloroform is not a suspect degradation product of any of the VOC constituents detected in ground water beneath the site.
- There is no evidence of active biodegradation at the site as TCE readily biodegrades to dichloroethene and dichloroethane.
- Ground water flow direction from the documented source area (i.e., the inactive gravel pit) is to the northeast and not toward the Cole residence.
- The identified ground water contaminant plume parallels the direction of ground water flow.
- The hydraulic properties of the aquifer, as defined by single well bail-down recovery tests and a short term pumping test performed on the Cole well, suggest that normal or extended pumping of this well will not draw contaminants from the defined plume area to the well.

The origin of the sporadic chloroform contamination in the Cole well is not know but is probably local to the well head.

5.4 Contaminant Fate and Transport

The data generated during this study indicate the primary contaminant transport media of concern is ground water. The main contaminants of concern are TCE and 1,1,1-TCA. Based

on ground water flow conditions and the areal distribution of the plume, the primary receptor is the cabin well located approximately 450 feet due north of the Cole residence. Sampling of this well indicates unimpacted conditions at the present time.

To estimate potential receptor concentrations at the cabin well, a two dimensional analytical ground water model was used. A uniform one-directional ground water flow system was assumed with a slug source of contamination. Based on site-specific hydrogeology and the nature of past disposal activities (i.e. storage and spillage over a fixed period of time rather than a continuous injection point source) these are reasonable assumptions.

Computer simulations were run using the Hunt equation (Hunt, 1983):

$$C = 0.01064C_0V_cexp-\{[(x-v_t)^2/(4A_Lv_t)] + y^2/(4A_Tv_t)\}/[mnv_t(A_LA_T)^{1/2}t]$$

where,

 C_0 = difference between solute concentration injected into aquifer and native aquifer solute concentration in mg/L.

C = change in aquifer solute concentration due to solute injection in mg/L.

x,y =cartesian coordinates of monitoring wells in feet.

m = aquifer thickness in feet.

n = aquifer effective porosity as a decimal.

t = time after injection started in days.

v_s = seepage velocity without adsorption in ft/day.

A_L = longitudinal dispersivity without adsorption in feet.

A_T = transverse dispersivity without adsorption in feet.

V_e = volume of injected mass in gallons.

As adsorption is a common retardation factor for contaminant transport in the ground water system, the computer simulations accounted for adsorption by dividing A_L , A_T , v_s and C by:

$$Rd = 1 + [D_{ba}/n_{o})K_{d}$$
 (Walton, 1989)

where,

R_d = retardation factor as a decimal.

 D_{ba} = bulk density of dry aquifer skeleton in g/cm³.

n_o = aquifer actual porosity as a decimal.

 K_d = partition coefficient in ml/g.

Input parameters for all variables except K_4 , were fixed with either known site specific data or conservative assumptions to provide a worst case estimate. Table 13 summarizes the input parameters and assumptions.

The partition coefficient K_d was used to help calibrate the model to simulate the approximate distribution of contaminant concentrations detected in the field. A range of K_d values were calculated for TCE and 1,1,1-TCA using the following equation with varying organic carbon contents:

$$K_d = K_\infty X_\infty$$
 (EPA, 1982)

where,

 K_{∞} = partition coefficient expressed on an organic carbon basis.

X_{oc} = mass fraction of organic carbon in sediment.

 K_{∞} was calculated using the following relationship:

$$K_{oe} = 0.63 K_{ow}$$
 (EPA, 1982)

where,

K_{ow} = octanol-water partition coefficient (literature values).

In the absence of site specific data for the mass fraction of organic carbon in the aquifer material, K_d was calculated using a range of X_∞ values from 0.001 to 0.01. This is a conservative yet reasonable range for sand and gravel type aquifers (NYSDEC guidelines use the upper range or greater values in the absence of site specific data).

TABLE 13
SUMMARY OF GROUND WATER ANALYTICAL MODEL INPUT PARAMETERS
MACHIAS GRAVEL PIT SITE

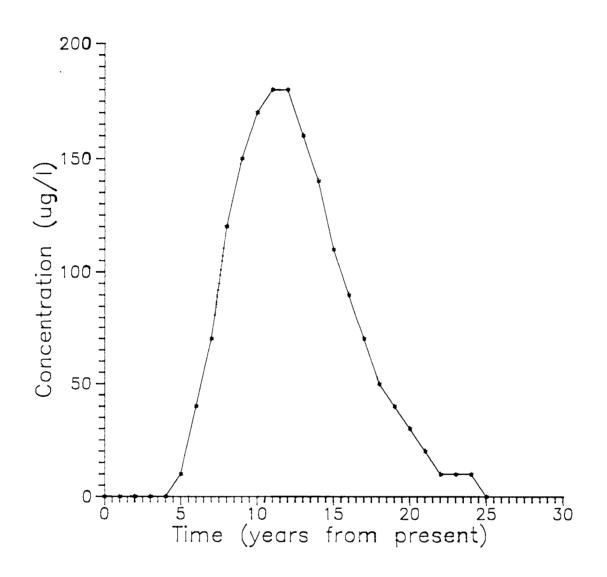
Variable	Assigned Value	Remarks
C _o	TCE - 1100 mg/I 1,1,1-TCA - 950 mg/l	Solubility (EPA, 1981) Solubility (EPA, 1981)
V _e	16,500 gallons	Approximately 300-55 gallon drums.
m	90 ft.	Background geology data.
n	0.35	Literature value (Freeze and Cherry, 1979).
t	1000 days	Approximately 3 years since completion of drum removal.
٧,	0.56 ft/day	Calculated seepage velocity (Section 4).
A _L	30	Literature interpretation (Walton, 1985).
$\mathbf{A_T}$	0.33 (A _L)	Slightly greater than literature approximation of 0.1 (A _L) due to field distribution of constituents suggesting increased A _T .
D_{be}	2.30	Literature value (Walton, 1989).
n _p	0.4	Literture value (Freeze and Cherry, 1979).

TCE - Trichloroethane 1,1,1-TCA - Trichloroethane A grid system with 100 by 100 foot centers was established over the study area with the slug injection point being just southwest of monitoring well GW-5. Computer simulations were run with the defined input parameters and varying K_d values. The existing distribution of contaminants noted in the field were reasonably approximated using a K_d calculated based on a mass fraction organic carbon content in the aquifer of 0.003 for both TCE and 1,1,1-TCA. Calculated and actual concentrations for wells are provided in Table 14. Model output is provided in Appendix E.

Once sufficiently calibrated, model simulations were run over an increasing number of years to define the potential contaminant versus time concentration curves for the cabin receptor well (RW-3). The simulations were run with an increased longitudinal dispersivity ($A_L = 100$) to account for the increase in the travel distance from the source area (Walton, 1985). The predicted TCE and 1,1,1-TCA concentration distribution curves are provided on Figures 13 and 14.

Based on analytical model results, the leading edge of the 1,1,1-TCA slug should start being detected at the receptor well within approximately 2 years. The maximum 1,1,1-TCA concentration at the receptor is estimated to be 160 ug/l. The leading edge of the TCE slug is estimated to arrive at the receptor in approximately four years. The maximum TCE concentration is expected to peak at approximately 180 ug/l.

These estimates are considered to be very conservative and are believed to represent a worst case maximum based on the volume of TCE and 1,1,1-TCA assumed to have been spilled. As additional documented information becomes available regarding the actual volumes of TCE and 1,1,1-TCA potentially disposed, these estimates can be appropriately refined.



Model Estimated TCE
Concentrations at
Cole's Cabin Well (RW-3)

PROJECT 42611603-2

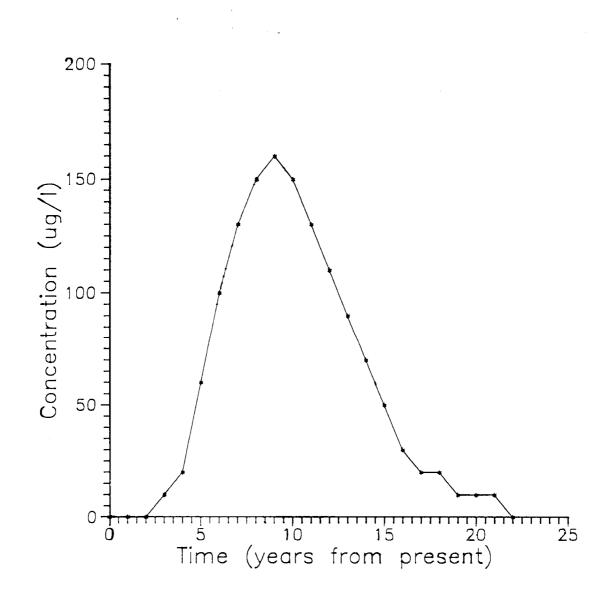
REVISIONS

DATE April 1991



Hydro-Search, Inc.

CONSULTING HYDROLOGISTS-GEOLOGISTS
RENO DENVER MILWAUKEE IRVINE



Model Estimated 1,1,1-TCA
Concentrations at
Cole's Cabin Well (RW-3)

PROJECT 42611603-2
DATE April 1991

REVISIONS

Hydro-Search, Inc.

Onsulting hydrologists-geologists No denver milwaukee irvin

CALIBRATED MODEL RESULTS
MACHIAS GRAVEL PIT SITE

TABLE 14

Monit or ing We ll	TCE Field	TCE-Model Concentration	1,1,1-TCA Field	1,1,1-TCA-Model Concentration
GW-5	720Ј	500	120	250
GW-3	44	30	390	170
GW-6	ND	ND	51	10
GW- 7 *	3 3	ND	13	ND

Note: All input parameters fixed as defined in Table 13. K_d for TCE and 1,1,1-TCA calculated assuming mass fraction of organic carbon in aquife materials of 0.003.

* Although the assumed transverse dispersivity could not duplicate the side gradient concentrations detected in well GW-7, the areal concentration distribution trend simulated by the model is qualitatively consistent with observed trends.

ND = Not detected J = Estimated

6.0 PRELIMINARY RISK ASSESSMENT

This section provides a preliminary risk assessment associated with the Machias Gravel Pit site as a result of past spillage/storage of wastes. A general qualitative discussion of the potential health and environmental hazards associated with each exposure pathway for each contaminated media are presented. In addition, a primary objective of this assessment is to provide a preliminary quantitative evaluation of the human health risk associated with future exposure to ground water contamination downgradient of the site. The potential human health risks are quantified for future exposure associated with ground water use. The predicted exposure point concentrations for this analysis are based on analytical ground water modeling results presented in Section 5.0. These are believed to provide a conservative worst-case estimate of risk.

This preliminary risk assessment includes four major components:

- Identification of contaminants of potential concern.
- Exposure assessment.
- Toxicity assessment.
- Risk characterization.

Section 6.1, "Identification of Contaminants of Potential Concern" presents a summary of the evidence of environmental contamination, and selects the contaminants of potential concern to be evaluated. The exposure assessment (Section 6.2) presents the important contaminant migration pathways and exposure routes for potential human and environmental receptors. Estimated daily intakes of contaminants of concern are calculated and presented for the ground water pathway. Section 6.3 presents the results of the toxicity assessment. The relevant dose-response parameters such as reference doses (RfDs) for noncarcinogens and cancer slope factors (CSFs) for carcinogens are presented. Section 6.4, "Risk Characterization" integrates the information developed in the three preceding components. Carcinogenic and noncarcinogenic human health risks are quantified for the ground water exposure pathway. Risks associated with other pathways of exposure are discussed qualitatively.

6.1 Identification of Contaminants of Potential Concern

Contaminants detected at the Machias Gravel Pit site were identified from samples of soil and ground water. A summary of the specific chemical contaminants detected for each environmental media is presented in Section 4.0.

Table 15 presents a summary of volatile organics, semi-volatile compounds (PAHs) and inorganics detected in soil at the site. Of the contaminants detected in soil, concentrations of benzo(a)pyrene and lead exceed the available background data. Benzo(a)pyrene and lead are both suspected human carcinogens. In addition, lead is the only contaminant detected which has an established soil criteria. The highest concentration of lead detected at the site (608 mg/kg) is within the acceptable criteria range (500-1000 mg/kg) established by the USEPA, (1989). Of the remaining contaminants detected in soil, all were either below available background levels or did not have background information available. The volatile compounds (1,1,1trichloroethane and trichloroethylene) would not be expected to be found in clean background samples from any site; however, the PAHs are typically known to occur at background levels even in pristine soils (ATSDR, 1990). Based on this analysis, the potential contaminants of concern for soil include 1,1,1-trichloroethane, trichloroethylene and benzo(a)pyrene. Based on observations recorded on test pit logs, the benzo(a)pyrene is probably associated with asphalt pieces within the fill, however, since it is a suspect carcinogen it will be included in this preliminary risk evaluation.

Table 16 presents a summary of the contaminants detected in ground water at the site. In accordance with EPA guidance, total metals data in ground water is considered in this evaluation, however, consideration of available dissolved metals data suggests that the inorganics are not significantly mobile within the ground water system. To identify those contaminants of potential concern in ground water, contaminant concentrations are compared to available USEPA Maximum Contaminant Limits (MCLs) and/or USEPA Lifetime Health Advisory levels for drinking water. Concentrations of benzene, 1,1,1-trichloroethane, trichloroethylene, total lead, total nickel, and total iron all exceed the available MCL and/or Health Advisory levels. Of

TABLE 15
SUMMARY OF SOIL DATA FOR MACHIAS GRAVEL PIT

Chemic al	Minim um	Maximum	Backgroun	nd	USEPA Soil Criteria
Volatile s (μg/kg)					
1,1,1-Trichloroethane	27	27	NA		NA
Trichlo ro eth yl ene	291	291	NA		NA
Semi-Volatiles (µg/kg)					
Acenaphthylene	280J	280Ј	NA		NA
Anthra ce ne	220J	220Ј	NA		NA
Benzo(a)anthracene	490J	490Ј	169-59,000	*	NA
Benzo(b)fluoranthene	570	570	15, 0 00-62,000	*	NA
Benzo(k)fluoranthene	410J	410J	300-26,000	*	NA
Benzo(a)pyrene	470J	470J	165-220	*	NA
Benzo(g,h,i)perylene	250J	250J	900-47,000	*	NA
Fluoroanthene	340J	1500	200-166,000	*	NA
Fluorene	220J	220Ј	NA		NA
Indeno(1,2,3-c,d)pyrene	400J	400J	8,0 00-61,000	*	NA
Phenanthrene	1900	1900	NA		NA
Pyrene	26 0J	1100	145-147,000	*	NA
Inorganics (mg/kg)					
Chromium	2.5	8.2	100	**	NA
Lead	5.5	608	10	**	500-1000
Nickel	9.6	23.0	40	**	NA

NA Not available.

Source: ESE, 1991.

J Estimated value.

^{* (}ATSDR, 1990).

^{** (}Bowen, 1966).

TABLE 16
SUMMARY OF GROUND WATER DATA FOR MACHIAS GRAVEL PIT

Chemic al	Maximum (μg/L)	USEPA MCL (μg/L)	New York State Ground Water Quality Standards (μg/L)	Lifetime Health Advisory (µg/L)
Organics				
Acetone	13		50	
Benzen e	9 J	5	ND	
Total Phenols	6 0		1	4000
1,1,1-Trichloroethane	390	200	5	200
Trichloroethylene	720 J	5	5	
<u>Inorganics</u>				
Chromium	54.4J	100	50	100
Iron (t ot al)	15 0,000J	300s	300	
Lead	154	5p	25	
Nickel	161			100

ND = Not Detectable
J = Estimated Value
p = Proposed MCL
s = Secondary MCL

Source: ESE, 1991.

New York Division of Water resources, 1991.

these contaminants, benzene was detected in a single sample at an estimated concentration (9 ug/l) only slightly above the MCL. Iron was detected at concentrations greatly exceeding the secondary MCL; however, no adverse human health effects would be expected because the secondary MCL was developed based on taste and staining thresholds in lieu of human health.

Of the remaining contaminants, concentrations of total phenols and chromium were well below their respective MCL and/or Lifetime Health Advisory levels. There is no available standard or criteria for acetone which can be compared to the detected concentration; however, acetone is frequently detected as a result of laboratory contamination. Although there is no evidence that laboratory contamination exists, acetone was only detected in one sample and does not appear to be a widespread contaminant at the site. Based on this analysis, the potential contaminants of concern for ground water include, 1,1,1-trichloroethane, trichloroethylene, total lead and total nickel.

It should be noted that dissolved metal concentrations for both lead and nickel are non-detected suggesting that these metals are fairly immobile within the ground water system. Exposure assessments based on total metals, therefore, provide an extreme worst-case.

6.2 Exposure Assessment

The assessment of pathways by which human and environmental receptors may be exposed to contaminants from the Machias Gravel Pit site includes an examination of existing migration pathways and exposure routes as well as those that may be reasonably expected in the future. The determination of exposure pathways is made by a careful evaluation of the current extent of contamination on and around the site in relation to local land and water uses, and the results of a fate and transport assessment that evaluates potential contaminant migration pathways. Contaminants detected at the Machias Gravel Pit site may migrate off-site or may remain persistent in the source area on-site. Some contaminants of concern such as the VOCs are expected to be relatively mobile and may be transported from the soil to the ground water. Once in the ground water, these mobile contaminants may be transported downgradient where

they may subsequently reach human receptors. Other contaminants such as the inorganics are expected to be less mobile and may remain in the source areas for much longer periods of time.

6.2.1 Ground Water Pathway

Based upon a preliminary evaluation of site characteristics and the results of the monitoring data, ground water is suspected to be the primary source of contamination on-site and the most important mode of contaminant transport. During rainy seasons, water infiltrates the contaminated soils and carries with it dissolved organic and inorganic compounds. Part of the contaminants may be absorbed by the soil underneath the contaminated soil zone. The other part of the contaminants, which is desorbed from the soil particles, may continue to move downward and reach the ground water.

Ground water contamination has been detected in monitoring wells located at the site. Private wells located downgradient of the site have been sampled, however, no contamination has been detected to date. Although exposure to off-site residents is not occurring through the domestic use of ground water at present, future exposure is predicted to occur as the contamination spreads toward these private wells. Residential wells may be used for both potable and nonpotable purposes, and human exposure to ground water contaminants could result from the following events:

- Drinking water consumption.
- Skin absorption of contaminants in water by direct contact during washing or bathing.
- Inhalation of VOCs released into ambient air during showering or other washing activities.

The detailed quantification of exposures includes an analysis of water ingestion, skin absorption and inhalation. Exposure point concentrations for 1,1,1-trichloroethane and trichloroethylene are based on the ground water modeling results presented in Section 5.0.

Estimates of exposure are calculated for both an adult and child hypothetical receptor using water from the cabin well at location RW-3. Since the predicted concentrations are expected to change over time, exposure estimates were calculated for each year of exposure separately then totaled for the exposure pathway of concern. For example, for carcinogenic risks associated with exposure to trichloroethylene, yearly exposure estimates were calculated for each year trichloroethylene is predicted to be present in the cabin well. These yearly estimates were then totaled to obtain the estimated lifetime dose. For those exposure scenarios that evaluate an exposure duration less than lifetime, (i.e., a 6-year exposure for a child) exposure estimates were calculated for those years with the highest exposure point concentrations.

Carcinogenic exposures were calculated only for an adult because it is assumed that the higher exposures received by a child are not significant when averaged over the lifetime of an individual. Noncarcinogenic exposures were calculated for both a child and adult. The equations and assumptions used to calculate exposures were based on the USEPA Risk Assessment Guidance for Superfund (USEPA, 1989).

Residential Potable Use of Ground Water

As previously discussed, residential wells in the area are not currently known to be affected by site-related constituents in ground water. However, this assessment evaluates potential exposure to constituents migrating to the main receptor identified to be the cabin well (RW-3).

Exposure via drinking water may occur by a variety of mechanisms including ingestion of drinking water and ingestion of foods prepared with or in water. A simplified approach was selected to evaluate these potential exposures. Dose estimates are based on a total water intake of 2 liters per day (L/day). This standard exposure value is sufficiently conservative to allow for exposures by multiple household uses such as those previously mentioned. The average person consumes less than 0.5 L/day of tap water for drinking purposes (Andelman, 1984).

Exposure to site-related constituents from ingesting ground water is estimated using the following equation (USEPA, 1989):

Intake
$$(mg/kg/day) = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$

Where:

CW = Chemical concentration in water (mg/L)

IR = Ingestion rate (2 L/day)

EF = Exposure frequency (365 days/year)

ED = Exposure duration (30 years for an adult; 6 years for a child))

BW = Body weight (70 kg for an adult, 16 kg for a child)

AT = Averaging time (70 years × 365 days/year for carcinogens; ED × 365 days/year for noncarcinogens)

Table 17 presents assumptions for input parameters and Table 18 presents the estimated exposure as a result of the drinking water pathway.

Dermal Absorption of Constituents in Water

Certain nonpotable water uses may result in skin contact and dermal absorption of waterborne constituents. Quantification of exposure received by dermal absorption is highly uncertain due to the theoretical nature of estimating skin permeation rates of chemicals solubilized in water. Many variables affect the uptake of chemicals through the skin including the duration of exposure, type of skin exposed, and amount of skin exposed. USEPA (1989) presents the following equation for calculation of dermal exposure to constituents in water:

Absorbed Dose
$$(mg/kg/day) = \frac{CW \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$$

Where:

CW = Chemical concentration in water (mg/L)

SA = Skin surface area available for contact (19400 cm² for adult; 7280 cm² for child).

PC = Chemical-specific dermal permeability constant (cm/hr)

ET = Exposure time (1.21 hours/day)

EF = Exposure frequency (365 days/year)

ED = Exposure duration (30 years for adult; 6 years for child) CF = Volumetric conversion factor for water (1 liter/1,000 cm³)

BW = Body weight (70 kg for adult; 16 kg for child)

AT = Averaging time (70 years × 365 days/year for carcinogens; ED × 365 days/year for noncarcinogens).

TABLE 17
EXPOSURE PATHWAY ASSUMPTIONS

Exposure Pathway	Adult	Child
Drinking Water		<u> </u>
Water Concentration (mg/l)	CW^{ι}	CW^2
Ingestion rate (1/day)	2	2
Exposure Frequency (days/year)	365	365
Exposure Duration (year)	30	6
Body Weight (kg)	70	16
Averaging Time (days)	25 ,550	2,190
Dermal Absorption		
Water Concentration (mg/l)	CM_t	CW^2
Skin Surface Area (cm²)	19,400	7280
Permeability Constant (cm/hr)	0.1	0.1
Exposure Time (hrs/day)	1.21	1.21
Exposure Frequency (days/year)	365	365
Exposure Duration (year)	30	6
Conversion Factor (1/cm³)	0.001	0.001
Body weight (kg)	70	16
Averaging Time (days)	25 ,550	2,190
Inhalation		
Water Concentration (mg/l)	CW^{ι}	CW^2
Air Concentration (mg/m³)	18.2 CW ¹	18.2 CW ²
Inhalation Rate (m ³ /hr)	0.6	0.6
Exposure Time (hrs/day)	0.2	0.2
Exposure Frequency (days/year)	365	365
Exposure Duration (year)	30	6
Body weight (kg)	70	16
Averaging Time (days)	25,550	2,190

CW¹ = Modeled ground water concentration from cabin well at RW-3. Since predicted concentrations are expected to change over time, the values of CW¹ for each year of exposure were used in the calculation as a function of time. A yearly estimate of exposure was calculated for each year the contaminant is predicted to be present in RW-3, then all of the yearly estimates were totalled to obtain an estimate of lifetime exposure for the adult.

CW² = Modeled ground water concentrations from cabin well at RW-3. A yearly estimate of exposure was calculated for the six years with the highest predicted contaminant concentrations for RW-3, then the six yearly estimates were totaled to obtain an exposure estimate for the child.

Source: ESE, 1991.

TABLE 18
ESTIMATED EXPOSURE BY DRINKING WATER INGESTION

	Carcinogenic Dose	Non-Carcinogenic Dose		
Contami n ant	Adult (mg/kg/day)	Adult (mg /kg/day)	Child (mg/kg/day)	
1,1,1-Trichloroethane	NA	1.27 E-03	1.73 E-02	
Trichloroethylene	6.82 E-04	1.59 E-03	2.04 E-02	

Source: ESE, 1991.

Permeability constants (PC) reflect the movement of the chemical across the skin to the stratum corneum and into the bloodstream. PC values are based on an equilibrium partitioning and are chemical-specific. However, the open literature has very little useable information pertinent to this exposure variable. As a result, it is generally assumed that chemicals are carried through the skin as a solute in water which is absorbed (rather than being preferentially absorbed independently of the water), and that the chemical concentration in the water being absorbed is equal to the ambient concentration. As a result, the permeation rate of water across the skin boundary is assumed to be the appropriate factor controlling dermal absorption. The permeability constant of water has been reported to be 8.00 E-04 cm/hr (Blank et al., 1984). However, some chemicals such as VOCs are expected to have higher PC values because of their demonstrated lipid solubility. Permeability constants for some VOCs have been reported to range from 1.0 E-01 to 1.0 E-03 cm/hr (Baranowska and Dutkiewicz, 1982; Dutkiewicz and Tyras, 1967). As a result, the PC values used in this assessment are 1.0 E-01 cm/hr for VOCs. Table 19 presents the results of the exposure analysis for the dermal absorption pathway. Calculation input parameters are included in Table 17.

Inhalation of Constituents Volatilized During Showering

As discussed previously, the VOCs in ground water may volatilize during showering and result in inhalation exposure. The evaluation of the inhalation of constituents from showering requires an estimation of the constituent concentration in the air as a result of volatilization. For purposes of this risk assessment, it is assumed that all of the VOCs in the water are volatilized during the shower event. As a result, the constituent concentration in the air (CA) is calculated based on the following equation;

$$CA (mg/m^3) = CW \times FR \times ET/RV$$

Where:

CA = VOC concentration in air breathed (mg/m³)

CW = VOC concentration in water (mg/L)

FR = Flow rate of water during the shower (L/minute)

ET = Exposure time or duration of shower event (minutes)

 $\mathbf{RV} = \text{Room volume (m}^3)$

TABLE 19
ESTIMATED EXPOSURE BY DERMAL ABSORPTION

	Carcinogenic Dose	Non-Carcinogenic Dose		
Contami n ant	Adult (mg/kg/day)	Adult (mg/ kg/day)	Child (mg/kg/day)	
1,1,1-Trichloroethane	NA	1.48 E-03	7.62 E-03	
Trichloroethylene	8.02 E-04	1.87 E-03	8.99 E-03	

Source: **ESE**, 1991.

The average flow rate of water during a typical shower is about 8 gallons per minute or 30.28 L/minute (USEPA, 1989). In addition, the USEPA (1989) has reported that the median showering time period is approximately 7 minutes and the 90th percentile is approximately 12 minutes. For purposes of this risk assessment, it is conservatively assumed that the room volume is 20 m³. Therefore, CA is estimated to be 18.2 CW (mg/m³).

Inhalation exposure to VOCs volatilizing during a shower is estimated using the following equation (USEPA, 1989):

Intake
$$(mg/kg/day) = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$$

Where:

CA = VOC concentration in air (mg/m^3)

IR = Inhalation rate $(0.6 \text{ m}^3/\text{hour})$

ET = Exposure time (0.2 hours/day)

EF = Exposure frequency (365 days/year)

ED = Exposure duration (30 years for adult; 6 years for child)

BW = Body weight (70 kg for adult; 16 kg for child)

AT = Averaging time (70 years x 365 days/year for carcinogens; ED x 365 days/year for noncarcinogens)

Table 20 presents the results of the exposure analysis for the inhalation exposure pathway. Calculation input parameters are included on Table 17.

6.2.2 Soil Pathway

An important exposure pathway of concern at the Machias Gravel Pit Site exists as a result of the environmental persistence of the contaminants of concern in the soil. Contaminants present in the surficial soils may be absorbed through the skin on contact or accidentally ingested by unintentional hand-to-mouth activity. Access to the site is not restricted. Although trespassing is not known to be a problem at the site, there is nothing to preclude trespassers. Contaminants may be absorbed through the skin as a result of direct contact with the soil. The degree of exposure is largely dependant on the concentration of the contaminant in the soil, the exposed

TABLE 20
ESTIMATED EXPOSURE BY INHALATION FROM SHOWERING

	Carcinogenic Dose	Non-Carcinogenic Dose		
Contam in ant	Adult (mg/kg/day)	Adult (mg/kg/day)	Child (mg/kg/day)	
1,1,1-Trichloroethane	NA	1. 38 E-03	1.89 E-02	
Trichloroethylene	7.45 E-04	1.68 E-03	2.23 E-02	

Source: ESE, 1991.

skin surface, the absorption rate, and the frequency of exposure. Although surface soil in the inactive gravel pit area does contain some elevated inorganics, concentrations are not extremely high and exposure is expected to occur infrequently. As a result dermal exposure is not anticipated to be significant.

Contaminants in soil may also be directly ingested by adults and children who may occasionally trespass on the site. However, as discussed for dermal absorption, the soil concentrations and exposure frequency are both expected to be low enough to suggest that exposure should not be significant.

Future land use of the site may include some type of industrial, commercial, or residential development. Future residential development of the site may not be a likely scenario; however, consideration of this potential may be required in a more detailed risk assessment. Based on the existing information known about the site, soil exposures through a residential scenario would not be expected to be significant, because of the generally low concentration of the contaminants of concern.

6.2.3 Air Pathway

The presence of contaminants of concern in soil at the site may result in a release of contaminants to the atmosphere via volatilization and/or dust entrainment.

The volatile organic contaminants of concern have relatively high vapor pressures and Henry's Law constants, facilitating their release from the soil or surface water to the air. The semi-volatile compounds and inorganics have very low or no vapor pressures and Henry's Law constants such that volatilization is not a likely transport process. Under current site conditions, volatilization is not expected to be significant because the surface soil concentrations of the volatile organics are non-detected. As a result, inhalation of vapors is not expected to be significant at the site.

Residual contaminants bound to surficial soils may also be transported as suspended particulates or dust, and thus may migrate from a site when environmental conditions are favorable. Some of the factors influencing the potential for dust entrainment into the atmosphere include surface soil moisture, soil particle sizes, kind and amount of vegetative cover, wind velocity and the amount of soil surface exposed to the eroding wind force. For example, dust formation may be significant during extended periods of dry weather. While concentrations of contaminants are expected to be present in the dusts generated on-site, concentrations are not expected to be extremely high due to known current levels in soil. As a result, inhalation exposure through this pathway is not expected to be of concern at this site.

6.2.4 Surface Water Pathway

Although there are no clearly identified surface water features which directly route surface runoff, drainage at the site appears to occur both internally and externally. Typically, when precipitation falls on the contaminated source area, any surface runoff either drains internally toward a central depression or may quickly drain off-site by general surface flow. For the purpose of this exposure assessment, it is assumed that migration of contaminants in surface runoff is insignificant.

6.3 Toxicity Assessment

This section identifies the health-related guidelines that are used in the risk characterization (Section 6.4) to evaluate the potential health risks posed by the exposures estimated in the previous section. In evaluating potential health risks, both carcinogenic and noncarcinogenic health effects must be considered. Health effects must also be considered for each potential route of exposure identified in the exposure assessment. For this preliminary risk assessment, oral, dermal and inhalation routes of exposure are of concern.

The criteria used to evaluate the potential for noncarcinogenic health effects are generally referred to as reference doses (RfD) or reference concentration (RfC). The criteria that are used

in the evaluation of carcinogenic risk are referred to as carcinogenic slope factors (CSF). RfDs, RfCs, and CSFs are all developed by the USEPA. The USEPA has developed oral and inhalation criteria. Dermal criteria have not been developed for any chemicals. In the absence of dermal criteria, the criteria for ingestion was used for the dermal route in accordance with Appendix A of Volume 1 of the USEPA Risk Assessment Guidance of Superfund (USEPA, 1989). Table 21 presents the toxicity criteria available from the USEPA for the potential contaminants of concern. Toxicity data for benzo(a)pyrene and lead are not available because the USEPA is currently reviewing the toxicological information for these two chemicals.

6.4 Risk Characterization

The objective of this risk characterization section is to integrate information developed in the toxicity assessment and the exposure assessment to obtain a preliminary estimate of the current and potential health risks associated with the potential contaminants of concern at the site. The preliminary estimate of health risks for carcinogenic and noncarcinogenic contaminants as well as for the different potential exposure pathways is discussed separately because of the different toxicologic endpoints and methods employed in characterizing risk. Incidental human health risk associated with exposure to the carcinogenic contaminant (trichloroethylene) in the ground water pathway is calculated by multiplying the exposure levels for each route by its respective cancer slope factor. For the noncarcinogenic contaminant (1,1,1-trichloroethane) modeled in the ground water pathway, a hazard index (HI) approach is followed. This approach assumes that multiple exposures could result from different routes and that the combined magnitude of the adverse effects is proportional to the sum of the ratios of the estimated exposures to the acceptable exposures for each route. When the calculated HI exceeds a value of 1.0 for any contaminant, route, or for the sum of HIs for multiple contaminants or routes, there may be concern for a potential health risk.

Since carcinogenic risk estimates are based on the presumption of lifetime exposure, cumulative doses received by an adult are assumed to be most representative of exposure. In general,

TABLE 21

TOXICITY CRITERIA FOR THE POTENTIAL CONTAMINANTS OF CONCERN
AT THE MACHIAS GRAVEL PIT SITE

	Ingestion	n Route	Inhalation Route		
Contam in ant	RfD (mg/kg/day)	CSF (mg/kg/day) ⁻¹	RfD (mg/kg/day)	CSF (mg/kg/day) ⁻¹ NA	
Benzo(a)pyrene	NA	NA	NA		
Lead	NA	NA	NA	NA	
Nickel	2.0E-02	NA	NA	8.4E-01	
1,1,1-Trichloroethane	9.0E-02	NA	3.0E-01	NA	
Trichloroethylene	NA	1.1E-02	NA	1.7E-02	

NA = Not available.

Source: USEPA, 1990.

elevated exposures received during early childhood alone are not that significant in determining lifetime cancer risk. As a result, for the purposes of this preliminary risk assessment, carcinogenic risks were calculated based on lifetime exposure estimates for an adult. Noncarcinogenic effects may be the result of chronic (long-term) exposure, and may occur for both children and adults. Therefore, the noncarcinogenic HIs were developed for both an adult and child.

6.4.1 Risks Associated With the Ground water Pathway (Quantitative Estimates)

Ground water may be used for potable and nonpotable domestic purposes. Potentially impacted residents may, therefore, be exposed to contaminants through drinking water, dermal absorption, and inhalation pathways. Both carcinogenic and noncarcinogenic health risks are summarized for each route of exposure associated with ground water use.

The total estimate of future noncarcinogenic risks associated with the ground water pathway are summarized in Table 22. The total adult hazard index for each route of exposure ranges from 4.60 E-03 to 1.64 E-02. The total hazard index for the adult (sum of hazard indices for drinking water, dermal absorption, and inhalation) is 3.51 E-02. Since all route-specific and total noncarcinogenic HIs are less than one, there is no significant noncarcinogenic health threat for the adult.

The total child hazard index for each route of exposure ranges from 6.30 E-02 to 1.92 E-01. The total hazard index for a child (sum of hazard indices for drinking water, dermal absorption, and inhalation) is 3.40 E-01. Since all route-specific and total noncarcinogenic HIs are less than unity, there is no significant noncarcinogenic health threat for the child.

The total estimate of future carcinogenic risks associated with the ground water pathway is summarized in Table 23. The total lifetime carcinogenic risk levels for each route of exposure ranges from 7.50 E-06 to 1.27 E-05. The total cancer risk estimate of 2.90 E-05 (sum of cancer risk levels for drinking water, dermal absorption and inhalation) is within the acceptable risk

TABLE 22
ESTIMATED NONCARCINOGENIC RISKS ASSOCIATED WITH THE GROUND WATER EXPOSURE PATHWAY (RISK TO 1,1,1-TRICHLOROETHANE)

	Noncarcinogenic	Hazard Indexes	
Exposure Route	Ad ult	Chil d	
Drinking Wa ter	1.41 E-02	1.92 E-01	
Dermal Absorption	1.64 E-02	8.47 E-02	
Inhalation	4.60 E-03	6.30 E-02	
Total	3.51 E-02	3.40 E-01	

Source: ESE, 1991.

TABLE 23
ESTIMATED CARCINOGENIC RISKS ASSOCIATED WITH THE GROUND WATER EXPOSURE PATHWAY (RISK TO TRICHLOROETHYLENE)

Exposure Route	Carcinogenic Risk Level		
Drinking Water	7.50 E-06		
Dermal Absorption	8.82 E-06		
Inhalatio n	1.27 E-05		
Total	2.90 E-05		

Source: **ESE**, 1991.

range (10⁻⁴ to 10⁻⁶), but exceeds the target level of 10⁻⁶. These cancer risk estimates suggest that future use of the ground water may result in unacceptable risks when compared to the target risk level. It is important to note that this analysis is based on many conservative assumptions which may tend to overestimate the cancer risk estimate. For example, the ground water models used to predict future ground water concentrations and the exposure-related assumptions were all conservative (high probability that these parameters were overestimated to some degree). As a result, future carcinogenic risks associated with the use of ground water are likely to be lower than the estimate presented in Table 23.

6.4.2. Risks Associated With Other Pathways (Qualitative Estimates)

Based on the available data, significant health risks associated with soil, surface water, and air exposure pathways are not expected at the Machias Gravel Pit Site. Exposure point concentrations for these pathways are not expected to be very high based on minimal concentrations in the source areas and the low potential for release and migration. In addition, there are few receptors in close proximity to the site, and those that are would be expected to be present for only short periods of time and infrequent occurrences (trespassers on-site). Although the toxicity of some of the contaminants of concern is relatively high [benzo(a)pyrene is a human carcinogen], because the potential for exposure is low, the potential for significant risk is also low. (It should be noted that the benzo(a)pyrene is probably associated with asphalt pieces within the on-site fill materials.)

7.0 SUMMARY AND CONCLUSIONS

7.1 Summary

The investigation of the Machias Gravel Pit site performed by Motorola, Inc. included the following:

- Geophysical survey/test pits to confirm or refute the presence of buried drums.
- Surface/subsurface soil sampling.
- Monitoring well/ground water sampling.
- Residential well sampling.
- Slug tests.
- Constant discharge test.

The site in underlain by approximately 90 feet of unconsolidated fluvioglacial deposits overlaying shale bedrock. Unconsolidated deposits consist primarily of sand and sand and gravel units interlayered with silty horizons. The uppermost aquifer is within the sand and gravel deposits and is unconfined. Ground water flow roughly parallels surface topography. From the inactive gravel pit area (i.e., the area where the drummed wastes were handled and stored) ground water flows in a northeasterly direction eventually curving east toward Ischua Creek.

A magnetic gradiometer survey was performed to identify areas of potential buried metal within a suspect drum burial area. Results of the gradiometer survey were used to locate seven test pits to visually confirm or refute the presence of buried drums. No evidence of buried drums was identified in any of the test pits. Analytical data from soil samples collected from the test pits also showed unimpacted conditions reaffirming conclusions based on visual observations that no drum disposal occurred in the suspect burial area.

Surface soil samples show unimpacted conditions except for elevated total lead within the inactive gravel pit area. Subsurface soil field screening and sampling also suggests unimpacted conditions except for TCE and 1,1,1-TCA immediately above the water table (approx. 43 feet below the ground surface) beneath the inactive gravel pit area.

Ground water analyses show a slug of TCE and 1,1,1-TCA contamination flowing in a northeasterly (downgradient) direction, away from the inactive gravel pit area. The first downgradient receptor is the cabin well located approximately 450 feet north of the Cole residence well. Subsequent analytical ground water modeling developed projected time versus concentration curves for TCE and 1,1,1-TCA at the receptor well. The Cole residence well does not appear to be in the contaminant migration pathway. No chloroform was detected in any of the monitoring wells or residential well samples.

A preliminary risk assessment was performed based on the analytical data generated during this study and the results of the analytical ground water modeling. The preliminary risk assessment included:

- Identification of contaminants of potential concern.
- Exposure assessment.
- Toxicity assessment.
- Risk characterization.

Results of the preliminary risk assessment are considered conservative, worst-case estimates due to conservative analytical ground water modeling assumptions.

7.2 Conclusions

Based on the physical and chemical data generated during this investigation and subsequent data evaluation, the following conclusions are provided:

Based on results of the geophysical survey and subsequent test pit excavation/sampling, no drums were disposed within the suspect drum burial area.

- The primary source area of contamination is confirmed to be the inactive gravel pit. There is no evidence of past waste handling/storage activities in the former maintenance garage area.
- A slug of VOC contamination is migrating via the ground water system to the northeast, toward the cabin well approximately 450 feet north of the Cole residence. The primary constituents of concern are TCE and 1,1,1-TCA.
- The Cole residence does not appear to be within the migration pathway of the VOC contamination.
- The sporadic chloroform problem associated with the Cole residence well appears to be an isolated issue not related to past waste handling/storage activities at the Machias Gravel Pit site.
- There is no significant non-carcinogenic health threat for adults or children associated with 1,1,1-TCA in the ground water.
- The total estimate of future carcinogenic risks associated with the ground water pathway is 2.9×10^{-5} .
- There are no apparent significant health risks associated with the soil, surface water or air exposure pathways.

The data from this study was also used in an engineering evaluation of remedial alternatives.

The evaluation is provided under separate cover.

8.0 ADDITIONAL NYSDEC REQUIREMENTS

In order to complete the Work Plan and NYSDEC requirements, the following additional items are presented in this section:

- Final application of the Hazard Ranking Systems (HRS) and revised scoring sheets.
- A completed Site Characterization Fact Sheet (SCFS).

Each are discussed below.

8.1 Final Application of HRS

8.1.1 Existing HRS Score

The Phase II Site Investigation Report dated July 1989, prepared by Lawler, Matusky & Skelly Engineers (LMS) for the NYSDEC included a HRS score for the Machias Gravel Pit site. The HRS score provided in the report was as follows:

- Migration route (S_m) 37.49.
- Fire and explosion (S_{FE}) Not applicable.
- Direct contact (S_{DC}) 12.50.

The migration route score is based on an evaluation of the ground water (S_{ow}) , surface water (S_{sw}) and air (S_A) migration pathways. The following migration pathway scores were calculated:

- S_{GW} 64.29
- S_{sw} 8.62
- $S_A 0$

The ground water route score is the "driving factor" for the total migration pathway score.

8.1.2 Re-evaluation of HRS Score

Based on the data and interpretations presented in this study, a modification of the migration route score is appropriate to reflect the additional information. A modification of the fire and explosion hazard score and the direct contact hazard score is not proposed as these appear to accurately reflect site conditions (i.e., little to no hazard with respect to direct contact and fire/explosion).

As noted in Section 8.1.1 the migration route score is based on an evaluation of the ground water, surface water and air migration pathway. The surface water route score and the air route score appear to be representative of site conditions and no modification is proposed.

The ground water route score however appears to be biased high. A revised ground water route scoring sheet is included in Appendix F. The primary modifications are associated with the "waste characteristics" and "targets" rating factors. Each of these rating factors are discussed below.

Waste Characteristics

The previous HRS scoring for ground water included a toxicity/persistence value of 18. This value was assigned based on using heptachlor epoxide for scoring purposes, however, this chemical was not detected in ground water. The modified ground water route scoring sheet includes a toxicity/persistence value of 12 using trichloroethene for scoring purposes. This was identified by the preliminary risk assessment as the main chemical of concern in the ground water. The modified total waste characteristics score is therefore 15.

Targets

The previous HRS scoring for ground water included a "distance to nearest well/population served" matrix value of 30. This value was based on an assumed total population served by ground water of 1278 people within a 3-mile radius of the site.

Based on ground water flow evaluations presented in this report, the impacted aquifer discharges to Ischua Creek, immediately north and east of the site. This is considered a hydrogeologic boundary and ground water users on the other side of a hydrogeologic boundary should not be included in the population served estimate. In light of the hydrogeologic boundary, a more representative population served estimate is in the 1 to 100 category which yields an assigned value of 3 which results in a matrix value of 10 (the matrix value includes an evaluation of the distance to the nearest well). The modified total targets score is, therefore, 19.

The two above rating factor modifications result in a revised ground water route score of $S_{GW}=22.37$. With no revisions proposed to the surface water and air migration route scores, the revised total migration route score is $S_m=13.86$.

8.2 Site Characterization Fact Sheet (SCFS)

As requested by the NYSDEC in a letter to Motorola, Inc. dated August 16, 1990, an SCFS was completed for the site and is included in Appendix G of this report. The purpose of the SCFS is to summarize available technical data for the site which will aid in defining those treatment technologies which may be applicable for further consideration in the engineering evaluation of remedial alternatives. The results of the engineering evaluation are provided under separate cover.

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Appendix A
Test Pit Logs

PROJE	CT: Ma	echi as	Grave	eL Pit LOG OF EXCAVATION NO. TP-1	
Date:	12/6	/90		Coordinates: 4950N, 4980 - 4990E	
	ation M		Ba	Ground Surface Elevation:	
ELEVATION (feet)	DEPTH (feet)	SAMPLE TYPE	PID	MATERIAL DESCRIPTION	SOILS ANALYSIS
	-			Fill - brown, loamy 1.0'	
	1 -	1	BG	Fill - dark brown humus 1.5'	
	2		8G	Fill - brown sandy silt with some gravel and clay. Much wood debris. Rusty metal sheets and a 5 foot long piece of metal pipe. 6.5' sand and gravel - some silt 7.0'	
	7 -			End of Excavation	
				Excavation dimension - 18' × 3' × 7'	
Rema	arks: Pig Sad	pe ide mple d	entific collec	ed above was oriented subvertical in the ground. ted - TP01-01	BG - Background
PRO.	JECT NO.			HYDRO-SEARCH, INC.	

PROJE	CT: M				
Date:	12/6	/90		Coordinates: 4940N - 4920N, 4960	E
Exca	vation M				
ELEVATION (feet)	DEPTH (feet)	SAMPLE TYPE	PID	MATERIAL DESCRIPTION	SOILS ANALYSIS
	1		BG	Fill - wood and roofing debris. Metal stripping approximately 3 inches wide. 1.5'	
	1 — BG 2 — BG 4 — BG 7 — BG		BG	Fill - brown loam with gravel. Some wood debris toward top. Two pieces of metal culvert and wire found two to three feet below the surface.	
	7 -		Bu	Sand and gravel - brown, silty 7.0' End of Excavation Excavation dimension - 20' × 3' × 7'	
Rema	irks: S a	ample	colle	cted - TP02-01	BG - Background
PROJ	IECT NO.			HYDRO-SEARCH, INC.	55 55573, 557.5

PROJE	CT: M				
Date:	12/6	/90		Coordinates: 4900N - 4890N, 4970	- 4960E
	ation M		. Bar	ckhoe Ground Surface Elevation:	
ELEVATION (feet)		SAMPLE	010	MATERIAL DESCRIPTION	SOILS ANALYSIS
	1 —		BG	Fill - Dark brown with humus 1.0'	
	2		8G	Fill - Dark brown to black loamy fill. Some asphalt pieces. Slice of wire wrap fiber hose. 3.0'	
	4 —		00	Fill - olive to tan, clayey.	
	_ 5 _			5.5'	
	6 -		BG	Sand and gravel - brownish with silt. Excavation dimension - 15' × 3' × 5.5'	
R ema	arks: 0	nlv m	etal f	ound was associated with wire wrap hose. cted - TP03-01	BG - Background
PRO	JECT NO.			HYDRO-SEARCH, INC.	Du Background

PROJECT: Machias Gravel Pit					DF EXCAVATION NO. TP-4	
Date:	12/7	/90		Coor	dinates: <u>4840N - 4820N, 4990</u>	
	ation M		8a	ckhoe Grou	nd Surface Elevation:	
ELEVATION (feet)	DEPTH (feet)	SAMPLE TYPE	PID	MATERIAL DESCRIP	TION	SOILS ANALYSIS
	1 —		BG	Soil/Fill - dark brown, loamy wit Gravel/Fill - dark brown gravelty to the north of exc	1.0'	
	2 — 3 — 4 — 5 — 6 — - - - - - - - - - - - - -		BG BG	Sand - brown to tan, clayey End of Excavati Excavation dimension -	5.0' 5.5' on 20' × 3' × 5.5'	to north.
Kema	rks: No Sa	sign ample	colle	nt metal but major change in amount cted - TP04-01	or graver trending in on south	BG - Background
PROJECT NO.				HYDRO-SEARCH,	INC.	

DDC:-	OT - **			el Pit LOG OF EXCAVATION NO.	TP-5	
PROJE	CT: Ma	ecnias	urave	EL PIT LOG OF EXCAVATION NO.		
Date:	12/7	(90		Coordinates: 4920N, 4940E	- 4960E	
Excav	ation M	ethod:	Bac	ckhoe Ground Surface Elevation:		
ELEVATION (feet)	· DEPTH (feet)	SAMPLE TYPE	PID	MATERIAL DESCRIPTION		SOILS ANALYSIS
	1		BG -	Fill - black, loamy Fill - brown, humus	1.5'	
	3 - - 4 - 5 - -		BG BG	Fill - brown, loamy with some sand and gravel. Clayey zone at four feet. Small pieces of concrete with rebar, miscellaneous small metal debris; asphalt pieces.	7.0'	
	8 -			Sand and Gravel - loamy End of Excavation Excavation dimensions - 20' × 3' x 7.5'	7.5'	
Rema	rks: S	ample	colle	cted: TP05-01		BG - Background
PROJ	IECT NO.		_	HYDRO-SEARCH, INC.		

PROJE	CT: M	ach i as	Grav	el Pit LOG OF EXCAVATION NO. TP-6	LOG OF EXCAVATION NO. TP-6		
Date:	12/7	/90		Coordinates: <u>4830N, 4930E - 4940</u>			
Excav	ation M	ethod:	. <u>B</u> a	ckhoe Ground Surface Elevation:	Ground Surface Elevation:		
ELEVATION (feet)	DEPTH (feet)	SAMPLE TYPE	P10	MATERIAL DESCRIPTION	SOILS ANALYSIS		
	3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 -		BG	Fill - dark brown, humus, roots. 2.0' Fill - dark brown loam with some silt and trace of gravel. Wood boards with nails. - clayey zone			
				7.0'			
	7	+		Sand - light brown, medium grain 7.5'			
	8			End of Excavation Excavation dimensions - 12' × 3' × 7.5' *10' × 3' × 6'			
Rema	rks: *	Initia b samp	il exc ole co	avation offset by 2 feet due to no apparent metal. llected.	BG - Background		
PROJ	IECT NO.			HYDRO-SEARCH, INC.			

PROJECT: Machi as Grav	vel Pit	LOG OF EXCAVATION NO. TP-7						
Date: 12 /6 /90		Coordinates: 4760N - 4740N, 4860	- 4880E					
Excavation Method:Ba	ackhoe	Ground Surface Elevation:						
ELEVATION (feet) DEPTH (feet) SAMPLE TYPE	MATERIAL DE	SCRIPTION	SOILS ANALYSIS					
1 — BG 1 — 3 — 3 — 4 — 5 — 5	Top soil - roots Sand - tan fine to medium sa and cobbly as excavat	0.5/ nd, trace silt. Becomes gravelly ion progresses north.						
6 — BG	End of Exc Excavation dimension	5.5/ Eavation ons - 20/ × 3/ × 5.5/						
Remarks: No major met No samples o	tal found but distinct change for collected.	rom sand to cobbles.	BG - Background					
PROJECT NO.								

Appendix B

Borehole Logs and Well Construction Summaries

SITE N	AME AND	LOCAT	ION: Motorola, Machies, New York ORILLI	NG METHOD:Auge	r				ING NO. P-1	
SAMPLE METHOD:Split spoon									1 QF 2 DRILLING	
	1: N4485. . RIG: Al		WATER TIM DAT 5750.48 Top of PVC: 1694.33 CASING	E E DEPTH	11	snow,	75.05	0 D 12/	ART FINISH IME TIME 9:30 14:00 ATE DATE 6/90 12/6/90	
ANGLE		Vert	ical BEARING N/A	UNDITIONS: LAWIT,		SI IUW,	٠٠ رو	кпцу		
			, , , , , , , , , , , , , , , , , , , ,		ND BIT		DEPT	ET .	SCRIPTION OF	
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL		SAMPLER AND	BLOWS/FOOT ON CASING	FROM		OPERATION AND REMARKS	
					S			<u>-</u>		
-	1		<u>Silt</u> : well sorted, moist, brown (OL).	•						Z Z
2 3	3		•					1.1	' recovery	DRILLING CONTR
_	3								,	LL
_ 2	3					=				081
	3							ŀ		
_	5		as above							
3	10		Silty Clay: clay, some very fine silt, mo	ist (CL).	1			.7	¹ recovery	
	8					-				
- 4			Sand: sand, fine, trace cobbles, well sor	ted, brown (SP).				†		
	2			-						
_ 5	7					_		1.0	recovery	
	8									
- 6	·		2.1.			=	.	+		
	3		<pre>Silty Sand: very fine, some silt, trace p (SM).</pre>	epoles, brown			1			
- 7	8				}		;	1.1	' recovery	
= ;	7								·	
8	6									
-	1									
F .	5		as abo ve, medium to fine sand							iner
9	5		Silty Clay: trace pebbles, brown (CL).		†			1.1	1 recovery	Larry Gardiner
	5									L X
10		-	Sand and Gravel: fine to coarse sand, pe	bbles to		-		+		La
-	2		cobbles, poorly sorted, very moist (GW).							BY
_ 11	4							.7	'I recovery	LOGGED BY
12	4								approximate water table	

SITE	AME AND	LOCAT	ION: Motorola, Machias, New York DRILLING METHOD: Aug	er					BORING NO.
	1: N44485	5 <u>.4</u> 5.	SAMPLE METHOD: SPLI WATER LEVEL TIME DATE DATE E5750.48 Top of PVC: 1694.33 CASING DEPTH	t S	0001	n :			SHEET 2 QF 2 DRILLING START FINISH TIME TIME 09:30 14:00 DATE DATE 12/6/90 12/6/90
	RIG: AT	'V -	SURFACE CONDITIONS: lawn	. 1	S	now,	35°!	, Hi	ndy
	6 IN.		UE FTLBS	AND BIT	TYPE	00T	IN	PTH	DESCRIPTION OF
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SO1L GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER /	CASING	BLOWS/FOOT ON CASING	FROM	T0	OPERATION AND REMARKS
13	2 4 6 9		Clayey Silt: very fine silt, pliable, very moist to wet, brown (ML).						.5' recovery
_ _ _ _ 15 _ _	1 3 6		as above Silty Clay: gray (CL).						HNu = background
16	1 2 5		Sand and Gravel: poorly sorted, wet (GW). Silty Clay: wet, brown-gray (CL).						1.6¹ recovery
-	5 17 15		as above, trace pebbles Sand: coarse, well sorted, wet (SP).		† †				1.01 recovery
19 20 20			T.D. 20 feet						

SITE N	AME AND	LOCAT	ION: Motorola, Machias, New York	DRILLING METHOD: Augs	er					BORING NO. GW-3D	
DATUM	: N4905.	05, E	5168.97 Top of PVC: 1742.21	SAMPLE METHOD: Spli				clou		SHEET 1 QF 7 DRILLING START FINISH TIME TIME 08:20 09:45 DATE DATE 12/11/90 12/12/90	
ANGLE	RIG: AT	Vert	ical BEARING N/A	RFACE CONDITIONS: silt	and	1 61	ay,	Crou	Oy,		
	E HAMMER	TORQ	UE FTLBS		BIT		-	DEP IN F			
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMB AND DESCRIPTION OF M		AND	CASING TYPE	BLOWS/FOOT ON CASING	FROM	10	DESCRIPTION OF OPERATION AND REMARKS	
1	1 1 2 3		Silt: some clay and pebbles, well (ML).	sorted, moist, brown							DRILLING CONTR
2 3	·		Silty Clay: some pebbles, wet (CL)	•							
- 4			as above with trace pebbles								
-	4 4 5 6		<u>Silt</u> : some clay, trace pebbles, we	et, brown (ML).			-			1.5' recovery	
9 10	3 3		a s a bo ve				-			1.0' recovery	Larry Gardiner
11	2		as a bo ve with some pebbles	·						.3' recovery	LOGGED BY

SITE N	AME AND	LOCAT	ION: Motorola, Machias, New York	DRILLING METHOD: Aug	er				BORING NO.	
				SAMPLE METHOD:Spli	t Spo	on			SHEET 2 OF 7 DRILLING START FINISH	
DATUM	: N4905.	05 E	5 16 8.97 Top of PVC: 1742.2'	WATER LEVEL TIME DATE CASING DEPTH					TIME TIME 08:20 09:45 DATE DATE 12/11/90 12/12/90	
	RIG: AT		SL	JRFACE CONDITIONS: silt	and	ctay	, ct	oudy,	25°F.	1
SAMPL	E HAMMER	TORG	UE FTLBS			·	1	EPTH		
E .	z .				BIT			FEET		1
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUM AND	BER	ER AND	BLOWS/FOOT	ASTNG		DESCRIPTION OF OPERATION AND	
DEPT (EL	BLO ON (RE		DESCRIPTION OF	MATERIAL	SAMPLER	BLOW	NO NO	10	REMARKS	
	1		Sand: fine to medium, some gravel (SP).	, fair sorting, moist			-			<u>~</u>
_ _ 13	3					-			.7' recovery	DRILLING CONTR
	6 4			,						RILLIN
14	7		Sand and Gravel: very fine to coa subangular, moist (SW).	rse, poorly sorted,	1	-	_			١
- - 15	4		Securification (Only)			-			HNu = background	
-	6 6		as above							
16		-		·		-				
-	5 5		and the second s						.5' recovery	
— 17 —	6		as above with very fine to medium	Sano					.J recovery	
18	4									
	3						=			
19	3 5		as above				\exists		1.0' recovery	
E	3						+			
20	1		Cand. fine to madism, applies to	culpandular trece	4		_		HNu = background	
20	1		<u>Sand</u> : fine to medium, angular to <u>pebbles</u> , fair sorting, moist, bro	wn (SP).						
21				•			7			dine
-	7						\exists			<u>Gar</u>
22	İ]	ļ	_			Larry Gardiner
-	7		<u>Sandy Silt</u> : some very fine sand (ML).			\exists			
23	7						\exists		1.5' recovery	LOGGED BY
22	7		Sand: medium to coarse, moist, be	rown (SP).					, , , ,	LOGGI DATE
-	7						\exists			

SITE NAME AND LOCATION: Motorola, Machies, New York ORILLING METHOD: Auger SAMPLE METHOD: Split spoon						BORING NO. GW-3D SHEET 3 OF 7			
DRILL	RIG: AT	V Vert	ical BEARING N/A	WATER LEVEL TIME DATE			ct oudy,	STEP DRILLING START FINISH TIME TIME 08:20 09:45 DATE 12/11/90 12/12/90 25°F	
DEPTH IN FEET (CELEVATION)		SOIL	SAMPLE NUMB AND DESCRIPTION OF M		SAMPLER AND BIT	BLOWS/FOOT	TO TO THE	DESCRIPTION OF OPERATION AND REMARKS	
	3 6 7 5		Sand and Silt: very fine to coarse sorted, moist, brown (SM).	e, interbedded, well				1.2' recovery	DRILLING CONTR
26 27 	7 8 10		<u>Sand</u> : fine, angular, well sorted (SP).				1.3' recovery	
28 29 30	7 9 9		<u>Sand</u> : fine to medium, poorly sorts	ed, moist, brown (SW).		-		1.5' recovery	
- - - - - - - -	9 10 11 12		as above			 		1.0' recovery	
32 33 33 34 35	6 6 9 6		as above with very fine sand, dry					1.4' recovery	Larry Gardiner
34	6 8 9		as ab ov e			-		.9' recovery	LOGGED BY LS

SITE N	IAME AND	LOCAT	ION: Motorola, Machias, New York DRILLING METHOD:	Auge	r				RING NO. GW-3D	
			SAMPLE METHOD:		4 OF 7 DRILLING	‡				
	RIG: A1	۲V	S168.97 Top of PVC: 1742.21 CASING DEPTH SURFACE CONDITIONS:	silt	and	clay,	cloud		TART FINISH TIME TIME 08:20 09:45 DATE DATE /11/90 12/12/90 F	
SAMPL	E HAMMER				-		DEPT	н		
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND BESCRIPTION OF MATERIAL		CASTING TYPE	BLOWS/FOOT ON CASING	FROM IN EE	-	ESCRIPTION OF OPERATION AND REMARKS	
- - - - - - - - - - - - - - - - - - -	7 13 13		a s above					1.	1' recovery	DRILLING CONTR
38	9 10 10 8		<pre>\$ilty Sand: very fine to fine, some silt, dry, brown (SM).</pre>	٦ .					u = background 4¹ recovery	J
41	12 14 16 20		as above with trace pebbles					1.	3' recovery	
42	9 10 20 15		a s above			-		-	6' recovery	
44 45 46	10 10 10 10		a s above						9¹ recovery	Larry Gardiner
46 47 47	8 14 16 20		as above, becoming moist			-			.3' recovery	LOGGED BY

SITE	IAME AND	LOCAT	ION: Motorola, Machies, New York DRILLING METHOD: Aug	ger	BORING NO. GW-3D	
DATUM DRILL	1: N4905. - RIG: AT	.05, E	WATER LEVEL TIME DATE CASING DEPTH SURFACE CONDITIONS: SIGN	t spoon	SHEET 5 OF 7 DRILLING START FINISH TIME TIME 08:20 09:45 DATE DATE 12/11/90 12/12/90 25°F	
ANGLE	:	Veri	ical BEARING N/A			
DEPTH IN FEET STATES (ELEVATION)	BLOWS/ 6 IN. ## ON SAMPLER PER (RECOVERY)	SOIL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT CASING TYPE BLOUS/FOOT ON CASING FROM TO: TO: THE CASING TO: THE CASING	DESCRIPTION OF OPERATION AND REMARKS	
49	6 6 8		as above, wet		approximate water table	DRILLING CONTR
50	7 7 9 6		Silt: Wet, brown (ML).		1.5' recovery	3 0 1
53	3 4 7 6 6 7 8		as above as above		1.8' recovery	
56	9 13 17 17		as above		2.0' recovery HNu = background	Larry Gardiner
- - - - 59 - -	10		as above, trace clay		2.0' recovery	LOGGED BY

DATUM DRILL ANGLE	!: N4905.05 RIG: ATV	PROBLE BEARING N/A DROUE FTLBS	WATER LEVEL TIME DATE CASING DEPTH RFACE CONDITIONS: SILT	Spoon	BORING NO. GW-3D SHEET 6 OF 7 DRILLING START FINISH TIME TIME 08:20 09:45 DATE DATE 12/11/90 12/12/90 25°F DESCRIPTION OF OPERATION AND REMARKS	
- - - - - - - - - - 61	10 14 14 6	a s above, without clay			2.0' recovery	DRILLING CONTR
63	5 5 11 16	a s above			2.0' recovery	
64	7 9 12 16	a s above	•		2.01 recovery	
67	12 11 13 14	a s above			2.0' recovery	
68 69 70 71	6 9 12 15	as above			2.0' recovery	Larry Gardiner
71	4 12 13	a s abo ve , trace clay			2.0' recovery	LOGGED BY L

DATUI DRILI ANGLI	M: N4905. L RIG: AT	.05, E TV Vert	ti ca l BEARING N/A	WATER LEVEL	t spoo			BORING NO. GW-3D SHEET 7 OF 7 DRILLING START FINISH TIME TIME 08:20 09:45 DATE DATE 12/11/90 12/12/90 25°F	
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SO1L GRAPH	SAMPLE NUMB And Description of M		SANPLER AND BIT CASING TYPE	BLOUS/FOOT ON CASING	TROM 10 IN LEET HILD HILD HILD HILD HILD HILD HILD HILD	DESCRIPTION OF OPERATION AND REMARKS	
- - - - - - - - - - 74	4 5 7 9		<u>Clayey Silt</u> : some clay, wet, gray-	brown (ML).				HNu = background 2.0' recovery	DRILLING CONTR
75	6 5 5		as above, with 2" sand stringer					2.0' recovery	
77	5 6 10 6		<u>Sand and Gravel</u> : fine, to coarse s subangular to subrounded, trace si	and and peobles,				2.0' recovery	·
			T.D. = 77.8 feet						LOGGED BY Larry Gardiner

SITE N	IAME AND	LOCAT	ION: Motorola, Machies, New York	DRILLING METHOD:Au	ger					BORING NO. GW-5	
DATU	1: N4681.	86, E	4 98 7.56 Top of PVC: 1741.50	WATER LEVEL TIME DATE CASING DEPTH	it s					1 OF S DRILLING START FINISH TIME TIME 08:40 14:10 DATE 12/10/90 12/10/90	
DRILL	RIG: AT	V Vert		RFACE CONDITIONS: san	<u>d an</u>	d g	ravel				+
SAMPL	E HAMMER	TORG							7		1
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMB AND DESCRIPTION OF M		SAMPLER AND BIT	CASING TYPE	WS/FOOT CASING	TROM IN LE		DESCRIPTION OF OPERATION AND REMARKS	
2 3	3 5 13		Sand and Gravel: coarse sand to pe angular to subangular grains, mois brown (GW).	bbles, some fine sand, t to slightly moist,						1.0' recovery	DRILLING CONTR
3	4 25 30 16		as above							.5' recovery	
5	5 8 10 12		<u>Sand</u> : very coarse to fine, trace p sorted, angular, moist, brown (SW)	pebbles, poorly						1.5' recovery	
7	10		as above without pebbles							1.4' recovery	
- 8 - 9 - 10	3 10		Silty Sand: coarse to fine, some s moist, brown (SM).	silt, poorly sorted,						1.5' recovery	Sandra Haws
10 - - - - 11	2		as a bo ve							HNu = background	LOGGED BY Sa

SITE A	AME AND	LOCAT	ION: Motorola, Machias, New York	DRILLING METHOD: Aug	er				BORING NO.	
				SAMPLE METHOD:Spli	t Spoo	on .			SHEET 2 OF 5 DRILLING START FINISH_	ļ ļ
				WATER LEVEL TIME DATE					TIME TIME 08:40 14:10 DATE DATE	
DRILL		Vert	ical BEARING N/A		and	rave			12/10/90 12/10/90	
	E HAMMER	TORQ	UE FTLBS		ВІТ		DEF	TH		
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBE AND DESCRIPTION OF MA		SAMPLER AND E	BLOWS/FOOT ON CASING	FROM	T0	DESCRIPTION OF OPERATION AND REMARKS	
- - - - 13	3 12 15 16		a s above, slight ly coarser						1.41 recovery	DRILLING CONTR
15	1 9 14 17		as above			-			1.8' recovery HNu = background	-
17	2 7 11 17		Sand and Silt: fine sand and silt, downward from upper silty sand univellow-brown (SM).	gradational fining t, trace clay, moist,					1.6' recovery	
18	4 13 24 18		as above			-			1.9' recovery	
20 21 22	3 10 15 16		as above, coarsening to medium san	d and silt					HNu = Background 2.0' recovery	Sandra Haws
22	2 15 24 28		as a bo ve, fining to fine sand and	silt					1.9' recovery	LOGGED BY Sa

SITE N	AME AND	LOCAT	I ON : M oto rola, Machias, New York	DRILLING METHOD: Auge	er				BORING NO.	
				SAMPLE METHOD: Spli	t sp	oon			SHEET 3 OF 5 DRILLING START FINISH	
	: N4681. RIG: AT		4987.56 Top of PVC: 1741.50	WATER LEVEL TIME DATE CASING DEPTH RFACE CONDITIONS: sand	and	gra	ivel		TIME TIME 08:40 14:10 DATE DATE 12/10/90 12/10/90	
ANGLE		Vert	ical BEARING N/A	MINEL COMPTITIONS: SENS	<u> </u>					
-	6 IN. THER PLER BENTY)				AND BIT	TYPE	1.	DEPTH IN FEET	DESCRIPTION OF	
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMB AND DESCRIPTION OF M	ATERIAL	SAMPLER	CASING TYPE	ON CASTNG	FROM TO	OPERATION AND REMARKS	
 25	2 13 27		as above, coersening to medium sar	nd and silt					1.7' recovery	DRILLING CONTR
 26 	4								HNu = background	DRIL
- 27 - 27 	15 21 27		as above, fining to fine sand and	siit					1.6' recovery	
28 	3 17 26		Sandy Silt: some very fine sand, tyellow-brown (ML).	trace clay, moist,					2.0' recovery	
30	35 5								HNu = background	
- - - - - - - - - - - - - - - - - - -	32 52 62		as above						1.9' recovery	
32 33	2 26 29		a s ab ov e						1.1' recovery	aws
	30		Sand and Gravel: fine sand and pet slightly moist, brown (GM).	obles, some silt,					HNu = background	Sandra Haws
	10 100/ 5"		as above with trace clay						.1' recovery	LOGGED BY

SITE N	AME AND	LOCAT	I ON : M oto rola, Machias, New York	DRILLING METHOD:Aug	er			BORING NO.	
				SAMPLE METHOD: Spli	t Spo	oon		SHEET 4 OF 5 DRILLING] [
DATUN	1: N4681.	86, E	4 98 7.56	WATER LEVEL TIME DATE CASING DEPTH RFACE CONDITIONS: sand	and	Opave,		START FINISH TIME TIME 08:40 14:10 DATE DATE 12/10/90 12/10/90	
ANGLE	RIG: AT	Vert		REACE CONDITIONS: Sand	anu	gravet			į
	E HAMMER	TORG	U E FTLBS		811	u	DEPTH IN FEET		
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL	SAMPLE NUMB AND DESCRIPTION OF M		SAMPLER AND	BLOWS/FOOT ON CASING	FROM TO	DESCRIPTION OF OPERATION AND REMARKS	
 37 38	10 40 34 40		as above					1.0' recovery	DRILLING CONTR
39	6 32 40 46		as above			 		1.2' recovery	
40 41	7 50 60		as above Sandy Silt: some fine sand, some of	olay, moist, brown (ML).		-		HNu = background	
42 42 43	36 4 19 26 37		as above, becoming very moist					1.9' recovery collected sample GWSB01-01 at 13:15	
44	3 12 22 25		a s above, we t at 45'			-		1.6' recovery approximate water table 45'	Sandra Haws
46 47 	2		<u>Silty Sand</u> : fine to medium sand, : wet, brown (SM).	some silt, trace clay,		-		HNu = background	LOGGED BY SR

SITE N	AME AND	LOCAT	ION: Moto	rola,	Machias	, New Yor	k	DRILLING METHO	Đ: <u>Aug</u>	er					BORING NO.	
								SAMPLE METHOD:	Spli	t sp	oon				SHEET 5 OF 5 DRILLING START FINISH TIME TIME	
DATU	1: N4681.	86, E	4 98 7.56		Top of	PVC: 174	1.50	TIME DATE CASING DEPTH							08:40 14:10 DATE DATE 12/10/90 12/10/90	
ANGLE	RIG: AT	Vert	ical		BEARING	N/A	SU	REFACE CONDITION	S: sand	and	_gr	avet		-		
	E HAMMER	TORC	:U <u>E</u>		·	FTL8\$_	ļ			817	ш	1	DEP N F	TH		
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH			DES	SAMPLE AN CRIPTION	D			SAMPLER AND	CASING ITPE	BLOWS/FOOT ON CASING	FROM	TO	DESCRIPTION OF OPERATION AND REMARKS	
 49 	3 13 17 21		as abov	e											2.0' recovery	DRILLING CONTR
50 	1 6 11 12		as abov	e											2.0' recovery	3
52 					Т.О	. = 51 fε	eet									
																LOGGED BY Sandra Haws

SITE	AME AND	LOCAT	I ON: M ot orola, Machias, New York	DRILLING METHOD: Au	ger	•		BORING NO. GW-6	
DRIL	RIG: A	ATV	5 <u>28</u> 2.4 <u>7</u> Top of PVC: 1739.8	WATER LEVEL TIME DATE BECASING DEPTH SURFACE CONDITIONS: cor	it spoor	1º snow	, cl	1 0F 5 DRILLING START FINISH TIME TIME 10:00 11:00 DATE DATE 12/07/90 12/10/90	
SAMP	E HAMMER	Vert	ical BEARING N/A UE FTLBS	clo	udy, 35°	۴			+ †
DEPTH IN FEET (ELEVATION)	EN.	SOIL GRAPH	SAMPLE NUM AND DESCRIPTION OF		SAMPLER AND BIT CASING TYPE	BLOWS/FOOT ON CASING FROM ZOO		DESCRIPTION OF OPERATION AND REMARKS	
1 2	1 2 2 2		<u>Silt</u> : some clay, trace pebbles, b	orown (Mi).				1.2' recovery	DRILLING CONTR
3	3 4 6 6		as above					.9' recovery	
- - - - - 5 - -	3 7 6 4		as above					.9' recovery	
- 6 - 7 - 7	7 8 5		as above					1.2' recovery	
9	2 3 2 2		as above					.3' recovery	Larry Gardiner
10			Sand: fine, some pebbles, medium (SW).	sorting, wet, brown				.5' recovery	LOGGED BY LE

SITE	NAME AND	LOCAT	ION: Motorola, Machies, New York	DRILLING METHOD: Au	ger				BORING NO. GW-6	
				SAMPLE METHOD: Spl	it Sp	oon			SHEET 2 OF 5	
DRILL	RIG: A	Ver t	ical BEARING N/A	WATER LEVEL TIME DATE 8 CASING DEPTH URFACE CONDITIONS: COP		ald, 1 ³	snow	, cl	ORILLING START FINISH TIME TIME 10:00 11:00 DATE DATE 12/07/90 12/10/90 oudy to partly	
	E HAMMER	RIORG	UE FTLBS	-	<u> </u>		DEP			
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUM AND DESCRIPTION OF		SAMPLER AND BI	CASING TYPE BLOWS/FOOT ON CASING	FROM	T0	DESCRIPTION OF OPERATION AND REMARKS	
-	40		<u>Sand</u> : very fine to pebbles, poort	y sorted, brown (SW).			i	-		
13	12 32 13 12								.9' recovery	DRILLING CONTR
15	10 11 12 20		as above, trace silt						.6' recovery	
17	15 12 11 11		large cobble jammed in split spoo	n, no recovery					0.0' recovery	
18 - - - - 19 - - - - 20	9 6 6		<u>Sand</u> : fine to medium, medium sort (SW).	ing, subangutar, brown					.8' recovery	
21	8 8		as above with very fine sand						.6' recovery	Larry Gardiner
22 23 24	6		<u>Sand</u> : fine, well sorted, subangul brown (SP).	ar, slightly moist,					.8' recovery	LOGGED BY L

SITE N	AME AND	LOCAT	ION: Motorola, Machies, New York	DRILLING METHOD: Aug	ier				BORING NO. GW-6	
	RIG: A	ATV	5282.47 Top of PVC: 1739.88	WATER LEVEL TIME DATE CASING DEPTH RFACE CONDITIONS: COFF	t spoo	1. 11	snow	, cl	SHEET 3 OF 5 DRILLING START FINISH TIME TIME 10:00 11:00 DATE DATE 12/07/90 12/10/90 Dudy to partly	
SAMPL	E HAMMER					T -	DEP	TH		
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMB AND DESCRIPTION OF M		SAMPLER AND BIT	BLOWS/FOOT ON CASING	FROM IN E	10	DESCRIPTION OF OPERATION AND REMARKS	
25 25 26	10 10 10 11		as above						1.5' recovery	DRILLING CONTR
- - -	14 16 19 17		Sand and Gravel: some silt, poorly subangular, brown (GM).	sorted, angular to					.9¹ recovery	
28 - 29 - 29	11 15 19 17		as above						.8' recovery	
— 30 — — — — 31	13 22 17 14		as above, clay stringer at 31.5						1.2' recovery	
33 34 34 35	16 18 16 13		<u>Sand</u> : fine, some cobbles, well some brown (SP).	rted, subangular,					.8' recovery	Larry Gardiner
34	17 15 15		<u>Sand and Gravel</u> : very fine to pebb angular to subangular, brown (GW).	oles, poorly sorted,					1.0' recovery	LOGGED BY <u>La</u> DATE

DATUM DRILL ANGLE	1: N4979. RIG: A	.34, E	ical BEARING N/A	WATER LEVEL TIME DATE SECASING DEPTH SURFACE CONDITIONS: COT	rn field, 1' snow, coudy, 35°F DEPTH IN FEET	
DEPTH (ELEV	BLOWS ON SA (RECO	SO	AND DESCRIPTION OF		SAMPLER AND CASING TYPE BLOWS/FOOT ON CASING FROM	AND REMARKS
 37 	16 13 15 18		<u>Sand</u> : medium to coarse, trace petdry, brown (SW).	obles, medium sorting,		DRILLING CONTR
38 39 	16 15 14 13		as above			.8' recovery
40	15 18 26 32		as above			1.2' recovery
43	15 27 20 8		a s above with fine sand			
- * 7	14 16 16 16		<u>Silt</u> : trace pebbles, brownish gr	ay (ML).		Larry Gardiner
46 47	10 12 18 20		<u>Sand and Gravel</u> : very fine sand <u>sorted</u> , brown (GW).	to pebbles, poorly		LOGGED BY La

DATU! DRIL! ANGL! SAMP!	1: N4979 RIG: A	.34, E	ical BEARING N/A	DRILLING METHOD: SAMPLE METHOD: WATER LEVEL TIME DATE CASING DEPTH RFACE CONDITIONS:	Split sp	id. 11	Snow, c	BORING NO. GW-6 SHEET 5 OF 5 DRILLING START FINISH TIME TIME 10:00 11:00 DATE DATE 12/07/90 12/10/90 Loudy to partly	
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL	SAMPLE NUMB AND DESCRIPTION OF M		SAMPLER AND B	BLOUS/FOOT ON CASING	FROM	DESCRIPTION OF OPERATION AND REMARKS	
50	10		No sample Silt: well sorted, wet, brown (ML) Sand: fine, well sorted, wet, brow					approximate water table 48'	DRILLING CONTR.
53	10 13 15 12 14 14 17		no sample T.D. = 56 feet						LOGGED BY Larry Gardiner DATE

SITE N	IAME AND	LOCAT	I O N: M ot orola, Machias, New York	DRILLING METHO	D: <u>Aug</u>	er_	-				BORING N		
				SAMPLE METHOD:	Spli	t sp	oon				SHEET 1 O DRIL START	F 4 LING FINISH	Ī
DATU	4: N4825.	.45, E	5420.21 Top of PVC: 1729.1	WATER LEVEL TIME DATE 6 CASING DEPTH							TIME 15:00 DATE 12/03/90	TIME 17:00 DATE 12/04/90	
	RIG: A	ATV	ical BEARING N/A	URFACE CONDITION	S: gras	sy 1	field	1, 3	's	OW,	35°F, win	dy	ł
	E HAMMER				·	1.		1	DEP	TH			
EET (BIT	ш	L	IN F	EET			
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUM	IRFR		SAMPLER AND	CASTNG TYPE	ON CASTNG			DESCRIP OPERA		
TH ELEV	OWS SAI	S &	AND DESCRIPTION OF		•	PLER	SING	CAS			AN REMA	D }	
DE	862		DESCRIPTION OF	MATERIAL		SAM	S E	8	FROM	10			
	1		Silt: some sand and clay, roots r	near surface		T							I
F 	2		coarsening downward, slightly moi	st, tan to brow	1 (OL).								NTR
_ 1	2										1.5' red	overy	DRILLING CONTR
_ `	3	'											LING
	7							\exists					DRIL
4			Sand and Gravel: some silt and cl	av. pebbles, su	prounded.	+		-	,				_
	8		moist, brown (GM).	,,,	,			\exists					
	7							\exists			1.0' red	overy	
_	6												
- 4	6							╛					
4		-						\exists					
	3							\exists					
_ 5	2		as above with increasing sand, ve	erv moist				\exists			.6' red HNu = ba	overy ckground	
_	11		<u> </u>					\exists					
_	9							\exists					
_ 6	—						.	\exists			ŀ	:	
	13												
7	15		as above with pebbles and cobbles	\$.3' red	overv	
_	10							╛		 			
	8												
8 9 10													
	3							\exists					
- 9	11		as above with trace clay, slight:	ly moist							.6' red	overv	S
<u> </u>	17			-,				\exists					На
-	16												Sandra Haws
10		-						亅			HNu = ba	ackground	Sat
_	8												ВҮ _
11	18		as abc ve								.9' red	coverv	LOGGED BY
	24		LS GEOTT					_		1		· · · · · /	LOGG
-	10												

SITE N	AME AND	LOCAT	ION: Motorola, Machias, New York DRILLING METHOD: Au	ger					BORING NO.
	: N4825. RIG: A	ATV.	WATER LEVEL TIME DATE 5420.21 Top of PVC: 1729.16 CASING DEPTH SURFACE CONDITIONS: gra	it S			S ⁴¹ Si	, wor	SHEET
ANGLE		Vert	ical Bearing N/A UE FILBS						
				317				PTH FEET	
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOUS/FOOT ON CASING	FROM	10	DESCRIPTION OF OPERATION AND REMARKS
 13	22 15 18 36		as above with only pebbles			-			.8' recovery
14			Silty Sand: some silt. trace peobles, sightly moist,	-		-			HNu = background
14	9 11 16 57		Silty Sand: some silt, trace pebbles, slightly moist, brown (SM).						1.0' recovery
16	67 31 26 32		<u>Sand and Gravel</u> : coarse sand and pebbles, some silt, poorly sorted, slightly moist, light brown (GM).						.9' recovery
18 - - - 19 - -	12		as above, dry ·			-			1.0' recovery
20	22 50		no r ec overy			-			0.01 recovery
22	10		as a bo ve with small pebbles, moist						1.5' recovery

			<u></u>						
SITE N	AME AND	LOCAT	I ON: M oto rola, Machias, New York	DRILLING METHOD: Aug	er			BORING NO.	
				SAMPLE METHOD: Spl	t sp	oon		SHEET 3 OF 4	
								DRILLING START FINISH	
				WATER LEVEL TIME				TIME TIME 15:00 17:00	Ţ
			### - 4 PMO- 1770 1	DATE				DATE DATE 12/03/90 12/04/90	İ
DRILL	1: N4825. . RIG: A	\TV	\$	URFACE CONDITIONS: gras	ssy f	ield, 3	" snow,	35°F, windy	1
SAMPL	E HAMMER	Vert	icat BEARING N/A UE FTLBS						ł
			120		BIT		DEPTH IN FEET		ŀ
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	<u> </u>			AND F	YPE OT G		DESCRIPTION OF	ł
H IN	JS/ SAMP	SO1L GRAPH	SAMPLE NUM	BER	R A	CASING TYPE BLOWS/FOOT ON CASING		OPERATION	
EPTH (ELE	BLOS ON S (REC	, C	AND DESCRIPTION OF	MATERIAL	SAMPLER	AST LOW	FROM	AND REMARKS	
٥				· -,	SA	3 80	FR(
<u> </u>									
 25	26								AT A.
 25	40		as above with large pebbles, trac	e rlav				1.7' recovery	DRILLING CONTR
	55		es above with thige peoples, trace	.c viay				111 100000	LINC
_ _ _ _ 26	62								RIL
_ 26									۵
	54								
-	80								
<u> </u>			as above					.9' recovery	
	100/								
27 27 28									
- 20	18					_			
						-]		
29	33		as above with trace cobbles					1.3' recovery	
-	34								
-	42				ŀ				
30 			Sand: coarse to medium, trace sit	it, trace pebbles, some	7		† †	HNu = background	
-	18		sorting, slightly moist, brown (S						
31 32 33 34 34 35	30				1		4	1.4' recovery	
<u> </u>	30								
	30						}		
32							1		
F	9								
-	24						1		S
— 33 —	26		a s above					1.4' recovery	Haw.
-	29								Sandra Haws
34		<u> </u>				· · ·	4 1	HNu = background	Sanc
_	10					-	1		
-	27						}		LOGGED BY
— — 35	21		as above					1.6' recovery	LOGGE
_	32					-	1		07
-	38					-	1		

SITE N	AME AND	LOCAT	I ON: Motorola, Machias, New York	DRILLING METHOD: Aug	er			BORING NO. GW-7	
				SAMPLE METHOD: Spli	t Spoon			SHEET 4 OF 4 DRILLING START FINISH	
DATUM DRILL ANGLE	RIG: A	45, E		WATER LEVEL TIME DATE CASING DEPTH REACE CONDITIONS: gras	sy fietd	3" s	пон,	TIME TIME 15:00 17:00 DATE DATE 12/03/90 12/04/90 35°F, windy	
	E HAMMER					l DE	PTH		I
EET (N	. × .				B11	IN	FEET		
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUME AND DESCRIPTION OF N		SAMPLER AND E CASING TYPE BLOWS/FOOT	ON CASING FROM	10	DESCRIPTION OF OPERATION AND REMARKS	
_	23								<u>د</u> ا
	30 40 43		as above with some pebbles					1.8' recovery	DRILLING CONTR
- 70	14		as above, wet at 39.8'					1.35' recovery	
40	42							approximate water table HNu = 7 above background -	
- - - - 41	14 19 24		Sand and Gravel: coarse sand, transcriptions to subangular, wet, brown	ce sitt, pebbles		1 1 1		steam emitting, probably moisture influence 1.7' recovery	
- - - - - - - -	24		Tourided to subdrighter, set, of our	(4.7)				HNu = background	
- - - - - - - - - - - - - - - - - - -	16 33 30		a s above					.7' recovery, 1' sluff from running sands	
44	5					1		HNu = background	
 45 	19 42 37		as above as above with large pebbles					1.6' recovery	Sandra Haws
46	9							HNu = background	i
47	26 82		as above					.6' recovery	LOGGED BY
-	_								0

SITE	NAME AND	LOCAT	ION: Motorola, Machies, New York	DRILLING METHOD:	Auger					BORING NO.	
				SAMPLE METHOD:	Split s	poo	n			SHEET 1 OF 2 DRILLING	1
				WATER LEVEL TIME DATE						START FINISH TIME TIME	
			5614.88 Top of PVC: 1699.57	CASING DEPTH						12/07/90 12/07/90	ļ
ANGL	L RIG: / E: LE HAMME!	Vert	ical BEARING N/A	RFACE CONDITIONS:	of snow		and	grav	et,	moist, patches	ļ
		, TORE	1177.200		817			DEF IN F			
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	I			9 Q	YPE	0.01			DESCRIPTION OF	Ì
VAT	IS/	SOIL GRAPH	SAMPLE NUMB	ER	R A	5	/FO			OPERATION AND	
EPTH	BLOP ON S	0, 0	AND Description of M	MATERIAL	SAMPLER AND	CASING TYPE	BLOWS/FOOT ON CASING	FROM		REMARKS	
_			······································		SA	ت	0 0	Æ	10		
_			Silt: some clay, trace sand, roots	near surface,		T					
-	2 .		moist, dark brown (OL).				-				NT R
<u> </u>	4						_			1.2' recovery	22
-	3						=				T I K
-	6										DRILLING CONTR
2	<u> </u>		Silty Sand: medium to coarse sand.	some silt, trace		ļ					_
-	2		<u>Silty Sand</u> : medium to coarse sand, <u>pe</u> bbles and clay, moist, brown (SN	1).	İ	•	_				
3	1									.8' recovery	
3	3									, , ,	
	7										
4		-			İ		-				
- '	3										
F.	5						=			1.2' recovery	
<u> </u>	6		as above with some pebbles				=			HNu = background	
-	6										
_ 6		ļ									
	2				}		_				
-	7						=				1
7			as above with some clay, trace pet	obi es	•	1	-			1.4' recovery	
_	5										
- - 8							-				
			Sand and Gravel: coarse sand, pebb moist, brown (GP).	oles and cobbles,							
F	Ch a l ha		moist, brown (GP).				-				
<u> </u>	Shelby tube						_			1.0' recovery	ş
_							=				Sandra Haws
							=				nd r.
9	Ì						-			HNu = background	Sar
_	3										3¥ _
_ 11	5		a s a bov e				_			.9' recovery	LOGGED BY
Ŀ ''	5						_			.,,	550
_	5						=				_

.TUM:	N4328.	.37, E	SAMI————————————————————————————————————	PLE METHOD:SPLIT	t Sp					BORING NO. GW-8 SHEET 2 OF 2 DRILLING START FINISH TIME TIME 08:50 11:00 DATE DATE 12/07/90 12/07/90
GLE:	RIG: A	Vert	ical BEARING N/A	E CONDITIONS: silt of si		ina.	anu	gray	vec,	moist, patches
			Y		817				PTH FEET	
BIOUS/ 6 IN	ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATER	IAL	SAMPLER AND BIT	CASING TYPE	ON CASING	FROM	TO	DESCRIPTION OF OPERATION AND REMARKS
3	3 10 13 15		<u>Sand</u> : c oarse, some pebbles, moist, bro	ып (SP).						1.0' recovery
5	3 12 7 5		Silt and Clay: some very fine sand, we plasticity (CL).	et, brown, medium						.7' recovery
7	3 3 5 7		a s above							HNu = background approximate water table 16.5'
9	2 4 6 8		a s above							1.8' recovery
1	3 9 13 18		as above Silty Sand: coarse, some silt, clay as poorly sorted, wet, gray (SM).	nd gravel, very						HNu = 8ackground 1.5' recovery
23			T.D. = 22 feet				-			

PIEZOMETER CONSTRUCTION SUMMARY

	Well No. P-1
	Boring No. X-Ref:
	Survey Coords: N4485.45, E5750.48 Elevation Ground Level
4	Drilling Summary: Total Depth: 18 feet Borehole Diameter: 8.25 inches Casing Stick-up Height: 0 feet Driller: Empire Soils (Art) Construction Time Log: Start Finish Task Date Time Drilling 12/6 9:30 12/6 14:00
	Rig: ATV
	Filter Placement: 12/6 14:40 12/6 15:00
	Basic: Geologic Log X Geophysical Log Casing String(s): C = Casing S = Screen Depth String(s) Elevation 0 - 8 C 12/9/90 - 6 gallons, bailer
	8 - 18 S
	Stabilization Test Data: N/A
	Casing: C1: 2", schedule 40 PVC Casing: C2:
	Screen: S1: 2", 0.010 continuous stot PVC Q= So= 100 % R 80 E
	Filter Pack: silica sand (18-6')
	Grout Seal:cement-bentonite (3-0')
	TIME ()
	Comments:
	Motorola, Machias, New York

SUPERVISED B

	Survey Coords: N4905.05, E5168.97 Drilling Summary: Total Depth: 77.8 feet Borehole Diameter: 8.25 inches Casing Stick-up Height: ±2 feet Driller: Empire Soils (Kenny and Art) Rig: ATV Drilling Fluid:none Protective Casing:steel locking Well Design & Specifications Basic: Geologic LogX Geophysical Log Casing String(s): C = Casing S = Screen	Construct Task Drilling Casing: Filter P Cementing Development	Ground L Top of PV tion Time lacement:	Sta Date 12/11 12/12 12/12 12/14 12/14	1742.2 rt Time 8:20 9:50	Fini Date 12/12	sh Time 9:45
	Drilling Summary: Total Depth: 77.8 feet Borehole Diameter: 8.25 inches Casing Stick-up Height: ±2 feet Driller: Empire Soils (Kenny and Art) Rig: ATV Drilling Fluid: none Protective Casing: steel locking Well Design & Specifications Basic: Geologic Log X Geophysical Log Casing String(s): C = Casing S = Screen Depth String(s) Elevation + 2 - 65 C -	Construct Task Drilling Casing: Filter P Cementing Development	lacement:	Sta Date 12/11 12/12 12/12 12/14 12/14	1742.2° rt Time 8:20 9:50	Fini Date 12/12	sh Time 9:45
	Total Depth: 77.8 feet Borehole Diameter: 8.25 inches Casing Stick-up Height: ±2 feet Driller: Empire Soils (Kenny and Art) Rig: ATV Drilling Fluid: none Protective Casing: steel locking Well Design & Specifications Basic: Geologic Log X Geophysical Log Casing String(s): C = Casing S = Screen Depth String(s) Elevation +2 - 65 C -	Construct Task Drilling Casing: Filter P Cementing Developm	lacement:	Sta Date 12/11 12/12 12/12 12/14	rt Time 8:20	Fini Date 12/12	sh Time 9:45
	Total Depth: 77.8 feet Borehole Diameter: 8.25 inches Casing Stick-up Height: ±2 feet Driller: Empire Soils (Kenny and Art) Rig: ATV Drilling Fluid: none Protective Casing: steel locking Well Design & Specifications Basic: Geologic Log X Geophysical Log Casing String(s): C = Casing S = Screen Depth String(s) Elevation +2 - 65 C -	Task Drilling Casing: Filter P Cementing Development	lacement: 9: ent: elopment:	Sta Date 12/11 12/12 12/12 12/12 12/14 12/	7 ime 8:20 9:50	Date 12/12 12/12	Time 9:45 10:08
	Borehole Diameter: 8.25 inches Casing Stick-up Height: ±2 feet Driller: Empire Soils (Kenny and Art) Rig: ATV Drilling Fluid: none Protective Casing: steel locking Well Design & Specifications Basic: Geologic Log X Geophysical Log Casing String(s): C = Casing S = Screen Depth String(s) Elevation +2 - 65 C -	Casing: Filter P Cementing Developm	lacement: 9: ent: elopment:	Date 12/11 12/12 12/12 12/12 12/14	7 ime 8:20 9:50	Date 12/12 12/12	Time 9:45 10:08
	Protective Casing: steel locking Well Design & Specifications Basic: Geologic Log X Geophysical Log Casing String(s): C = Casing S = Screen Depth String(s) Elevation + 2 - 65 C -	Filter P Cementing Developme	elopment:	12/12 12/12 12/14			
	Well Design & Specifications Basic: Geologic Log X Geophysical Log Casing String(s): C = Casing S = Screen Depth String(s) Elevation + 2 - 65 C -	Well Dev	elopment:		10:10 12:30 13:40	12/12 12/12 12/14	10:50 15:30 15:15
*	Depth String(s) Elevation + 2 - 65 C -	Well Dev	•				
		12/14/9	90 - 21 s	allons,			
	1 00 - /2 5 -				bailer		
		Stabiliz	ation Tes	st Data:	12/1	4/90	
	<u> </u>	.		Spec.	Cond	Temp	·
	Casing: C1: 2", schedule 40 PVC	Time 15:20 15:23 15:27	6.35 6.50 6.55	390 455 475)	7.5 8.5 8.5	
	Casing: C2:	15:27 15:29 15:32	6.60	472		8.5 8.5	
	Screen: S1: 2", 0.010 continuous stot PVC	Recovery Q= 100 7 R 80			So=		
	Filter Pack:silica_sand (75-63')	E C 60 V 40					
	Grout Seal: cement-bentonite (59.2-01)	R 20					
	Bentonite Seal: pellets (63-59.2)	0	20 TIME	40	60	80	100
	Comments: cement runoff apron				<u> </u>		
	Motorola - Machias, New York			····			

SUPERVISED B

DATE

Survey Coords: <u>N4681.86, E4987.56</u>			
	Top of P	/C	
Dritting Summary:	Construction Time		Einich
Total Depth: 52.0 feet Borehole Diameter: 8.25 inches	- task	Start Date Time	Finish Date Time
Casing Stick-up Height: <u>±2 feet</u>	Drilling	12/10 8:40	
Driller: Empire Soils (Art)	-	·	
Rig: ATV		12:12	17/10 15-/
Dri ll ing Fluid:none	_ Casing:	12/10 15:35	12/10 15:4
Protective Casing: steel locking	Filter Placement	12/10 15:55	12/10 17:0
	Filter Placement Cementing:	12/11 9:00	12/11 11:3
Well Design & Specifications	Development:	12/13 9:10	12/13 9:5
Basic: Geologic Log X Geophysical Log	_		
Casing String(s): C = Casing S = Screen	Well Development		
Depth String(s) Elevation	_ 1		
+ 2 - 41 C	<u>12/13/90 - 5 g</u>	allons, baile r	
72 41	-		
41 - 51 s	_		
Casing: C1: 2", schedule 40 PVC	Time pH 10:30 6.65 10:33 6.90 10:35 6.70 10:38 6.80	Spec. Cond. 199 200 200 199	Temp (C) 6.5 8.0 7.5 7.5
Casing: C2:	_	<u>.t</u>	<u> </u>
Screen: S1: 2", 0.010 continuous stot PVC	Recovery Data:	So=	
361 ccm. 311 <u>12 315 3 35 1 1</u>	100		
	- % R 80	<u> </u>	
Filter Pack: silica sand (51-391)	C 60		
	_ v 40		
Grout Seal: cement-bentonite (36.0')	_ E 20	 	
		1 1 1	
Ben to nite Seal: pellets (39-361)	_ 0	40 60	80 1
		,	
	TIME	()	
			
Comments: cement runoff apron			

						GW-6	
			Boring	No. X-R€	ef:		
	Survey Coords: <u>N4979.34, E5282.47</u> E			_			
			Top of P	/c	1739.88	3	
	Total Depth: 54.5 feet Borehole Diameter: 8.25 inches	Construc Task Drilling		St.	Time	Fini Date 12/10	Time
	Dril li ng fluid: <u>none</u>	Casing:		12/10	11:45	12/10	11:55
		Filter P Cementin Developm	lacement g: ent:	12/10 12/10 12/13	12:35 13:40 10:20	12/10 12/10 12/13	12:55 14:15 10:45
	Depth String(s) Elevation	Well Dev	•		bailer		
	+ 2 - 44.5 C						
		Time 14:00	pH 6.50	Spec.	Cond. 78	Temp 7.0	
	Casing: C1: 2", schedule 40 PVC Casing: C2:	14:10 14:16 14:20	7.25 7.40 7.45	3	00 00 10	6.5 7.0 6.5	
	Screen: S1: 2", 0.010 continuous stot PVC	Recovery 100 % R 80			So=		
	Filter Pack:silica_sand_(54.5-44.5')	E 60 V 40					
	Grout Seal: cement-bentonite (39-0') Bentonite Seal: pellets (44.5-39')	R 20	20	40	60	80	100
			TIME)		,00
	Comments: cement runoff apron						
** *	Motorola - Machias, New York						{

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Survey Coords: <u>N4825.45, E5420.21</u>	Elevation Ground L	evel	
	Top of PV	c <u>1729.1</u>	6
Drilling Summary:	Construction Time	Log:	
Total Depth: 46.5 feet Borehole Diameter: 8.25 inches	Task	Start Date Time	Finish Date Time
Cas ing Stick-up Height: 0 feet	Drilling		12/4 17:00
Driller:Empire Soils (Kenny)			
Rig: ATV	Casing:	12/6 11:20	12/6 11:30
Dri ll ing Fluid: <u>water</u>	·		
Protective Casing: steel locking			12.45
	Filter Placement: Cementing:	12/7 8:15	12/7 10:00
Well Design & Specifications	Development:	12/12 16:00	12/12 17:00
Basic: Geologic Log X Geophysical Log	.		
Casing String(s): C = Casing S = Screen	Well Development:		
Depth String(s) Elevation	12/12/90 - 7 ga	llons, bailer	
	.		
36 .5 - 46.5 s			
	Stabilization Tes	t Data: 12/1	3/90
	Time pH	Spec. Cond.	Temp (C)
	16:35 7.6	259	6.5
Casing: C1: 2", schedule 40 PVC	16:37 7.9 16:39 8.1	271 270	6.5
Cas in g: C2:	16:41 8.0	275	7.0
	Recovery Data:	<u> </u>	
Screen: S1: 21, 0.010 continuous stot PVC	Q=	So=	
	x ¹⁰⁰		
	R 80	+ + + + + + + + + + + + + + + + + + + +	
Filter Pack: silica sand and natural	C 60	- [-	+
(46.5-34.51)	V 40		
Grout Seal:cement-bentonite (30.5-0')	R 20		
	- Y O - -	+ + -	
Bentonite Seal: pellets (34.5-30.54)	20	40 60	80 100
	TIME	()	
	<u> </u>		····
Comments:			
 Motorola - Machias, New York			
 _		· · · · · · · · · · · · · · · · · · ·	-

		Boring	No. X-Ref	f:		
Survey Coords: <u>N4328.37, E5614.88</u>						
		Top of PV	/C1	699.57		
Drilling Summary:	Construc	tion Time		1	Fini	
Total Depth: 22 feet Borehole Diameter: 8.25 inches Casing Stick-up Height: ±2 feet Driller: Empire Soils (Art)	Task Drilling			Time	Date	Time
Rig: ATV Drilling Fluid: none	Casing:		12/7	11:10	12/7	11:13
Protective Casing: steel locking	Filter P	lacement:	12/7	11:22	12/7	12:05
Well Design & Specifications	Cementin Developm	9:	12/7	13:10; 14:10	12/7 12/11 12/12	_15:00
Basic: Geologic Log X Geophysicat L Casing String(s): C = Casing S = Scre	09					
Depth String(s) Elevation	Well Dev	elopment:	:			
+ 2 - 12 C -	12/12/9	0 - 7 gal	llons, ba	iler		
12 - 22 s	went_dr	y after 5	gallons			
	Stabiliz	ation Tes	st Data:	12/14	4/90	
					·	
	16:00	6.35	Spec.	Cond.	Temp 7.	
Casing: C1: 2", schedule 40 PVC	16:05 16:08	6.50 6.55	45		8. 8.	
Casing: C2:		6.60	47	2	8.	.5
	Recovery		<u> </u>			
Screen: S1: 2", 0.010 continuous stot	100	·		So=		
	% R 80	1				
	E C 60					
Filter Pack:silica_sand (22-10')						
Grout Seal: cement-bentonite (6.8-0)) E R 20					
Bentonite Seal: pellets (10-6.8')		20	40	60	80	100
		TIME	()		ŧ
Comments: cement runoff apron						
 Motorola, Machias, New York			·- ·			

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Appendix C
Recovery-Curve Plots

$$L/c_{w} = 78$$
 $A = 4$
 $B = .65$

Assume Ksand pack = Kaquiter

$$\ln \frac{Re}{r_{W}} = \left[\frac{1.1}{\ln(648/.083)} + \frac{4 + .65 \ln[(50 - 6.48)/.083]}{78} \right]^{-1}$$

$$= \left[.2524 + .1013 \right]^{-1} = 2.827$$

$$K = \frac{(.083)^{2}(2.827)(.229)}{2(6.48)} = 3.44 \times 10^{-4} \text{ ft/min or } 5.74 \times 10^{-6} \text{ ft/sec}$$

Well GW-2

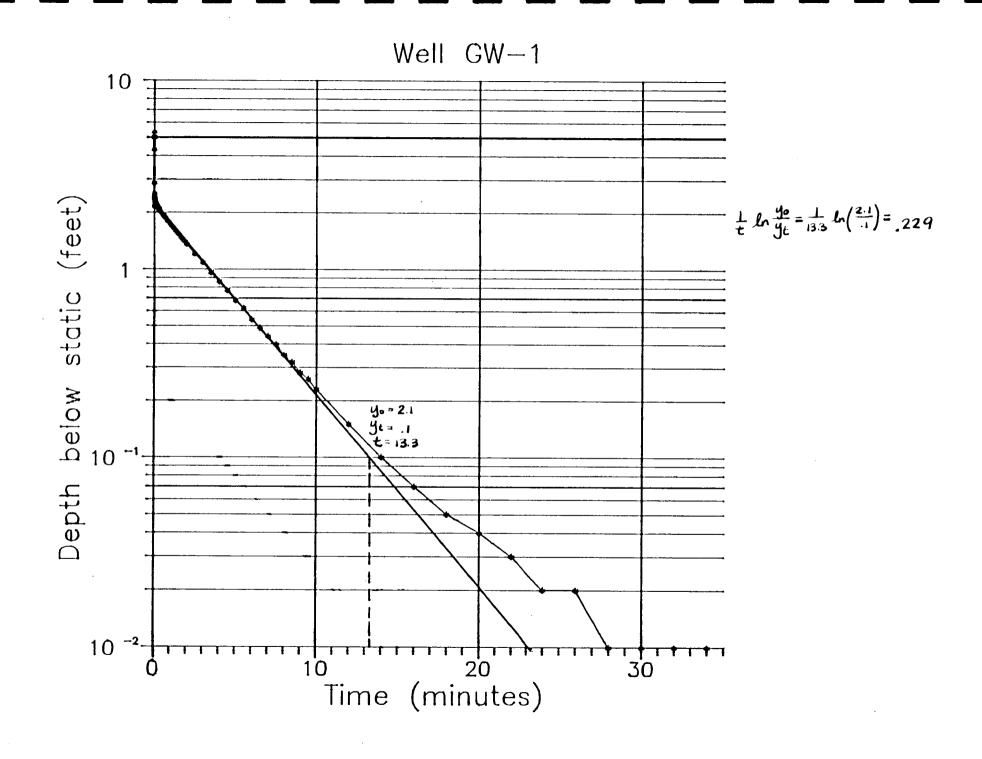
$$4r_{\omega} = 120.5$$
 $A = 4.8$

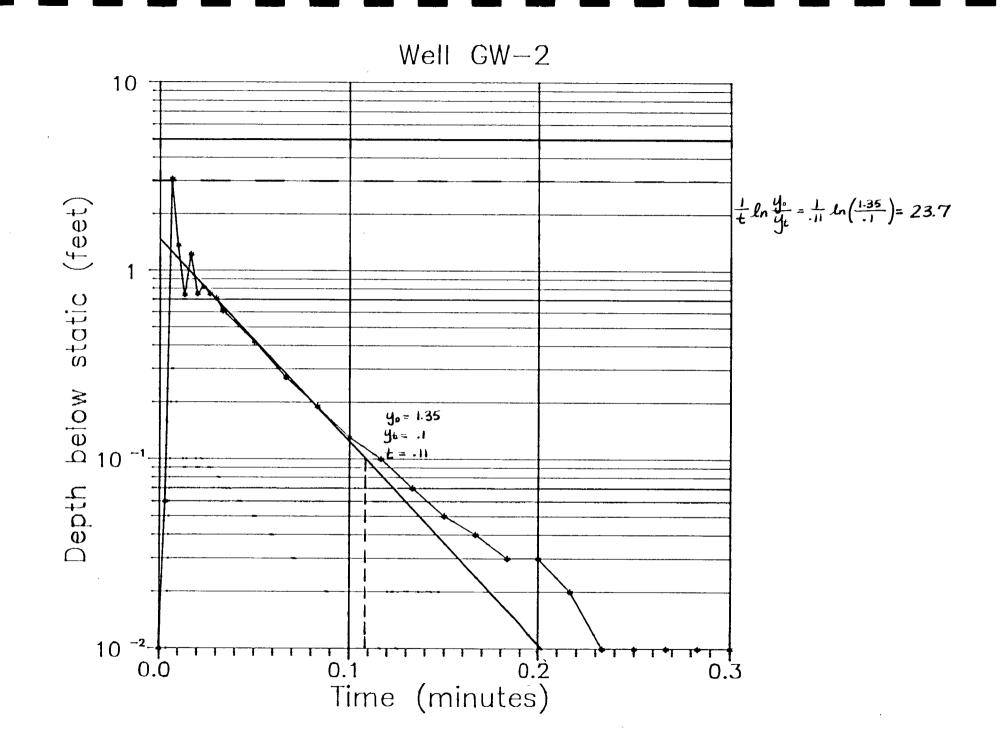
assume Ksandpack & Kaquiter

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln(1/.083)} + \frac{4.8 + .8 \ln[(50-11)/.083]}{\log/.083} \right]^{-1}$$

$$= \left[.225 + .080 \right]^{-1} = 3.28$$

$$K = \frac{(.083)^2 (3.28)(23.7)}{2(10)} = 2.68 \times 10^{-2} \text{ ft/sec}$$





$$A = 4.8$$

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln (11.55/.083)} + \frac{4.8 + .8 \ln [(50 - 11.55)/.083]}{120.5} \right]^{-1}$$

$$K = \frac{(.083)^2(3.305)(1.08)}{2(10)} = 1.23 \times 10^{-3}$$
 ft/min or 2.05×10^{-5} ft/sec

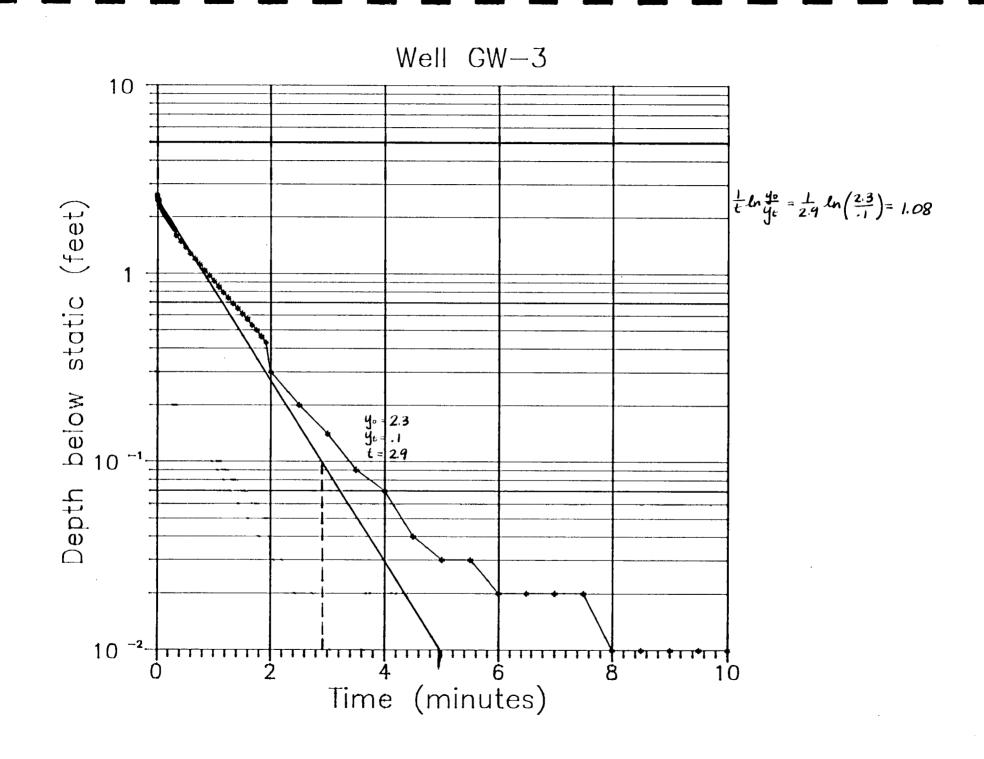
Well GW-4

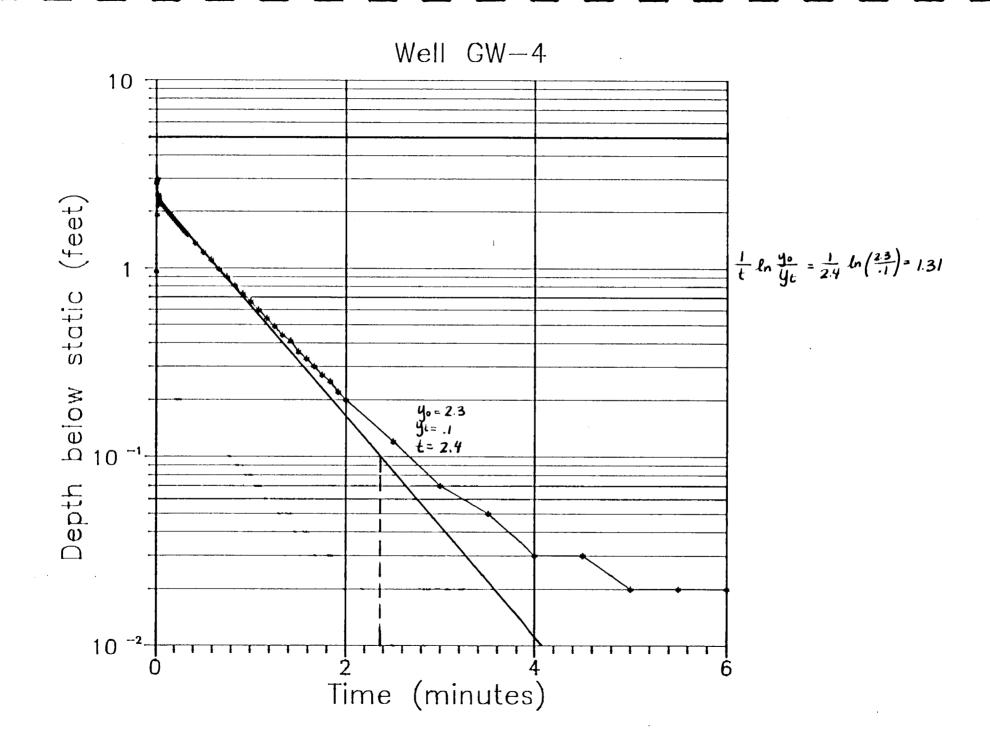
$$A = 4.8$$

$$\ln \frac{R_0}{\Gamma_W} = \left[\frac{1.1}{\ln(12.36/.083)} + \frac{4.8 + .8 \ln[(50 - 12.36)/.083]}{120.5} \right]^{-1}$$

$$= \left[.2199 + .0797 \right]^{-1} = 3.338$$

$$K = \frac{(.083)^2(3.338)(1.31)}{2(10)} = 1.51 \times 10^{-3} \text{ft/min} \text{ or } 2.51 \times 10^{-5} \text{ft/sec}$$





$$A = 3.4$$

$$\ln \frac{Re}{r_{w}} = \left[\frac{1.1}{\ln (5.04/.083)} + \frac{3.4 + .5 \ln [(50-5.04)/.083]}{60.7} \right]^{-1}$$

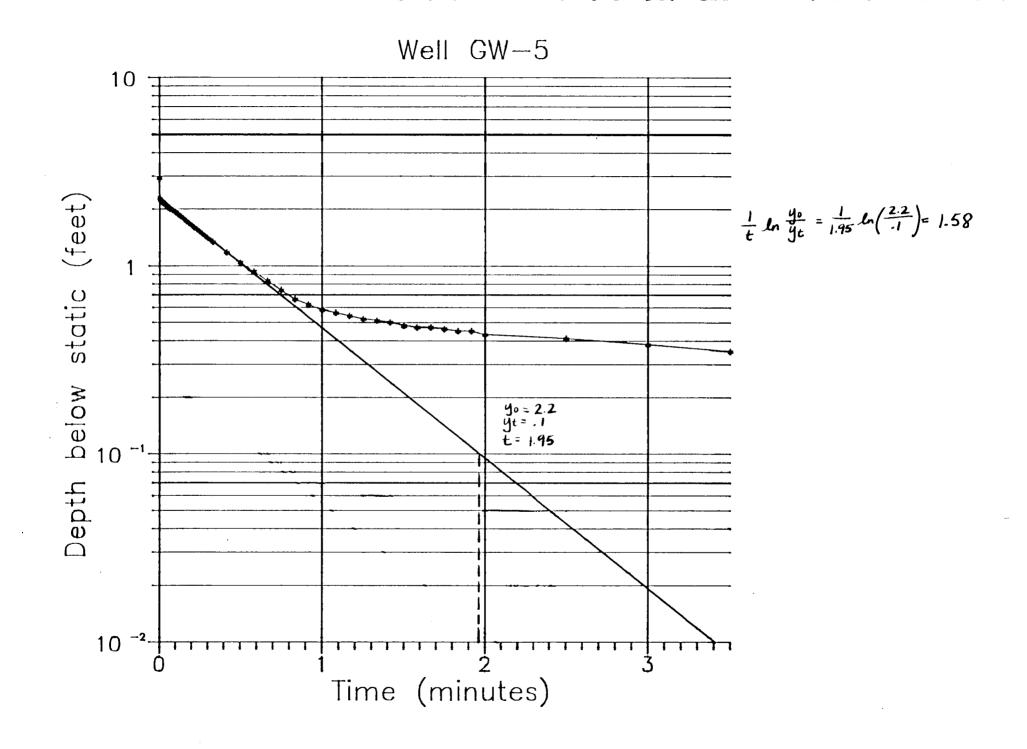
$$K = \frac{(.083)^2(2.679)(1.58)}{2(5.04)} = 2.89 \times 10^{-3} ft / \text{min} = 4.82 \times 10^{-5} ft / \text{sec}$$

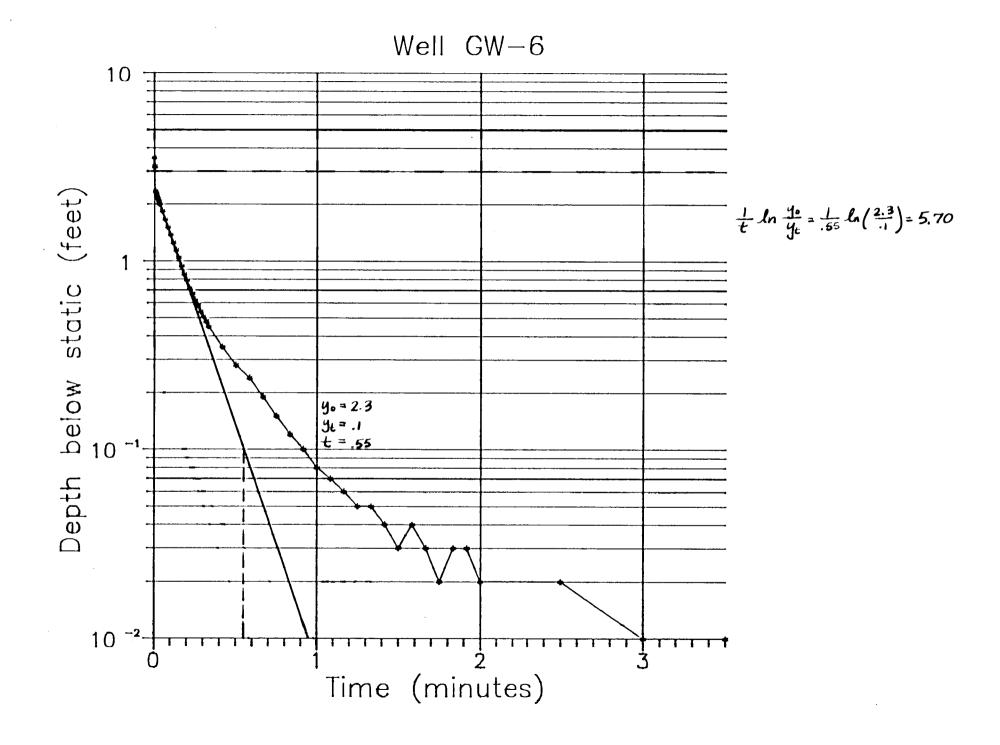
Well GW-6

$$\ln \frac{Re}{r_{w}} = \left[\frac{1.1}{ln (7.16/.083)} + \frac{4.05 + .7 ln [(50-7.16)/.083]}{86.2} \right]^{-1}$$

$$= \left[.2468 + .0957 \right]^{-1} = 2.920$$

$$K = \frac{(.083)^2(2.92)(5.70)}{2(7.16)} = 8.01 \times 10^{-3} ft/\min \text{ or } 1.33 \times 10^{-4} ft/\sec$$





$$H = 7.34$$

$$A = 4.1$$

$$ln\left(\frac{R_{e}}{r_{\omega}}\right) = \left[\frac{1.1}{ln\left(7.34/.083\right)} + \frac{4.1 + .7 ln\left[\left(50-7.34\right)/.083\right]}{88.4}\right]^{-1}$$

$$K = \frac{(.083)^2(2.947)(4.42)}{2(7.34)} = 6.11 \times 10^{-3} \text{ ft/min or } 1.02 \times 10^{-4} \text{ ft/sec}$$

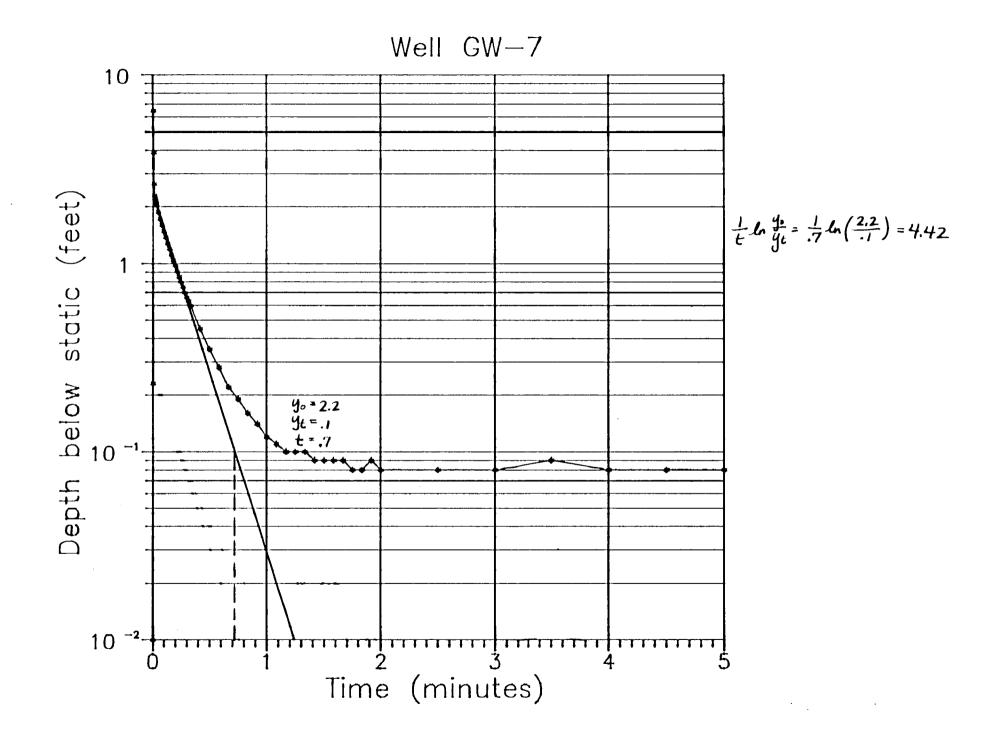
Well GW-8

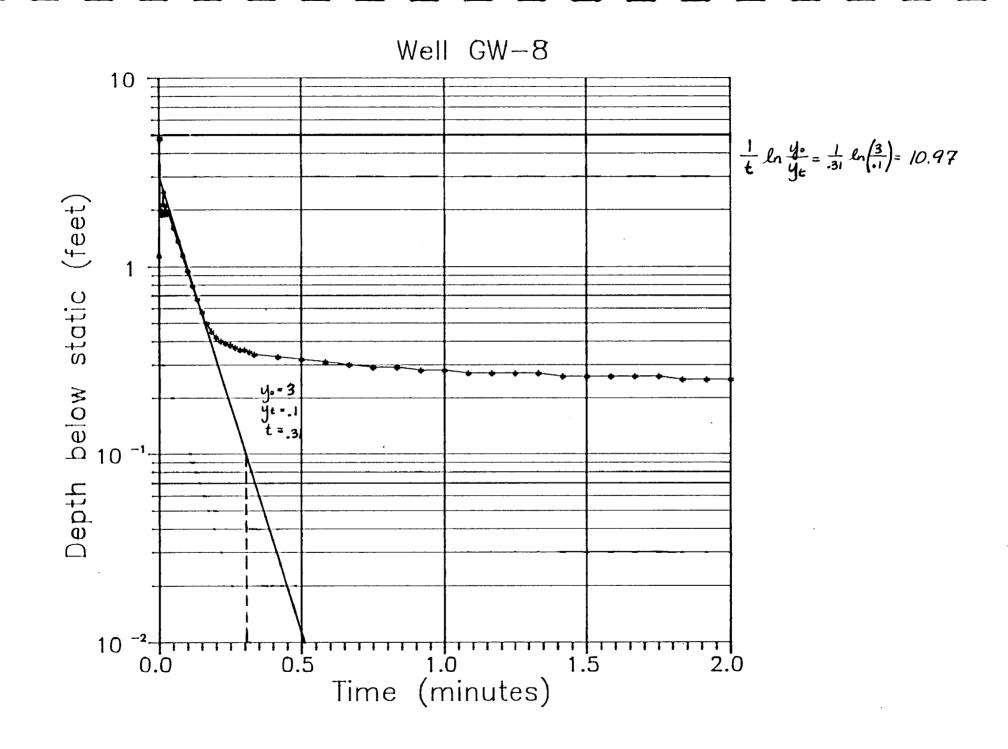
Assume Ksandpack = Kaquifer

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln (7.02/.083)} + \frac{4.05 + .67 \ln [(50 - 7.02)/.083]}{84.6} \right]^{-1}$$

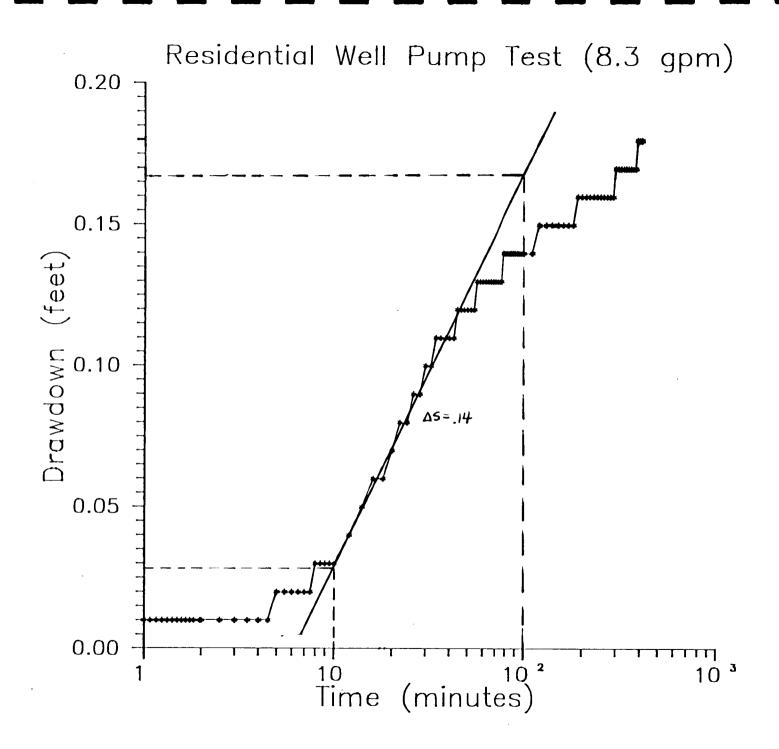
$$= \left[.2479 + .0954 \right]^{-1} = 2.913$$

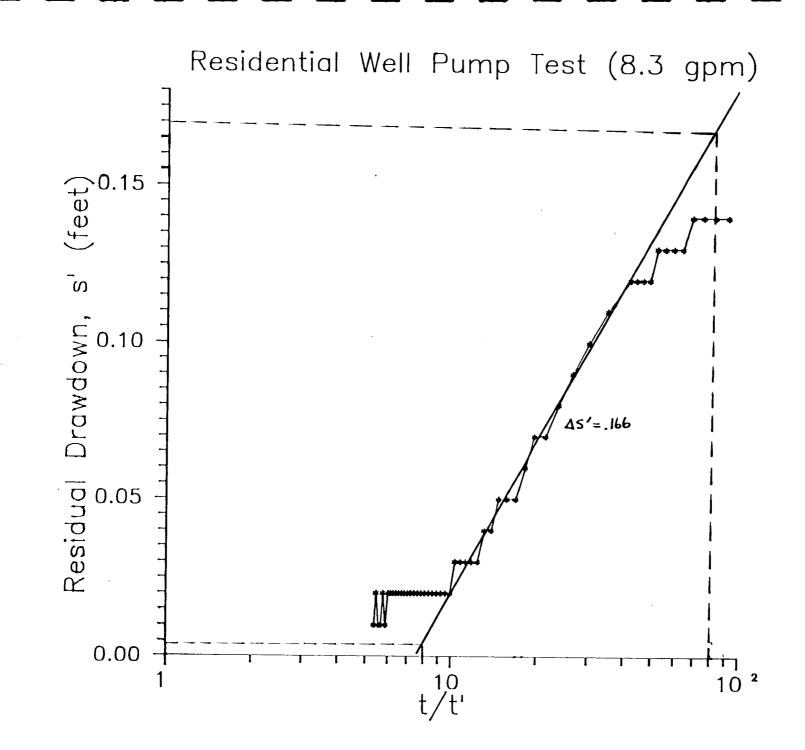
$$K = \frac{(.083)^{2}(2.913)(10.97)}{2(7.02)} = 1.57 \times 10^{-2} \frac{64}{\text{min}} \approx 2.61 \times 10^{-4} \frac{64}{\text{sec}}$$





O-SEARCH, INC.	CLIENT Motorold PROJECT DETAIL	DATE CHECKED CHECKED BY	7-/603-2PREPARED BY 4. Haw DATE
Dawds	14.70		
T= 264	1(02)		
1 = 267	$\frac{(8.3)}{45} = 15,000$	apd/ii	
/	45 (J 1/ft - 1 1-21	
	0/(00)/(00)/		
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	.3)(15,000)(.004) (40.5)2		
		Commission of the commission o	
Necover	7		
214	8 2)		
<u> </u>	$\frac{8.3)}{1} = 14,608 \text{ gpd}$	// /	
(.75)	· • · · · · · · · · · · · · · · · · · ·	
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Appendix D
Third Party Data Validation



ENVIRONMENTAL MANAGEMENT GROUP

PARK WEST TWO CLIFF MINE ROAD PITTSBURGH, PA 1527**5**-10**71** [412] 788-1080

RE	CE	= '	VE0
FEB	1	5	1991
Ans'd.	•••		••••

C-49-2-1-151

February 14, 1991

Mr. Richard Gnat Hydro-Search, Inc. 350 Indiana Street Suite 300 Golden, Colorado 80401

Subject: Subcontracted Data Validation Services

Dear Mr. Gnat:

Please find enclosed the completed Data Validation Checklists, associated Attachments #1, #2, and #3, and appended Qualified Sample Results, as required by USEPA Region II and pertaining to the validation of the following Motorola site data packages:

Versar Control_#	Fraction(s)	Total Packages
4067	Metals	1
4067	BNA	1
4067/410 1	VOA	2
4101/407 8	Metals	1
4101/411 7 /4123/4129	BNA	1
4117/412 3 /4 12 9	Metals/VOA/Phenols	3
4078	VOA/BNA/Phenols	3

Summary of Qualifications

As indicated in the checklist for the organic fraction analyses of Control #4067/4101 samples, the Relative Percent Difference (RPD) between semivolatile fraction matrix spike and matrix spike duplicate results for acenaphthene (21), exceeded the quality control limit of 19. No qualification of the data was necessary as both the matrix spike and matrix spike duplicate Percent Recoveries (%Rs) for this compound were within acceptable limits and no positive result was reported for this compound in the unspiked sample (MGTP03-01).

In Control #4117, both the Matrix Spike (MS) and Matrix Spike Duplicate (MSD) %Rs for trichloroethene (138% and 158%, respectively), exceeded the 120% upper quality control limit. The positive result for trichloroethene in the unspiked sample (MGGW05-01) was qualified as estimated, "J". Also, the continuing calibration Percent Differences (%Ds) for several volatile compounds exceeded 30% but were less than 50%. No qualifications

C-49-2-1-151 Mr. Richard Gnat February 14, 1991 Page Two

to the data were necessary since no positive results were reported for the non-compliant compounds in affected samples.

Review of organic fraction Control #4078 data revealed one base-neutral surrogate (2-fluorobiphenyl) for sample MGSS01-01 (126%), exceeded the 115% upper quality control limit. No qualification to the data is necessary when only one surrogate for the base-neutral fraction is out of compliance.

For metals analyses, the matrix spike %R for lead (215.9%) exceeded the 125% upper quality control limit affecting samples analyzed under Control #4067. All positive results reported for lead in this sample set are rejected, qualified "R", accordingly. In addition, the laboratory duplicate RPD for lead (23.1) exceeded the quality control limit of 20. No further actions were necessary since all lead results were previously rejected because of excessive MS recovery.

One of the CRDL Standard analysis recoveries for chromium (73.4%), was below the 80% lower quality control limit; samples analyzed under Control #4117, 4123, 4129 are affected. Positive results and nondetects for chromium in all samples contained in this set are qualified as estimated, "J" and "UJ", respectively. In addition, the MS %R for iron exceeded the upper quality control limit. No qualifications of the data were necessary, however, because the concentration of iron in the unspiked sample was greater than four times the amount of iron spiked. The laboratory duplicate RPD for iron (132.5%), exceeded the quality control limit of 20. All results reported for iron in this sample set are positive and are qualified as estimated, "J", accordingly.

No qualifications were made to the metals fraction data for Control #4078 as no non-compliances were noted.

Please do not hesitate to contact me at 412-747-7559 if you have any questions regarding these reviews.

Very truly yours,

Debra A. Scheib

Data Validation Coordinator

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	10.07,701 YUR 10 CASE NUMBER: 4067/418	n (V 194)		
,	IAB: <u>Versar Laboration</u> SITE: <u>Motorola</u>	es / Mary	land Sp	ectual Services T.
. Data Completeness and Deliverables		YES	NO	N/A
1.1 Have any missing deliverables been to the data package.	received and added		X	
ACTION: Call lab for explanation / n missing deliverables. If la note the effect on review of the "Contract Problems/Non-conformative."	ab cannot provide them, f the package under			
1.2 Was SMO CCS checklist included with	package?		X	
. Cover Letter/Case Narrative	,			
2.1 Is the Narrative or Cover Letter pre	esent?	ι <u>X</u>		
2.2 Are Case Number and/or SAS number of Narrative or Cover Letter?	ontained in the	区		
. Data Validation Checklist				
The following checklist is divided into is filled out if the data package contain Part B for any BNA analyses and Part C is	ins any VOA analyses,			
Does this package contain:				
VOA data?		$\overline{\times}$		
BVA data?		×		
Pesticide/PCB data?				
ACTION: Complete corresponding parts of	f chacklist			

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	YES	NO	N/A	
PART A: VOA ANALYSES			,	
Traffic Reports and Laboratory Narrative				
.1 Are the Traffic Report Forms present for all samples?	$\stackrel{\sim}{\sim}$			
ACTION: If no, contact lab for replacement of missing or illegible copies.				
1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data?		ιΧι	-	
ACTION: Use professional judgement to evaluate the effect on the quality of the data.				
ACTION: If any sample analyzed as a soil contains more than 50% water, all data should be flagged as estimated (J).				
ACTION: If both VOA vials for a sample have air bubbles, flag all positive results "J" and all non-detects	rRii.			
Holding Times				
2.1 Have any VOA holding times, determined from date of collection to date of analysis, been exceeded?		(X)		
If unpreserved, aqueous aromatic volatiles must be analyzed within 7 days of collection and non-aromatic volatiles must be analyzed within 14 days. If preserved with hydrochlorisacid and stored at 4°C, then both aromatic and non-aromatic volatiles must be analyzed within 14 days. If uncertain about preservation, contact the sampler to determine whether the samples were preserved.	ic .c			
A ten-day holding time for soil samples is recommended.				
Table of Holding Time Violations				
(See Traffic Report) Sample Date Date Lab Sample Matrix Preserved? Sampled Received	Date Analyzed	, · L		
		_	1/4	
		_ /		
I		_		
ACTION: If holding times are exceeded, flag all positive	modilte:	 :<		
ACTION: If holding times are exceeded, flag all positive estimated ("J") and sample quantitation limits a ("U"), and document in the narrative that hold	s estimate	ed ed		

vere exceeded.

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YES 8 N/A If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. The reviewer may determine that non-detect data are unusable ("R"). Surrogate Recovery (Form II) .1 Are the VOA Surrogate Recovery Summaries (Form II) present for each of the following matrices: rΧı a. Low Water b. Med Water c. Iow Soil d. Med Soil 3.2 Are all the VOA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices: a. Low Water b. Med Water c. Low Soil d. Med Soil ACTION: Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative. 3.3 Were outliers marked correctly with an asterisk? ACTION: Circle all outliers in red. 3.4 Was one or more VOA surrogate recovery outside of contract specifications for any sample or method blank? If yes, were samples reanalyzed?

ACTION: If surrogate recoveries are > 10% but all do not meet SOW specifications:

Were method blanks reanalyzed?

- 1. Flag all positive results as estimated ("J").
- 2. Flag all non-detects as estimated detection limits ("W").

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	If any surrogate has a recovery of <10%:	YES	NO	N/A	
•	 Flag all positive results as estimated ("J"). Flag all non-detects as unusable ("R"). 				
! !	Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas.				
	e any transcription/calculation errors between raw Form II?		ىك		
ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".				
0 <u>Matrix Spike</u>	s (Form III)				
4.1 Is the M present?	atrix Spike Duplicate/Recovery Form (Form III)	(x)			
	rix spikes analyzed at the required frequency of the following matrices:				
a. Low	Water	[]		<u>×</u>	
b. Med	Water				
c. Low	soil .	(X)			
d. Med	Soi l			×	
ACTION:	If any matrix spike data are missing, take the action specified in 3.2 above.				
4.3 How many	VOA spike recoveries are outside QC limits?				
	<u>Water</u> <u>Soils</u>				
-	out of 10 out of 10				
4.4 How many duplicat	RPD's for matrix spike and matrix spike se recoveries are outside QC limits?				
	<u>Water</u> <u>Soils</u>				
-	out of 5 Out of 5				
ACTION:	If MS and MSD both have less than 10% recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for the MS/MSD analysis. Use professional judgement in applying this criterion to other samples in the package.				

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		A		
		YES	NO	N/A
Blanks (Form	<u>IV</u>			
5.1 Is the N	Sethod Blank Summary (Form IV) present?	$i \times i$		
TCL comparation analyzed of simil	cy of Analysis: for the analysis of VOA counds, has a reagent/method blank been for each set of samples or every 20 samples ar matrix (low water, med water, low soil, soil), whichever is more frequent?	<u>.</u>		
	A instrument blank been analyzed at least ery twelve hours for each GC/MS system used?	以		
ACTION:	If any method blank data are missing, call lab for explanation / resubmittal. If not available, reject all associated positive data ("R").			
	graphy: review the blank raw data - chromatograms quant reports or data system printouts and spectra.			
	hromatographic performance (baseline stability) in instrument acceptable for VOAs?	ιX		
ACTION:	Use professional judgement to determine the effect on the data.			
<u>Contamination</u>	<u>no</u>			
valid to qu	er blanks" and "distilled water blanks" are lated like any other sample and are not used malify data. Do not confuse them with the CC blanks discussed below.			
results describe	method/instrument/reagent blanks have positive (TCL and/or TIC) for VOAs? When applied as ed below, the contaminant concentration in anks are multiplied by the sample Dilution	_	رنگ	
	Field/trip/rinse blanks have positive VOA results L/or TIC)?			
ACTION:	Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)			
ē } V }	only field/rinse blanks taken the same day as the samples are used to qualify data. Trip blanks are used to qualify only those samples with which they were shipped. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate,			

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					•				
	T	ollow the directions : TL results due to con alue from all the ass	tamination. Use the 1		S 140	N/A			
		Sample conc > CRQL but < 10x blank	Sample conc < CRQL & is < 10x blank value			ue			
hyle	Aceton	e Flag sample result e with a 'U'; cross e out 'B' flag e	Reject sample result and report CRQL; cross out 'B' flag	No qualifica is needed	ation				
T		Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc value & > 5	> CRQL blank valu	e			
	Other Contaminant	s with a 'U'; cross	Reject sample result and report CRQL; cross out 'B' flag	No qualification is needed	ation				
	ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).								
6.3	Are there sample?	field/rinse/equipment	blanks associated wit	n every	ی د				
I I	t E	or low level samples, here is no associated xoeption: samples tal o not have associated	field/rinse/equipment ken from a drinking wa	: blank.	Litt Gen	mad ngi set			
0 <u>ecv</u>	MS Tuning a	nd Mass Calibration ()	Form V)						
7.1		/MS Tuning and Mass Car Bromofluorobenzene		₂ v)	<u></u>				
7.2	Are the en (m/z) list hour shift	hanced bar graph specting for the BFB provid?	trum and mass/charge ded for each twelve	(<u> </u>	د				
7.3	Has a tuni twelve hou	ng performance compour rs of sample analysis	nd been analyzed for e per instrument?	very	د				
		f any tuning data are pecified in 3.2 above.							
	a	ist date, time, instrumalyses for which no a		pg ,					

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					YES	NO	N/A
DA	TE	TIME	DSTRUMENT	SAMPLE NUMBER	8		
•							
						 N	14
<u></u>		, 				•	F
		i		.i	 .		
ACTION:		ted outsi	provide missing data de an acceptable tw				
7.4 Have the instrume			riteria been met fo	or each	(X)		
ACTION:			which do not meet io th a separate sheet)				
ACTION:	associ Howeve (See 1	ated samp r, if exp 988 Funct er may ac	pration is in error, ole data as unusable canded ion criteria cional Guidelines), exept data with appr	("R"). are met the data	•		
mass lis	sts and	Form Vs?	cion / calculation e (Check at least tw eck more.)	errors between to values but		رێ	
been rep	orted?	riate num (Check a more val	mber of significant at least two values, lues.)	figures (two) but if errors	ιX	_	
ACTION:	resubn	ittal, ma	s exist, call lab fo ake necessary correct Conclusions".	or explanation / tions and note			
7.7 Are the acceptab	spectra ole?	of the r	mass calibration com	pound			
ACTION:	whethe	r associa	al judgement to dete ated data should be ified, or rejected.	ermine			
O <u>Target Compo</u>	and Lis	t (TCL) 1	Analytes				
present	with re	quired he	s Data Sheets (Form eader information on ollowing:	IVOA) neach			
a. Sampl	les and/	or fract:	ions as appropriate		<u>(X</u>)		
b. Matri	ix spike	s and mat	trix spike duplicate	×s	(X)		
c. Blank	-		- <u>-</u>		[\ 1		
	···				1.0		

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•	mass spect	ra for the	identified o s (Quant Repo	romatograms, t compounds, and orts) included	the	YES	NO	N/A
	the sample	e package f	or each of th	re following?				
	a. Samples	s and/or fr	actions as ap	ppropriate		لك		
	b. Matrix (Mass s	spikes and spectra not	matrix spik required)	e duplicates		<u> </u>		
	c. Blanks	<u>:</u>				丛		
- 			are missing in 3.2 above.	, take action				
8.3	Are the re	espo n se fac	ctors shown i	n the Quant Re	eport?	LX1		
.4	Is chromat	tographic 1	performance a	coeptable with	n			
_	respect to	o :	Baseline sta	bility		(X)		
			Resolution			(<u> </u>		
•			Peak shape			(X)		
			Full-scale	maph (attenua	tion)	(\times)		
			Other:					X
	ACTION:	Use profes acceptabil	sional judger ity of the da	ment to determinata.	une the			
8.5 8	Are the lidentifie	lab-generat ed VOA comp	ed standard i ounds present	mass spectra o t for each sam	of the ple?	۲		
	ACTION:	specified generate t	in 3.2 above. heir own sta	e missing, tak . If lab does ndard spectra, lems/Non-compl	not. . make			
8.6	Is the Ri units of	RT of each the standa	reported com and RRT in th	pound within (e continuing o	0.06 RRT calibration?			
8.7	relative	ions preser intensi t y ass s pectr	greater than	ndard mass spe 10% also pres	ectrum at a sent in the	(<u> </u>		
8.8	8 Do sample within 20	e and stan 0%?	lard relative	ion intensit	ies agree	<u>[X]</u>		
	ACTION:	acceptabi	lity of data.	ment to deter If it is de ications were	termined			

all such data should be rejected, flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (at

the calculated detection limit).

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			YES	NO	N/A	_
ent	atively I	dentified Compounds (TIC)				
1.1	Are all T	Ventatively Identified Compound Forms (Form I, bresent; and do listed TICs include scan number ion time, estimated concentration and "J"	ι <u>X</u> ı			
9.2	~~~~~	mass spectra for the tentatively identified and associated "best match" spectra included ample package for each of the following:			,	
	a. Sample	es and/or fractions as appropriate			X	
3	b. Blank	S			X	
I	ACTION:	If any TIC data are missing, take action specified in 3.2 above.				
: 	ACTION:	Add "J" qualifier if missing and "N" qualifier to all <u>identified</u> TIC compounds on Form I, Part B.				
9.3	TITC COM	TCL compounds (from any fraction) listed as curds (example: 1,2-dimethylbenzene is xylene		<u>[X</u>]		
1	ACTION:	Flag with "R" any TCL compound listed as a TIC.				
9.4	relative	ions present in the reference mass spectrum with a intensity greater than 10% also present in the mass spectrum?	[]		X	
9.5	5 Do TIC a agree w:	and "best match" standard relative ion intensities ithin 20%?	[]		X	
	ACTION:	Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.				
o <u>c</u>	ompound 0	uantitation and Reported Detection Limits				
	0.1 Are to Form Verification,	here any transcription / calculation errors in I results? Check at least two positive values. Y that the correct internal standard, quantitation and RRF were used to calculate Form I result. any errors found?		(<u>X</u>)		
1	10.2 Are t	the CRQLs adjusted to reflect sample dilutions for soils, sample moisture?	$(\underline{\times})$			

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Revision 7 YES N/A ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions". ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a OC exceedance dictates the use of the higher CROL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package. Standards Data (GC/MS) 11.1 Are the Reconstructed Ion Chromatograms, and data system printcuts (Quant. Reports) present for initial $r \times 1$ and continuing calibration? ACTION: If any calibration standard data are missing, take action specified in 3.2 above. GC/MS Initial Calibration (Form VI) 12.1 Are the Initial Calibration Forms (Form VI) present and complete for the volatile fraction? ACTION: If any calibration standard forms are missing, take action specified in 3.2 above. 12.2 Are response factors stable for volatiles over the concentration range of the calibration (RSD <30%)? ACTION: Circle all outliers in red. ACTION: When RSD >30%, non-detects may be qualified using professional judgement. Flag all positive results "J". When RSD >90%, flag all non-detects as unusable ("R"). (Region II policy.) 12.3 Do any compounds have an average RRF < 0.05? ACTION: Circle all outliers in red. ACTION: If any volatile compound has an average

RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag nondetects for that compound as unusable ("R").

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N/A YES NO 12.4 Are there any transcription / calculation errors in the reporting of average response factors (RRF) or RSD? (Check at least two values but if errors are found, check more.) ACTION: Circle errors in red. ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions". GC/MS Continuing Calibration (Form VII) 13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the volatile fraction? 13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument? ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis. ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation / resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R"). 13.3 Do any continuing calibration standard compounds have [X]a RRF < 0.05? ACTION: Circle all outliers in red. ACTION: If any volatile compound has a RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R"). 13.4 Do any compounds have a % difference between initial and [X]continuing calibration RRF > 25%? ACTION: Circle all outliers in red and qualify associated sample data as outlined in the table below:

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				YES	NO	N/A
	* DIFFERENCE					•,,
25 -5 0	50-90	>90				
'J' positive results, no action for non detects	'J' positive results, 'W' non detects	'J' positive results, "R" non detects				
13.5 Are there a ny trans reporting o f average (%D) between i ni tian least two v alues by	ge response fac al and continui	tors (RRF) or diff ng RRFs? (Check a	erence t		ιX	
ACTION: Circle en	rors in red.					
resubmitt:	are large, cal al, make any ne rs under "Concl	l lab for explanat coessary correction usions".	ion / as and			
Internal Standards (For	m VIII)					
14.1 Are the internal s sample and blank w for each continuin	ithin the upper	(Form VIII) of ever rand lower limits	ΣY	ıΣı		
ACTION: List all	the outliers b	elow.				
Sample # Inter	nal Std Are	ea Lower Limit	Uppe	r Limit	· .	
<u> </u>						NA
<u> </u>						
					_	
(Att	ach additional	sheets if necessar	ry.)			
lower lin detects If extrementables exhibits	nit, flag with (U values) quan melv low area o	d area count is our "J" all positive nutitated with this counts are reported drop off, flag all").	esults ar internal , or if 1	nd non- standar performa	rd. ince	
	associated cal	ibration standard:		(X)		
ACTION: P rofession d ata if	onal judgement the retention t	should be used to imes differ by mor	qualify e than			

30 seconds.

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YES NO N/A

o Field Amplicates

15.1 Were any field duplicates submitted for VOA analysis?

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer narrative. However, if large differences exist,

identification of field duplicates should be

confirmed by contacting the sampler.

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		31.73	
PART B: BNA ANALYSES	YES	NO N/A	
raffic Reports and Laboratory Narrative	\		
1.1 Are the Traffic Report Forms present for all samples?			
ACTION: If no, contact lab for replacement of missir or illegible copies.	ng		
.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data?	<u>.</u>	丛 _	
ACTION: Use professional judgement to evaluate the effect on the quality of the data.			
ACTION: If any sample analyzed as a soil contains me than 50% water, all data should be flagged estimated (J).	ore as		
2.1 Have any BNA holding times, determined from date of collection to date of extraction, been exceeded? Samples for BNA analysis, both soils and waters, must be extracted within seven days of the date of collection. Extracts must be analyzed within 40 days of the date of extraction.		(<u>X</u>) _	
Table of Holding Time Violations			
	ort) te Date acted Analyzed		
		- - N/A	-
		-	
			
ACTION: If holding times are exceeded, flag all posture estimated ("J") and sample quantitation li ("W"), and document in the narrative that were exceeded.	Tiff on entries	as ed	

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YES NO N/A If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. The reviewer may determine that non-detect data are unusable ("R"). urrogate Recovery (Form II) .1 Are the BVA Surrogate Recovery Summaries (Form II) present for each of the following matrices: a. Low Water b. Med Water c. Low Soil d. Med Soil .2 Are all the HVA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices: a. Iow Water b. Med Water c. Low Soil d. Med Soil ACTION: Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative. 3.3 Were outliers marked correctly with an asterisk? ACTION: Circle all outliers in red. 3.4 Were two or more base-neutral OR acid surrogate recoveries out of specification for any sample or method blank? If yes, were samples reanalyzed?

ACTION: If all ENA surrogate recoveries are > 10% but two within the base-neutral or acid fraction do not meet SOW specifications, for the affected fraction only (i.e. base-neutral OR acid compounds):

Were method blanks reanalyzed?

1. Flag all positive results as estimated ("J").

2. Flag all non-detects as estimated detection limits ("W").

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		YES	NO	N/A
	If any base-neutral or acid surrogate has a recovery of <10%: 1. Flag all positive results for that fraction (i.e. all acid or base-neutral compounds) "J". 2. Flag all non-detects for that fraction "R".			,
I	Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas.			
.5 Are ther data and	re any transcription/calculation errors between raw Form II?		\triangle	
ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
atrix Spike	s (Form III)			
.1 Is the I	Matrix Spike Duplicate/Recovery Form (Form III)	Ľ		
4.2 Were ma	trix spikes analyzed at the required frequency h of the following matrices:			
a. Low	Water	[]		<u>×</u>
b. Med	Water			<u> </u>
c. Low	Soil			
d. Med	Soil			$\frac{\times}{}$
ACTION:	If any matrix spike data are missing, take the action specified in 3.2 above.			
4.3 How mar	ny BNA spike recoveries are outside QC limits?			
	<u>Water</u> <u>Soils</u>			
	out of 22			
4.4 How man	ny RPD's for matrix spike and matrix spike ate recoveries are outside QC limits?			
	<u>Water</u> <u>Soils</u>			
	out of 11 out of 11	\$		and Area
ACTION	: If MS and MSD both have less than 10% recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for MS/MSD analysis. Use professional judgement in applying this criterion to other samples.		ollowing	oost Dick- m Flischud g parge)

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Name: VERSAR INC Contract: _______

Dicode: VERSAR Case No.: 4067 SAS No.: _____ SDG No.: 1

trix Spike - EPA Sample No.: MGTP03-01 Level: (low/med) LOW

DMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
					=====
Phenol	0	į o	6410	U	-
2 Chlorophenol	0	0	5630	0	-
1,4-Dichlorobenzene	0	0	3170	0	
N-Nitroso-di-n-prop.(1)	0	0	3620	0	į.
1 2,4-Trichlorobenzene_	0	0	3340	0	1
4 Chloro-3-methylphenol	0	0	9230	0	
Acenaphthene	5630	0	4060	72	31-137
1-Nitrophenol	0	0	9280	0	-
2 4-Dinitrotoluene	0	0	4450	0	-
Pentachlorophenol	0	· 0	3080	0	-
Pyrene	5630	265	4400	73	35-142

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC L	IMITS REC.
enol	0	7000	0	0		
-Chlorophenol	0	6830	0	0	ı	_
4-Dichlorobenzene	0	3690	0	0		
Nitroso-di-n-prop.(1)	0	4210	0	0		
,2,4-Trichlorobenzene	0	4050	0	0		
-Chloro-3-methylphenol	0	10400	0	O		
enaphthene	5640	5000	89	-21 *	19	31-137
Nitrophenol	0	11700	0	O		_
,4-Dinitrotoluene	0	5630	0	0		-
Entachlorophenol	0	4800	0	0		-
rene	5640	4910	82	-12	36	35-142

N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk lues outside of QC limits

D: 1 out of 11 outside limits

Recovery: 0 out of 22 outside limits

MMENTS: CLP, HYDROSEA, 4067, MGTP03-01, L, S, 39712, B, , 420.98, 1, 1UL, INST W:RESTEK 30M RTX5 45C62M > 290 613C/M

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	YES	N O	N/A
The American TD			
Blanks (Form IV)	$_{I} \times_{J}$		
5.1 Is the Method Blank Summary (Form IV) present?			
5.2 Frequency of Analysis: for the analysis of ENA TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent?	Ľ.		
5.3 Has a BVA instrument blank been analyzed for each GS/MS system used.	X		
ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If not available, reject all associated positive data ("R").			
5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printcuts and spectra.			
Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs?	区		
ACTION: Use professional judgement to determine the effect on the data.			
	•		
<u>Contamination</u>			
NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.			
6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for BVAs? When applied as described below, the contaminant concentration in			
these blanks are multiplied by the sample Dilution Factor.		(<u> </u>	
6.2 Do any field/rinse blanks have positive HVA results (TCL and/or TIC)?		(<u>X</u>	
ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)			
NOTE: Only field/rinse blanks taken the same day as the samples are used to qualify data. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate, spectral, tuning or calibration QC problems.			

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 			YES	NO N/A
•	Follow the directions in TCL results due to control TCL results due to control TCL results due to control TCL results directions in the disease TCL results due to control TCL results due to co	tamination. Use the 1	qualify	No Ny N
	Sample conc > CRQL but < 10x blank	Sample conc < CRQL & is < 10x blank value	Sample conc > C value & >10x bla	RQL nk value
Common Phthalate Esters	with a 'U'; cross	Reject sample result and report CRQL; cross out 'B' flag	No qualification is needed	
	Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CR value & > 5 blan	QL k value
Other Contaminan	ts with a 'U'; cross	Reject sample result and report CRQL; cross out 'B' flag	No qualification is needed	
	For TIC compounds, if less than five times t taminated associated b (umusable).	he concentration in the lank, flag the sample	he most con- data "R"	
6.3 Are there sample?	e field/rinse/equipment	: blanks associated wi	ا ا	<u>_</u> _
ACTION:	For low level samples, there is no associated Exception: samples to do not have associated	l field/rinse/equipmen aken from a drinking w	it blank.	ne cubrital with
GC/MS Tuning	and Mass Calibration	(Form V)		
7.1 Are the present	SC/MS Tuning and Mass (for Decafluorotripheny)	Calibration Forms (For lphosphine (DFTPP)?	≖ v)	
7.2 Are the (m/z) li hour shi	enhanced bar graph spe sting for the DFTPP pr ft?	ctrim and mass/charge ovided for each twelve	<u>(</u> ×)	
7.3 Has a tu twelve h	ning performance compo ours of sample analysi	und been analyzed for s per instrument?	every (<u>\(\)</u>	
action:	If any tuning data ar specified in 3.2 abov	e missing, take action e.	1	
ACTION:	List date, time, inst analyses for which no data are available.	rument ID, and sample associated GC/MS tuni	ing	

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			·				
					YES	NO	N/A
	DATE	TIME	INSTRUMENT	SAMPLE NUMBER	క		
8							
						N/T	4
						10/1	4
		_		_	· · ·		
ACT	ge	lab cannot presented outs	provide missing dat ide an acceptable t	a, reject ("R") al welve hour calibra	il data ation		
.4 Have	e the ic trument	us e d?	criteria been met f	for each	区		
ACT	ION: Li	ist all data riteria (atta	which do not meet in the a separate sheet	on abundance			
ACT	as Ho (S	ssociated sam wever, if ex See 1988 Fund	bration is in error ple data as unusabl panded ion criteria tional Guidelines), coept data with app	le ("R"). a are met , the data			
mas	s lists	any transcrip and Form Vs? are found, ch	tion / calculation (Check at least eck more.)	errors between two values but		ıΧı	
bee	n report	ppropriate nu ted? (Check check more va	mber of significan at least two value alues.)	t figures (two) s, but if errors			
ACI	n	esubmittal, m	rs exist, call lab make necessary corr "Conclusions".	for explanation / ections and note			
7.7 Are	the speptable	ectra of the ?	mass calibration c	anpound	<u>(X</u>)		
ACI	w	hether associ	nal judgement to de iated data should b lified, or rejected	e			
Target	Compoun	d List (TCL)	Analytes				
pre pag	esent wi	ganic Analys th required l ea c h of the	is Data Sheets (For header information following:	m I BVA) on each			
a.	Samples	and/or frac	tions as appropriat	æ			
b .	Matrix	spikes and m	atrix spike duplica	ites	<u>[×]</u>		
	Blanks	-			<u>[*]</u>		

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8.2	Are the ENA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printcuts (Quant Reports) included in the sample package for each of the following?	YES	NO	N/A	
	a. Samples and/or fractions as appropriate	\subseteq			
	b. Matrix spikes and matrix spike duplicates (Mass spectra not required)	K			
	c. Blanks	$oxed{oxed}$			
	ACTION: If any data are missing, take action specified in 3.2 above.				
8.3	Are the response factors shown in the Quant Report?	区			
8.4	Is chromatographic performance acceptable with				
_	respect to: Baseline stability				
	Resolution	$\overset{\times}{\smile}$			
•	Peak shape	ب			
	Full-scale graph (attenuation)	(<u>\forall </u>)			
	Other:			×	
	ACTION: Use professional judgement to determine the acceptability of the data.				
8.5	Are the lab-generated standard mass spectra of the identified HNA compounds present for each sample?				
	ACTION: If any mass spectra are missing, take action specified in 3.2 above. If Iab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".				
8.6	Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration?	(X)			
8.7	Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum?	(<u>*</u>)			
8.8	Do sample and standard relative ion intensities agree within 20%?	<u>(</u> <u> </u>			
	ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected, flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (at the calculated detection limit).				

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	·		
1	YES	NO	N/A
3.0 Tentatively Identified Compounds (TIC)			
 9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "J" qualifier? 9.2 Are the mass spectra for the tentatively identified 	ن		<u>X</u>
compounds and associated "best match" spectra included in the sample package for each of the following:			
a. Samples and/or fractions as appropriate			<u>×</u>
b. Blanks			<u>_</u> ×_
ACTION: If any TIC data are missing, take action specified in 3.2 above.			
ACTION: Add "J" qualifier if missing and "N" qualifier to all identified TIC compounds on Form I, Part B.			
9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene-a VOA TCL—and should not be reported as a TIC)?		[]	$\underline{\checkmark}$
ACTION: Flag with "R" any TCL compound listed as a TIC.			
9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?			<u> </u>
9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?	[]		\angle
ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.			
1 0 Compound Quantitation and Reported Detection Limits			
10.1 Are there any transcription / calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?			
10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture?	(X)		

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YES NO N/A ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions". ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CROL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package. Standards <u>Data (GC/MS)</u> 11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant. Reports) present for initial $[\times]$ and continuing calibration? ACTION: If any calibration standard data are missing, take action specified in 3.2 above. GC/MS Initial Calibration (Form VI) 12.1 Are the Initial Calibration Forms (Form VI) present r×ι and complete for the ENA fraction? ACTION: If any calibration standard forms are missing, take action specified in 3.2 above. 12.2 Are response factors stable for BNAs over the $f \times f$ concentration range of the calibration (RSD <30%)? ACTION: Circle all outliers in red. ACTION: When RSD >30%, non-detects may be qualified using professional judgement. Flag all positive results "J". When RSD >90%, flag all non-detects as unusable ("R"). (Region II policy.) 12.3 Do any compounds have a RRF < 0.05? ACTION: Circle all outliers in red. ACTION: If any ENA compound has an average RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-

detects for that compound as unusable ("R").

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	·				
l		YES	NO	N/A	
12.4 Are there at the reporti %RSD? (Che found, chec	ny transcription / calculation errors in ng of average response factors (RRF) or ick at least two values but if errors are ik more.)		区		
	rcle errors in red.		•		
	ferrors are large, call lab for explanation / esubmittal, make any necessary corrections and ote errors under "Conclusions".	٠			
GC/MS Continuing	Calibration (Form VII)				
and the Co	· · · · · · · · · · · · · · · · · · ·				
13.2 Has a cont for every instrument	inuing calibration standard been analyzed twelve hours of sample analysis per?	ιX			
~	ist below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.				
		,	N/A	·	
	If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation / resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").				
	ontinuing calibration standard compounds have		<u> </u>]	-
•	Circle all outliers in red.				
action:	If any RWA compound has a RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").				
<u> </u>	empounds have a % difference between initial and mg calibration RRF > 25%?	-	_ (<u>_</u> X	_]	_
	Circle all outliers in red and qualify associate sample data as outlined in the table below:	sd.			

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						. =		
			& DIFFERENCE			YES	Ж	N/A
•	25	5- 50	50-90	>90	•			
	J' posi	tive	'J' positive	'J' positive				
			results, 'W'		Ţ			
2				non detects	ļ			
	 	i			1			
- _13.5	Are there	any transc	ription / cal	culation errors :	in the			
	reporting	g of average	response fac	tors (RRF) or dis	fference			
3				ng RRFs? (Check			V	
	least two	values but	if errors ar	e found, check m	ore.)		\triangle	•
•	ACTION:	Circle erro	ors in red.					
8	ACTION:			l lab for explan				
			l, make any ne s under "Concl	cessary corrections	ons and			
		ince errors	s under "Corker	usions".				
Inter	mal Stand	dar ds (For m	VIII)					
.	3 AV	:		Danie 177777 a.S. a.s.			•	
14.1				Form VIII) of eve				
			nin the upper calibration?	and lower limit	S	r V 1		
3	for each	Continuing	Caribracium:					
1	ACTION:	List all th	ne outliers be	low.				
5	Sample #	Interna	al Std Are	a Lower Limi	t Upp	er Limit		
1								
		-					_	
		_					_ .	4
ì								11/4
}								10/7
								•
1							_	
}								
								
		(Attac	ch additional	sheets if necess	ary.)			
5	ACTION:			larea count is o			or	
				itated with this			4	
J				unts are reporte				
				drop off, flag a				
1			unusable ("R"		-	_ 22-36		
5								
14.2	-			ternal standards		·. V .		
	30 secon	as of the a	ssociated call	bration standard				
5	ACTION:	Profession	al judgement s	should be used to	qualify			
				mos differ by m				

30 seconds.

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YES NO N/A

ield Duplicates

15.1 Were any field duplicates submitted for BNA analysis?

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer

narrative. However, if large differences exist, identification of field duplicates should be

confirmed by contacting the sampler.

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		PART C: PESTICIDE/PCB ANALYSES	YES	NO	N/A	
Traffi	ic Repor	ts and Laboratory Narrative				
1.1 Ar	re the I	Traffic Report Forms present for all samples?	\Box		X	
AC		If no, contact lab for replacement of missing or illegible copies.				
pr ar	roblems nalytica	raffic Reports or Lab Narrative indicate any with sample receipt, condition of samples, all problems or special notations affecting ity of the data?		<u></u>	<u>×</u>	
A	CTION:	Use professional judgement to evaluate the effect on the quality of the data.				
A	CTION:	If any sample analyzed as a soil contains more than 50% water, all data should be flagged as estimated (J).				
Holdi	ng Time					
2.1 H	ave any pollection	PEST/PCB holding times, determined from date of on to date of extraction, been exceeded?			$\overline{\times}$	
m C	ust be pollecti	for PEST/PCB analysis, both soils and waters, extracted within seven days of the date of on. Extracts must be analyzed within 40 the date of extraction.				
Surro	gate Re	covery (Form II)				
3.1 A	are the present	PEST/PCB Surrogate Recovery Summaries (Form II) for each of the following matrices:				
a	a. Low	Wate r			$\overline{\times}$	
E	o. Med	Wate r			$\overline{\times}$	
c	c. Low	Soil	[]		\times	
d	d. Med	Soil	[]		$\stackrel{\textstyle \star}{\succ}$	
S 17	Are all Surrogat matrices	the PEST/PCB samples listed on the appropriate ce Recovery Summaries for each of the following				
a	a. Low	Water	[]		X	
ŀ	b. Med	Water	[]		<u>X</u>	•
	c. Low	Soil	[]		\overline{X}	
	d. Med	Soil	[]		$\overline{\times}$	

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		•		
<u> </u>		YES	NO	N/A
ACTION:	Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative.			,
3.3 Were out	liers marked correctly with an asterisk?	ட		${\times}$
ACTION:	Circle all outliers in red.	•		
3.4 Was surr specific	rogate (DBC) recovery outside of the contract ration for any sample or blank?		[]	$\overline{\times}$
ACTION:	No qualification is done if surrogates are diluted detection. If recovery is below contract limit (I zero), flag all results for that sample "J". If zero, flag positive results "J" and non-detects "I recovery for the blank is zero, flag non-detects associated samples "R". If recovery is above contlimit, flag all positive results for that sample in the reviewers professional judgement the high is due to co-eluting interference (check the associated).	out above recovery : R". If for all tract "J", unles recovery ciated		
	re any transcription/calculation errors between raw d Form II?		[]	*
ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
.0 <u>Matrix Spik</u> e	es (Form III)			
4.1 Is the 1 present	Vatrix Spike Duplicate/Recovery Form (Form III)	[]		×
4.2 Were man	trix spikes analyzed at the required frequency n of the following matrices:			
a. Low	Water	[]		×
b. Med	Water			<u>×</u>
c. Low	So il	[]		X
d. Med	Soil	[]		$\overline{\chi}$
ACTION:	If any matrix spike data are missing, take the action specified in 3.2 above.			
4.3 How many PEST/PCB spike recoveries are outside QC limits?				
	Water Soils			
	out of 12 out of 12			

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YES NO N/A 4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits? Soils Water out of 6 out of 6 ACTION: If MS and MSD both have less than zero recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for MS/MSD analysis. Use professional judgement in applying this criterion to other samples. lanks (Form IV) .1 Is the Method Blank Summary (Form IV) present? 5.2 Frequency of Analysis: for the analysis of Pesticide TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent? 5.3 Chromatography: review the blank raw data chromatograms, quant reports or data system printouts. Is the chromatographic performance (baseline stability) for each instrument acceptable for PEST/PCBs? ACTION: Use professional judgement to determine the effect on the data. <u>Contamination</u> "Water blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify data. Do not confuse them with the other QC blanks discussed below. 6.1 Do any method/instrument/reagent blanks have positive results for PEST/PCBs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor. 6.2 Do any field/rinse blanks have positive PEST/PCB results? Prepare a list of the samples associated ACTION: with each of the contaminated blanks.

(Attach a separate sheet.)

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			•				
					YES	NO	N/A
1	NOTE	: Only field/rinse	blanks taken the same re used to qualify dat	day a. Blanks			
_		may not be quality	fied because of contam	ination			
		in another blank	. Blanks may be quali	fied for			
		problems.	ral, tuning or calibra	tion oc			
•		.,					
,	ACII	ON: Follow the dir	ections in the table b	elow to qualify			
_		TCL results ou	e to contamination. U the associated blanks	se me landesr			
	,-	Samila cons > CPOI	Sample conc < CRQL &	Sample conc > 0	ROL!		
	İ	but < 5x blank	is < 5x blank value	& > 5x blank va	lue		
	-	-1	Reject sample result	No qualification	<u> </u>		
-	j	Flag sample result with a "U"; cross	and report CRQL;	is needed			
		out "B" flag	cross out "B" flag				•
	¦_				I		
6.3	Are samp	there field/rinse/e	equipment blanks associ	lated with every	.г i		\times
	_						
	ACT:	ION: For low level	samples, note in data ssociated field/rinse/e	assessment that			
_		Exception: Si	amples taken from a dri	inking water tap			
		do no t have as	sociated field blanks	•			
_ 	ihrai	tion and GC Perform	ance				
Ī				- • • · · · ·			
7.1	Are	the following Gas	chromatograms and Data mary and Confirmation	System			
	(00)	nfirmation standard	s not required if then	e			
	are	no positive result	s above CRQL) column p	resent:			
_	a.	Evaluation Standar	d Mix A		[]		<u> </u>
	۵.				rı		~
	b.	Evaluation Standar	d Mix B		اا		<u>></u>
	c.	Evaluation Standar	d Mix C		[]		X
	,	Individu al Standar	a wio a		r 1		<u> </u>
	d.	ImplyIdual Startian	Q PIIX X				<u></u>
}	e.	Individual Standar	d Mix B		[]		<u> </u>
_	f.	Multi-component Pe	sticides Toxaphene & C	hlordane			$\overline{}$
	••				r 1		<u> </u>
	g.	Aroclors 1016/1260			<u> </u>		<u> </u>
}	h.	Aroclors 1221, 123	2, 1242, 1248, and 125	54	[]		<u>*</u>
	عن	MON: If n o, take a	action specified in 3.2	above			· ·
	77 C	12011	•				

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		YES	Ж	N/A
2	Is Form VIII Pest-1 present and complete for each GC column (primary and confirmation) and each 72 hour sequence of analyses?			X
	ACTION: If no, take action specified in 3.2 above.			
3	Are there any transcription/calculation errors between data and Form VIII?	raw —	ட	$\overline{\wedge}$
	ACTION: If large errors exist, call lab for explanation resubmittal, make any necessary corrections are note errors under "Conclusions".	on/ od		
- 4	Has the total breakdown on quantitation or confirmation column exceeded 20% for DDT?	<u></u>		<u> </u>
	- for Endrin?		[]	X
	or if Endrin aldehyde and 4,4'-DDD co-elute and there peak at their retention time, has the combined DDT and breakdown exceeded 20%?	is a Endrin ——		<u>×</u>
	ACTION: a. If DDT breakdown is greater than 20% on quantitation beginning with the samples following the last in contents.	on column ontrol standa	urd:	
	 Flag all positive DDT results "J". If DDT was not detected but DDD and/or DDE are flag the DDT non-detect "R". Flag positive DDD and DDE results "JN". If DDT breakdown is > 20% on confirmation column is identified on quantitation column but not on column, use professional judgement to determine should be reported on Form I (if reported, flag 	n <u>and</u> DOT confirmation whether DOT		
=	b. If Endrin breakdown is > 20% on quantitation column the samples following the last <u>in control</u> standard	n, beginning l:	with	
	 Flag all positive Endrin results "J". If Endrin was not detected, but Endrin Aldehyde Ketone are positive, flag the Endrin non-detect Flag Endrin Ketone positive results "JN". If Endrin breakdown is > 20% on confirmation on Endrin is identified on quantitation column but confirmation column, use professional judgement determine whether Endrin should be reported on (if reported, flag result "N"). 	olumn <u>and</u> not on	in	
	c. If the combined breakdown is used (it can only be	used		

if the conditions in 7.4 above are met) and is > 20% on quantitation column beginning with the last in control standard, take the actions specified in 7.4 a and b above. If the combined breakdown is >20% on confirmation column and Endrin or DOT is identified on quantitation column but not on confirmation column, use professional judgement to determine whether Endrin or DDT should be reported on

Form I (if reported, flag result "N").

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			YES	NO	N/A
5	Is the 1: <10% for	inearity check RSD of all four calibration factors the quantitation column?		_	X
	i	If no, flag positive hits for all pesticide and RCB analytes "J" for all associated samples. Do not flag toxaphene or DOT if they are quantified from a 3-poin calibration curve.	t		
7.6	(quantit	% difference between the EVAL A and each analysis ation and confirmation) DBC retention time within s (2% for packed column, 0.3% for capillary [I.D. m], 1% for megabore [0.32 < I.D. < 2 mm]) ?	· .		<u>×</u>
	ACTION:	DBC retention time cannot be evaluated if DBC is not detected. If it is present and has a retention time out of QC limits, then use professional judgement to determine the reliability of the analysis and flag results "R", if appropriate.			
.7	Was the	proper analytical sequence followed for each period of analyses (page PEST D-36 in 8/87 SOW).			X
	ACTION:	If no, use professional judgement to determine the severity of the effect on the data and accept or reject it accordingly. Generally, the effect is negligible unless the sequence was grossly altered or the calibration was also out of limits.			
<u> 201</u>	sticide/R	CB Standards Summary			
. :	1 Is Form 72 hr s	IX present and complete for each GC column and equence of analyses?	[]		<u> </u>
•	ACTION:	If no, take action specified in 3.2 above.			
8 .	2 Are the raw dat	re any transcription/calculation errors between a and Form IX?		[]	×
	ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
■ 8.	3 Is DOT (except	retention time for packed columns > 12 min : OV-1 and OV-101 columns)?	[]		<u>×</u>
	ACITON:	If no, check that there is adequate resolution between individual components. If not, flag results for compounds that interfere with each other (co-elute) "R".			
8 .	.4 Do all establi	standard retention times fall within the windows ished for the first IND A and IND B analyses?	[]		$\overline{\chi}$

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			YES	NO.	N/A	
		Beginning with the samples following the last in control standard, check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and, DBC is visible non-detects are valid. If peaks are present and cannot be identified through "pattern recognition" or a consistent shift in standard retention times, flag all affected compound results "R".	1125	1	N/A	
B	factors v	continuing calibration standard calibration vithin 15% (for quantitation column) or confirmation column) of the initial (at g of 72 hr sequence) calibration factors?			<u>×</u>	
	ACTION:	If no, flag all associated positive results "J". Use professional judgement to determine whether or not to flag non-detects.		·		
est	icide/PC	B Identification				
9.1	Is Form : pesticid	X complete for every sample in which a e or PCB was detected?			X	
_	ACTION:	If no, take action specified in 3.2 above.				
. 2	Are ther data and	e any transcription errors between raw Form X?		[]	\neq	
	ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".				
.3	calculat	ntion times of sample compounds within the ed retention time windows for both quantitation irmation analyses?	[]		<u> </u>	
5 2	Was GC/M	S confirmation provided when required (when concentration is > 10 ug/ml in final extract)?			<u>×</u>	
	ACTION:	Reject ("R") all positive results (meeting quantitation column criteria, but missing confirmation by a second column or GC/MS (if appropriate). Also, reject ("R") all positive results not meeting retention time window criteria unless associated standard compounds are similarly biased (i.e. base on RRT to DBC).				
9.4	the mult	nromatograms for false negatives, especially for tiple peak components toxaphene and PCB's. Were my false negatives?	—	[]	<u>×</u>	
j	ACTION:	If appropriate PCB standards were not analyzed, or if the lab performed no confirmation analysis, flag the appropriate data with an "R".				

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Compound Quantitation and Reported Detection Limits	YES	NO	N/A
10.1 Are there any transcription / calculation errors in Form I results? Check at least two positive values. Were any errors found?			$\overline{\times}$
NOTE: Simple peak pesticide results can be checked for rough agreement between quantitative results obtained on the two GC columns. The reviewer should use professional judgement to decide whether a much larger concentration obtained on one column versus the other indicates the presence of an interfering compound. If an interfering compound is indicated, the lower of the two values should be reported and qualified as presumptively present at an estimated quantity ("JN"). This necessitates a determination of an estimated concentration on the confirmation column. The narrative should indicate that the presence of interferences has obscured the attempt at a second column confirmation.			
10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture?		[]	<u></u>
ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
ACTION: When a sample is analyzed at more than one dilution, the lowest CRQIs are used (unless a QC exceedance dictates the use of the higher CRQI data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.	1		
0 Chromatogram Quality			
11.1 Were baselines stable?			$\overline{\times}$
11.2 Were any electropositive displacement (negative peaks) or unusual peaks seen?		[]	*
11.3 Were early eluting peaks (for early eluting analytes) resolved to baseline?	[]		X
ACTION: For 11.1 and 11.2, comment only. For 11.3, reject ("R") those analytes that are not sufficiently resolved.			

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YES NO N/A

? <u>O</u> Field Duplicates

12.1 Were any field duplicates submitted for PEST/PCB analysis?

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer

narrative. However, if large differences exist, identification of field duplicates should be

confirmed by contacting the sampler.

(No. of Compounds/No. of Fractions (Samples)

	Date: 2/7/91 Case #: 406 /9 4/107
Type of Review: DATA Visited Hon	Lab Name: Versar / Maryland Spectral Service
Project: Hydrose Arch Motorola	LAD Name: Versar fringing
· · · · · · · · · · · · · · · · · · ·	Number of Samples: 8
Reviewer's Initials: 705	- A Attanton

Analytes Rejected Due to Exceeding Review Criteria:

	<u>Surrogates</u>	Holding Time	Calibration	Cab Contamination Mchad Milit Contamination NA	false +ve False -ve. ID	Other	Total # Samples	Total # Rejected/ Total # in all Samples
Acids (15)	0	0	0	0	0	Ø.	8	0/128
B/N (50) 34 VOA (35)	0	0	D	O	0	0	8	0/27)
PEST (20)	K			NA				
PCB (7)	(NA NA				

"" " " qualified."
Lue to menus blank

Analytes Estimated Due to Exceeding Review Criteria for:

	, T			NA				
cids (15) (0	0	0	0	0	8	0/128
/N (50) 34 NA (35)	0	0	0	0	ق ق	0	8	9/272
ST (20)	/			NA				
CI (7)	<u></u>			- NA -				
mp (1)	<i>-</i>			-NA				

ORGANIC REGIONAL DATA ASSESSMENT

	10. 4067 ° 4101		10torolA		
ABOR	Spetral Service	NO. OF S.		8 /soil	<u> </u>
0₩ #	2/88			ESD) NU	Corporation
					as. L. Soman
PO: A	CTION FYI	COMPLE	דגם אסת	E _ 3/7/	191
	DATA ASSES	MENT SU	MMARY		
		VOA	BNA	PEST	OTHER
l. :	HOLDING TIMES	0	<u></u>	NA -	NA
	GC/MS TUNE/INSTR. PERFORM.	_0_	0		
3.	CALIBRATIONS		0		
i.	BLANKS		0		
5.	SURROGATES		0		
	MATRIX SPIKE/DUP		X		
7.	OTHER QC (TG, PG, WB)	NA	NA		
В.	INTERNAL STANDARDS	_0_	0.		
9.	COMPOUND IDENTIFICATION	<u> </u>	0		
0.	SYSTEM PERFORMANCE		0		
1.	OVERALL ASSESSMENT	0	0		
M Q U X	= Data had no problems/or qualified due = Data qualified due to major problems. = Data unacceptable. = Problems, but do not affect data. ON ITEMS: X! Acenaphthene R	PD catsic	le GC I.	its, no	qualitication
nessa	somy As no positive wesults re	ported.			
	·				
AREA	S OF CONCERN:				
	•			. — . <u></u>	
	BLE PERFORMANCE:				

Region II Organic Dala Valido:

ATTACHMENT 1 SOP NO. HW-6

PAGE OF 人

TOTAL REVIEW

CLP DATA ASSESSMENT

	Functional Guidelines No. 4067, 4/0/ SDG No.	for	Evalua	ting C	Organie Versar	cs Ana	lysi	S
Case	No. 4067 4/01 SDG No.		LABC	RATORY	Spectra Sprvice	SIT!	E 17	storela
DATA	ASSESSMENT:							
7	The current functional	guid	elines	(1988)	for e	valuat	ing	organio

data have been applied.

All data are valid and acceptable except those analytes which have been qualified with a "J" (estimated), "U" (non-detects), "R" (unusable), or "JN" (presumptive evidence for the presence of the material at an estimated value). All action is detailed on the attached sheets.

Two facts should be noted by all data users. First, the "R" flag means that the associated value is unusable. In other words, due to significant QC problems the analysis is invalid and provides no information as to whether the compound is present or not. "R" values should not appear on data tables because they cannot be relied upon, even as a last resort. The second fact to keep in mind is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data but any value potentially contains error.

Reviewer's Signature:	Them	1 man	Date: 2/7	_/19 <u>_9/</u>
519/14/41/01		1215	Luch Date: 2/13	12091
Verifi e d F	3y: <u>×</u>	Trad M. De	······································	_/ 19_'!

DATA ASSESSMENT:

1. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detects (sample quantitation limits) will be flagged as estimated, "J", or unusable, "R", if the holding times are grossly exceeded.

The following action was taken in the samples and analytes shown due to excessive holding time.

None

DATA ASSESSMENT:

2. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip field, rinse and water blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field blanks measure cross-contamination of samples during field operations. If the concentration of the analyte is less than 5 times the blank contaminant level (10 times for the common contaminants), the analytes are qualified as non-detects, "U". The following analytes in the samples shown were qualified with "U" for these reasons:

A) Method blank contamination None

B) Field or rinse blank contamination ("water blanks" or "distilled water blanks" are validated like any other sample)

None

C) Trip blank contamination

None

DATA ASSESSMENT:

3. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds, and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organics is bromofluorobenzene (BFB) and for semi-volatiles is decafluorotriphenyl- phosphine (DFTPP).

If the mass calibration is in error, all associated data will be classified as unusable, ${}^{n}R^{n}$. \mathcal{N}_{top}

DATA ASSESSMENT:

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

RESPONSE FACTOR:

The response factor measures the instrument's response to specific chemical compounds. The response factor for the Target Compound List (TCL) must be \geq 0.05 in both the initial and continuing calibrations. A value < 0.05 indicates a serious detection and quantitation problem (poor sensitivity). Analytes detected in the sample will be qualified as estimated, "J". non-detects for that compound will be rejected ("R"). None

DATA ASSESSMENT:

- 5. CALIBRATION:
- A) PERCENT RELATIVE STANDARD DEVIATION (%RSD) AND PERCENT DIFFERENCE (%D):

Percent RSD is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent D compares the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be <30% and %D must be <25%. A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J" and non-detects are flagged "UJ" (if %D or RSD >50%). If there is a gross deviation of %RSD and %D, the non-detects may be rejected ("R"). Mond

For the PCB/PESTICIDE fraction, %RSD for aldrin, endrin, DDT, and dibutylchlorendate must not exceed 10%. Percent D must be within 15% on the quantitation column and 20% on the confirmation column. NA

DATA ASSESSMENT:

6. SURROGATES:

All samples are spiked with surrogate compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

DATA ASSESSMENT:

7. INTERNAL STANDARDS PERFORMANCE:

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every experimental run. The internal standard area count must not vary by more than a factor of 2 (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary more than ±30 seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated, "J", and all non-detects as "UJ", or "R" if there is a severe loss of sensitivity.

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgment to determine either partial or total rejection of the data for that sample fraction.

None

DATA ASSESSMENT:

- 8. COMPOUND IDENTIFICATION:
- A) VOLATILE AND SEMI-VOLATILE FRACTIONS:

TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and by comparison to the ion spectra obtained from known standards. For the results to be a positive hit, the sample peak must be within ± 0.06 RRT units of the standard compound and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For the tentatively identified compounds (TIC) the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

B) PESTICIDE FRACTION:

The retention times of reported compounds must fall within the calculated retention time windows for the two chromatographic columns and a GC/MS confirmation is required if the concentration exceeds 10 ng/ml in the final sample extract.

DATA ASSESSMENT:

9. MATRIX SPIKE/SPIKE DUPLICATE, MS/MSD:

The MS/MSD data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for some additional qualification of the data.

Accompliance RPD 21. QC In: to 19.

No qualification were nessecury as no positive results for accompliance were reported in the original sample, METPO3-01.

DATA ASSESSMENT:

10. OTHER QC DATA OUT OF SPECIFICATION:

None

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued on next page if necessary):

No parameters exceed QL Imit - No qualitientiess were nessering

12. CONTRACT PROBLEMS NON-COMPLIANCE:

None

13. This package contains re-extraction, re-analysis or dilution. Upon reviewing the QA results, the following form I(s) are identified to be used.

PAGE/JOF/J

DATA ASSESSMENT:

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued):

NA

.

APPENDIX A: QUALIFIED

LABORATORY RESULTS

MARYLAND SPECTRAL SERVICES, INC. 1500 Caton Center Drive Baltimore, MD 21227

CLIENT SAMPLE ID:	MGSB01-01	VBLK1215			
	CONTROL-4101				
LAB SAMPLE ID:	90121428	METHOO_BLAN			
SAMPLE DATE:	12/10/90				
VERSAR RECEIVED DATE:	12/13/90				
ANALYSIS DATE:	12/15/90	12/15/9			
FILE NAME:	1214280	1215VBLKA	ı		
INSTRUMENT ID:	MSA	MS			
% MOISTURE:	18	N/	L		
MATRIX:		201	•		
UNITS:	UG/KG	UG/K			
DILUTION FACTOR:	1.6	1.			
VOLATILE COMPOUNDS	(These resul	ts are report	ed on a Dry We	eight Basis.)	
	20 U	10 U			
Acetone	10 U	5.0 4			
Benzene	10 U	5.0			
Bromodichl or omethane	10 U	5,0 (
Bromoform	20 U	10 (
Bromometha ne	20 U	10 (
2-Butanone	20 0	,,			
Carbon Disulfide	10 U	5.0	1		
Carbon Tetrachloride	10 U	5.0	1		
Chlorobenzene	10 U	5.0)		
Chloroethane	20 U	10			
Chloroform	10 U	5.0	1		
Chloromethane	20 U	10	J		
	10 U	5.0	J		
Dibromochloromethane	10 U				
1,2-Dichloroethane	10 U				
1,1-Dichloroethane	10 U				
1,1-Dichloroethene	10 U		ل ا		•
1,2-Dichloroethene (total)	10 U		U		
1,2-Dichl or opropane					
trans-1,3-Dichloropropene	10 U	5.0	u		
cis-1,3-Dichloropropene	10 U	5.0	U		
Ethylbenz en e	10 U	5.0	U		
2-Hexanone	20 0	10	U		
4-Methyl-2-Pentanone	20 4	10	U		
Methylene Chloride	10 L	5.0	U		
	10 L	5.0	U		
Styrene	10 1				
1,1,2,2-Tetrachloroethane	10 1				
Tetrachloroethene	10 1				
Toluene		5.0			
1,1,1-Trichloroethane	<u>27</u> 10				
1,1,2-Trichloroethane	10 1		-		
Trichlor oe thene	<u> 291</u>	5.0	U		
Vinyl Acetate	20	u 10	U		
Vinyl Chloride	20				
Xylene (total)	10	u 5.0	U		
A110.00 140.014					

MARYLAND SPECTRAL SERVICES, INC. 1500 Caton Center Drive Baltimore, MD 21227

CLIENT SAMPLE ID:	HLDBLK12-14	VBLK1216	B.			
	HOLD_BLANK					
LAB SAMPLE ID:	HLDBLK12-14	METHOD_BLAN	K			
SAMPLE DATE:	12/14/90					
RECEIVED DATE:	12/14/90					
ANALYSIS DATE:	12/16/90	12/16/9				
FILE NAME:	HLDBLK1214	1216VBLK	31			
INSTRUMENT ID:	MSB	MS	iB			
MATR1X:	WATER	WATI	ER			
UNITS:	UG/L	UG.	/L			
DILUTION FACTOR:	1.0	1	.0			
OLATILE COMPOUNDS					 	
	10 U	10				
Acetone	5.0 U	5.0	บ			
Benzene	5.0 U	5.0				
Bromodich lo rome tha ne	5.0 U	5.0				
Bromoform	10 0	10				
Bromometh an e	10 U	10				
2-Butanon e	10 0	10	•			
	5.0 U	5.0	u			
Carbon Di su lfide	5.0 U	5.0				
Carbon Te tr achloride						
Chlorobenzene	5.0 U	10				
Chloroeth an e	10 U					
Chloroform	5.0 U					
Chloromethane	10 U	10	5			
a ti i i a sabi a a mathana	5.0 U	5.0	U			
Dibromochtoromethane	5.0 U		U			
1,2-Dichloroethane	5.0 U		υ			
1,1-Dichloroethane	5.0 U		U			
1,1-Dichloroethene	5.0 U		U			
1,2-Dichloroethene (total)	5.0 U			-		
1,2-Dichloropropane	3.0	, ,,,,	-			
trans-1,3-Dichloropropene	5.0 U	5.0	u			
cis-1,3-Dichloropropene	5.0 L		U	,		
	5.0		U			
Ethylbenzene	10 1	•				
2-Hexanone	10 1	_				
4-Methyl-2-Pentanone	5.0					
Methylene Chloride	J. U . V		-			
50,,000	5.0	y 5.0	U			
Styrene 1,1,2,2 -Te tra chl oroethane	5.0		u			
1,1,2,2*tetracation betala	5.0		บ			
Tetrach loroethene	5.0		U .	•		
Toluene	5.0		U			
1,1,1-Trichloroethane	5.0		U			
1,1,2-Trichloroethane	J. Q		-			
Total I annothers	5.0	u 5.0	ט ו			
Trichloroethene	10		ט			
Vinyl Acetate	10		ט נ			
Vinyl Chloride	5.0	•	U			
Xylene (total)		u	, ,			

MARYLAND SPECTRAL SERVICES, INC. 1500 Caton Center Drive Baltimore, MD 21227

CLIENT SAMPLE ID:	MGTP01-01	MGTP02-01	HGTP02-01-0P	MGTP03-01	MGTP04-01	MGTP05-01
	CONTROL-4067		CONTROL-4067	CONTROL-4867	CONTROL-4067	CONTROL-4067
LAB SAMPLE ID:	90121429	90121430	90121431	90121432	90121433	90121434
SAMPLE DATE:	12/06/90	12/06/90	12/06/90	12/06/90	12/07 /90	12/07/90
VERSAR RECEIVED DATE:	12/08/90	12/08/90	12/08/90	12/08 /90	12/08/90	12/08/90
ANALYSIS DATE:	12/15/90	12/15/90	12/15/90	12/15/90	12/15/90	12/15/90
FILE NAME:	121429	121430	121431	121432	121433	121434
INSTRUMENT 1D:	MSA	MSA	MSA	MSA	MSA	AZM
% MOISTURE:	13	20	21	22	14	19
MATRIX:	SOIL	SOIL	SOIL	S01L	SOIL	SOIL
UNITS:	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
DILUTION FACTOR:	1.0	1.0	1.0	1.0	1.0	1.0
VOLATILE COMPOUNDS	(These resul	ts are reporte	d on a Dry Weig	pht Basis.)		
Acetone	11 U	13 U	13 U	13 U	12 U	12 U
Benzene	5.7 U	6.3 U	6.3 ♥	6.4 U	5.8 น	6.2 U
Bromodich lo rome th ane	5.7 น	6.3 U	6.3 U	6.4 U	5.8 บ	6.2 U
Bromoform	5.7 U	6.3 U	6.3 U	6.4 U	5.8 บ	6.2 U
Bromometh ane	11 U	13 U	13 U	13 U	12 U	12 U
2-Butanone	11 U	13 U	13 U	13 U	12 U	12 U
Carbon Di su lfide	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
Carbon Tetrachloride	5.7 U	6.3 U	6.3 U	6.4 U	5.8 น	6.2 U
Chlorobenzene	5.7 U	6.3 U	6.3 U	6.4 U	5.8 น	6.2 U
Chloroethane	11 U	13 U	13 U	13 U	12 U	12 U
Chloroform:	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
Chlorome tha ne	11 U	13 U	13 U	13 U	12 U	12 U
Dibromochloromethane	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
1,2-Dichloroethane	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
1,1-Dichloroethane	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
1,1-Dichloroethene	5.7 U	6.3 U	6.3 U	6.4 U	5.8 บ	6.2 U
1,2-Dichloroethene (total)	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
1,2-Dich lor opropane	5.7 U	6.3 U	6.3 U	6.4 U	5.8 น	6.2 U
trans-1,3-Dichloropropene	5.7 U	6.3 U	6.3 U	6.4 U	5.8 บ	6.2 U
cis-1,3-Dichloropropene	5.7 ย	6.3 U	6.3 U	6.4 U	5.8 น	6.2 U
Ethylben ze ne	5.7 U	6.3 U	6.3 U	6.4 U	5.8 น	6.2 U
2-Hexanone	11 U	13 U	13 U	13 ປ	12 U	12 U
4-Methyl-2-Pentanone	11 5	13 U	13 U	13 U	12 U	12 U
Methylen e Chloride	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 Ų
Styrene	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
1,1,2,2-Tetrachloroethane	5.7 U	6.3 U	6.3 U	6.4 U	5.8 น	6.2 U
Tetrachloroethene	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
Toluene	5.7 U	6.3 U	6.3 U	6.4 U	5.8 u	6.2 U
1,1,1-Trichloroethane	5.7 U		6.3 U	6.4 U	5.8 น	6.2 U
1,1,2-Trichloroethane	5.7 U	6.3 U	6.3 U	6.4 U	5.8 U	6.2 U
Trichloroethene	5.7 U	6.3 U	6.3 ย	6.4 U	5.8 u	6.2 U
Vinyl Acetate	11 U	13 U		13 U	12 U	12 ឋ
Vinyl Chloride	11 U			13 ປ	12 U	12 U
Xylene (total)	5.7 U	6.3 U	6.3 U	6.4 U	5.8 น	6.2 U

MARYLAND SPECTRAL SERVICES, INC. 1500 Caton Center Drive Baltimore, MD 21227

CLIENT SAMPLE ID:	MGS802-01	VBLK121	5
	CONTROL-4067		
LAB SAMPLE ID:	-	METHOD_BLAN	K
SAMPLE DATE:	12/07/90		
	12/08/90		
TEMPAR MEDITION TIME	12/15/90	12/15/9	0
ANALYSIS DATE:	121435	1215VBLK	
FILE NAME:		H213VBLA	
INSTRUMENT ID:	MSA		
% MOISTURE:	5	Ν,	
MATRIX:	SOIL	SO:	
UNITS:	UG/KG	UG/I	(G
DILUTION FACTOR:	1.0	1.	
HOLATTIE COMPONINGE	(These result	s are repor	ted
ADDITION OF THE COMPONING			
	11 U	10	
Acet on e -	5.3 U	5.0	
Benz en e	5.3 U	5.0	
Brom od ichl or omethane			
Brom of orm	5.3 U	5.0	
Bromomethane	11 U	10	
2-Butanone .	11 U	10	U
Carbon Disulfide	5.3 U	5.0	U
Carbon Tetrachloride	5.3 U	5.0	U
Chlorobenzene	5.3 U	5.0	U
******	11 U	10	
Chloroethane	5.3 U	5.0	
Chloroform	3.3 U	10	
Chlorométhane	0	, 10	-
		5.0	11
Dib ro moch lo romethane	5.3 U		
1,2-Dichloroethane	5.3 U	5.0	
1,1-Dichloroethane	5.3 U	5.0	
1,1-Dichloroethene	5.3 U	5.0	
1,2-Dichloroethene (total)	5.3 U	5.0	
1,2-Dichloropropane	5.3 U	5.0	U
, = - · · · · · · ·			
trans-1,3-Dichloropropene	5.3 U	5.0	Ų
cis-1,3-Dichloropropene	5.3 U	5.8	U
	5.3 U	5.0	
Ethylbenzene	11 U	10	
2-Kexanone			
4-Methyl-2-Pentanone	11 U		
Methylene Chloride	5.3 U	5.0	u
Styrene	5.3 U	5.0	
1,1,2,2-Tetrachloroethane	5.3 U	5.0	Ų
Tetrachloroethene	5.3 4	5.0	ឋ
Toluene	5.3 U		ŭ
1,1,1-Trichloroethane	5.3 U		
1,1,2-Trichloroethane	5.3 4		
1, 1, 2-11 tentos decidare	3.5 9	2.0	
	5.3 U	5.0	u
Trichloroethene			
Vi nyl Acetate	11 U		
Vi nyl Ch lo ride	11 U 5.3 U		

MARYLAND SPECTRAL SERVICES, INC. 1500 Caton Center Drive Baltimore, MD 21227

CLIENT SAMPLE ID:	HLDBLK12-14 HOLD_BLANK	VBLK1216B			•
LAB SAMPLE ID:		METHOD_BLANK			
SAMPLE DATE:	12/14/90				
RECEIVED DATE:	12/14/90				
ANALYSIS DATE:	12/16/90	12/16/90			
FILE NAME:	HLDBLK1214	1216VBLK81			
INSTRUMENT ID:	MSB	MSE			
MATRIX:	WATER	WATER			
units:	UG/L	חפין			
DILUTION FACTOR:	1.0	1.4	,		
VOLATILE COMPOUNDS				 	
Acetone	10 U	10 U			
Benzene	5.0 U	5.0 U			
Bromodi ch loromethane	5.0 U	5.0 U			
Bromoform	5.0 U	5.0 U			
Bromome th ane	10 U	10 U			
2-Butan on e	10 U	10 U			
Carbon Di sul fid e	5.0 U	5.0 U			
Carbon Tetrachloride	5.0 U	5.0 L			
Chlorobenzene	5.0 U	5.0 L			
Chloroethane	10 U	10 L			
Chloroform	5.0 U	5.0 L			
Chloromethane	10 U	10 L)		
Dibromochloromethane	5.0 U	5.0			
1.2-Dichloroethane	5.0 U				
1,1-Dichloroethane	5.0 U				
1,1-Dichloroethene	5.0 U				
1,2-Dichloroethene (total)	5.0 U				
1,2-Di ch loro pr opane	5.0 U	5.0	J		
trans-1,3-Dichloropropene	5.0 U				
cis-1,3-Dichteropropene	5.0 U				
Ethyl ben zen e	5.0 U				
2- Kexanone	10 U				
4-Methyl-2-Pentanone	10 0				
Methylene Chloride	5.0 4	5.0	U		
Styr ene	5.0				
1,1,2,2-Tetrachloroethane	5.0 L				
Tetrachloroethene	5.0 1				
Tolue ne	5.0				
1,1,1-Trichtoroethane	5.0				
1,1,2-Trichloroethane	5.0	5.0	U		
Trich lo roet he ne	5.0				
Vinyl Acetate	10				
Vinyl Chloride	10				
Xylene (total)	5.0	ų 5.0	U		

B - Detected in Lab Blank. U - Below Reported Quantitation Level. J - Estimated Value.

1B SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Name: VERSAR INC Contract:	MGTP01-01	
o code: VERSAR Case No.: 4067 SAS No.: S	SDG No.: 1	
trix: (soil/water) <u>SOIL</u> Lab Sample 1	ID: <u>39709</u>	_
mple wt/vol: 30.1 (g/mL) G Lab File ID:	: <u>W1491</u>	
ve : (low/med) <u>LOW</u> Date Receive	ed: <u>12/08/90</u>	
Moisture: not dec. <u>15</u> dec. Date Extract	ted: <u>12/10/90</u>	
traction: (SepF/Cont/Sonc) <u>SONC</u> Date Analyze	ed: <u>01/10/91</u>	
Cleanup: (Y/N) N pH: 7.5 Dilution Fac	ctor: <u>1.0</u>	
CAS NO. COMPOUND (ug/L or ug/Kg) UC		
91-20-3Naphthalene	390 U	
208-96-8Acenaphthylene	390 U	
83-32-9Acenaphthene	390 U	
■ 86-73-7Fluorene	390 U	
85-01-8Phenanthrene	390 U	
120-12-7Anthracene	390 U	
206-44-0Fluoranthene	390 U	
129-00-0	390 U	
218-01-9Chrysene	390 U	
218-01-9Chrysene 205-99-2Benzo(b) fluoranthene	390 U	
207-08-9Benzo(k) fluoranthene	390 U	
50-32-8Benzo(a)pyrene	390 U	
■ 193-39-5Indeno(1,2,3-cd)pyrene	390 U	
53-70-3Dibenz(a,h)anthracene	390 U	
191-24-2Benzo(g,h,i)perylene	390 U	

Name: <u>VERSAR INC</u> Cor	ntract:
Code: VERSAR Case No.: 4067 SA	AS No.: SDG No.: 1
mix: (soil/water) SOIL	Lab Sample ID: 39710
mple wt/vol: <u>30.0</u> (g/mL) <u>G</u>	Lab File ID: W1492
l: (low/med) <u>LOW</u>	Date Received: <u>12/08/90</u>
Moisture: not dec. <u>18</u> dec	Date Extracted: 12/10/90
taction: (SepF/Cont/Sonc) SONC	Date Analyzed: 01/10/91
Cleanup: (Y/N) N pH: 7.5	
CAS NO. COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG Q
91-20-3Naphthalene	400 U
208-96-8Acenaphthylene	} 400 U
83-32-9Acenaphthene	1 400 11
86-73-7Fluorene	400 U
85-01-8Pnenanthrene	400 U
120-12-7Anthracene	400 U
206-44-0Fluoranthene	400 U
129-00-0Pyrene	400 U
■ 56-55-3Benzo(a)anthracen	e i 400 lU i
218-01-9Chrysene	400 U
205-99-2Benzo(b) fluoranthe	ene 400 U
207-08-9Benzo(k) fluoranthe	ene 400 U
50-32-8Benzo(a)pyrene	400 U
193-39-5Indeno(1,2,3-cd)p	yrene 400 U
53-70-3Dibenz(a,h)anthra	cene 400 U
■ 191-24-2Benzo(q.h.i)pervle	ene 400 U

MGTP02-01DP

Name: VERSAR INC		Contract:		
Code: <u>VERSAR</u> Case		SAS No.:	SDG No.	: 1
ix: (soil/water) <u>SO</u>			mple ID: 39	
			_	
ple wt/vol: 30).0 (g/mL) G	_ Lab Fi	le ID: W1	493
l: (low/med) Lov	<u> </u>	Date R	eceived: <u>12</u>	/08/90
oisture: not dec.	L8 dec	_ Date E	xtracted: <u>12</u>	/10/90
action: (SepF/Con	c/Sonc) <u>Son</u>	<u>C</u> Date A	nalyzed: <u>01</u>	/10/91
Cleanup: (Y/N) N	pH:	.5 Diluti	on Factor: 1	.00
		CONCENTRATIO	N UNITS:	
CAS NO.	COMPOUND	(ug/L or ug/	Kg) <u>UG/KG</u>	Q
91-20-3	Naphthalene		400	ט
208-96-8	Acenaphthylene		400	ן ט
83-32-9	Acenaphthene		400	U
86-73-7	Fluorene		400	[ט
85-01-8			400	ū
120-12-7	Anthracene		400	ŭ
206-44-0	Fluoranthene		400	Ü
129-00-0	Pyrene		400	U
56-55-3	Benzo(a) anthrac	:ene	400 400	ט
218-01-9 205-99-2	Chrysene	+ h o n o	400	Ü
205-99-2	Benzo(b) Iluoran	thene	400	ט
207-08-9			400	ט
50-32-8			400	u u
193-39-5				Ü
53-70-3			400	ט
191-24-2	benzo(g,n,i)per	. Y Telle		

Name: VERSAR INC	MGTP03-01 Contract:
	SAS No.: SDG No.: 1
rix: (soil/water) <u>SOIL</u>	Lab Sample ID: 39712
ple wt/vol: <u>30.0</u> (g/mL) <u>G</u>	Lab File ID: W1494
l: (low/med) <u>LOW</u>	Date Received: 12/08/90
oisture: not dec. <u>41</u> dec	Date Extracted: 12/10/90
raction: (SepF/Cont/Sonc) SON	C Date Analyzed: 01/10/91
Cleanup: (Y/N) N pH: 7	.4 Dilution Factor: 1.00
CAS NO. COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG Q
91-20-3Naphthalene	560 U
_ 208-96-8Acenaentnviene	1 560 II I
83-32-9Acenaphthene) 560 lU l
■ 86-73-7Fluorene	560 [1]
85-01-8Pnenanthrene	560 U
120-12-7Anthracene	560 U
206-44-0Fluoranthene	340 J
129-00-0	260 J
219-01-9Chryson	ene 560 U
218-01-9	560 U 560 U
207-08-9Benzo(k) fluoran	thene 560 U
50-32-8Benzo(a)pyrene_	560 U
193-39-5Indeno(1,2,3-cd)pyrene 560 U
53-70-3Dibenz(a,h)anth	racene 560 U
191-24-2Benzo(g,h,i)per	ylene560 U

1B SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Name: <u>VERSAR INC</u>	Contract:	·	MG'	TP04-01
ode: <u>VERSAR</u> Case No.: 4067	_ SAS No.:		SDG No.:	1
rix: (soil/water) SOIL		Lab Sample	ID: <u>397</u>	15
ple wt/vol: <u>30.0</u> (g/mL)	G	Lab File II): <u>W14</u>	97
(low/med) <u>LOW</u>		Date Receiv	/ed: <u>12/</u>	08/90
oisture: not dec. 33 dec.		Date Extrac	ted: <u>12/</u>	10/90
rction: (SepF/Cont/Sonc)	SONC	Date Analyz	ed: <u>01/</u>	10/91
Cleanup: (Y/N) N pH:	6.1	Dilution Fa	ctor: 1.0	00
CAS NO. COMPOUND		TRATION UNI		Q
91-20-3Naphthalene 208-96-8Acenaphthyle 83-32-9Acenaphthene			490	ט
208-96-8Acenaphthyle	ne		490	U
83-32-9Acenaphthene			490	U
- 00-/3-/		1	490	U
85-01-8Phenanthrene			490	U
120-12-7Anthracene		1	490	ן ט
206-44-0Fluoranthene			490	U
129-00-0Pyrene			490	U
56-55-3Benzo(a) anth	racene		490	U
218-01-9Chrysene			490	U
205-99-2Benzo(b) fluo	ranthene		490	U
207-08-9Benzo(k) fluo	ranthene		490	ע
50-32-8Benzo(a) pyre	ne		490	<u>ַ</u>
193-39-5Indeno(1,2,3	-ca) pyrene		490	<u>ע</u>
53-70-3Dibenz(a,h)a	nthracene		490	<u>ט</u>
191-24-2Benzo(g,h,i)	peryiene		490	ט

MGTP05-01

Name: VERSAR INC Co	ontract:
code: <u>VERSAR</u> Case No.: 4067	SAS No.: SDG No.: 1
teix: (soil/water) <u>SOIL</u>	Lab Sample ID: 39716
mple wt/vol: <u>30.2</u> (g/mL) G	Lab File ID: W1498
val: (low/med) LOW	Date Received: 12/08/90
Moisture: not dec. 35 dec.	Date Extracted: 12/10/90
taction: (SepF/Cont/Sonc) SONC	Date Analyzed: 01/10/91
C_Cleanup: (Y/N) N pH:7.	Dilution Factor: 1.00
CAS NO. COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG Q
91-20-3Naphthalene	500 U
208-96-8Acenaphthylene	280 J
83-32-9Acenaphthene 86-73-7Fluorene	500 U 220 J
85-01-8Phenanthrene	1900
120-12-7Anthracene	220 JX
206-44-0Fluoranthene	1500
129-00-0Pyrene	1100
2 56-55-3Benzo(a) anthrace	ne 490 J
218-01-9Chrysene	500 U
205-99-2Benzo(b) fluorant	hene 570
207-08-9Benzo(k) fluorant	hene 410 J
50-32-8Benzo(a)pyrene	470 J
193-39-5Indeno(1,2,3-cd)	pyrene400 J
53-70-3Dibenz(a,h)anthr	acene500 U
191-24-2Benzo(g,h,i)pery	lene 250 JX

_ Name: VERSAR IN	CContr	act:	MGSB02-01
Code: <u>VERSAR</u>	Case No.: 4067 SAS	No.: SDG N	lo.: <u>1</u>
rix: (soil/water) <u>soil</u>	Lab Sample ID:	39717
imple wt/vol:	30.1 (g/mL) G	Lab File ID:	W1505
el: (low/med)	LOW	Date Received:	12/08/90
Moisture: not dec	. <u>30</u> dec	Date Extracted:	12/10/90
raction: (SepF	/Cont/Sonc) <u>SONC</u>	Date Analyzed:	01/11/91
Cleanup: (Y/N) <u>N</u> pH: <u>8.5</u>	Dilution Factors	1.0
CAS NO.		ONCENTRATION UNITS:	Q
91-20-3	Naphthalene_	47	70 U
208-96-8	Acenaphthylene		70 U
86-73-7	Acenaphthene	4-	70 U
85-01-8	Phenanthrene	4-	70 U
120-12-7	Anthracene	4	70 ע
206-44-0	Fluoranthene	4	70 lu l
129-00-0	Pyrene	4.7	
6-55-3	Benzo(a) anthracene_	4.7	70 ען 70
218-01-9	Chrysene	4	70 ע סי
205-99-2	Benzo(b) fluoranthene	47	70 U
207-08-9	Benzo(k)fluoranthene	4.7	70 ט
50-32-8	Benzo(a)pyrene	47	70 U
193-39-5	Indeno(1,2,3-cd)pyre	ene4	70 ע סק
53-70-3	Dibenz(a,h)anthracer	ne4	70 U
191-24-2	Benzo(a.h.i)pervlene	Δ,	זה וזו

191-24-2----Benzo(q,h,i)perylene____

MSBLANK Lame: VERSAR INC Contract: ode: VERSAR Case No.: 4067 SAS No.: SDG No.: 1 Lab Sample ID: MSTD3772 x: (soil/water) SOIL Lab File ID: W1506 _____ ple wt/vol: 30.0 (g/mL) G___ Date Received: (low/med) LOW___ Date Extracted: 12/10/90 oisture: not dec. ____ dec. ____ Date Analyzed: 01/11/91 ction: (SepF/Cont/Sonc) SONC Dilution Factor: 1.00 leanup: (Y/N) N_ pH: ____ CONCENTRATION UNITS: Q (ug/L or ug/Kg) UG/KG CAS NO. COMPOUND U 330 91-20-3----Naphthalene 208-96-8-----Acenaphthylene 330 U 2300 83-32-9----Acenaphthene 83-32-9-----Fluorene 330 U U 330 85-01-8-----Phenanthrene 330 U 120-12-7-----Anthracene _ U 330 206-44-0----Fluoranthene_____ 2800 129-00-0-----Pyrene 330 U 56-55-3----Benzo(a)anthracene____ U 330 218-01-9-----Chrysene 330 U 205-99-2----Benzo(b) fluoranthene U 207-08-9----Benzo(k) fluoranthene____ 330 330 U 50-32-8-----Benzo(a)pyrene_ U 330 193-39-5----Indeno(1,2,3-cd)pyrene____ 330 U 53-70-3----Dibenz(a,h)anthracene____

330

U

SBLK24 Name: VERSAR INC Contract: Code: VERSAR Case No.: 4067 SAS No.: SDG No.: 1 Lab Sample ID: SBLK24 mix: (soil/water) SOIL nple wt/vol: 30.0 (g/mL) G Lab File ID: W1490 (low/med) LOW . Date Received: _____ Moisture: not dec. ____ dec. ___ Date Extracted: 12/10/90 taction: (SepF/Cont/Sonc) SONC Date Analyzed: 01/10/91 Cleanup: (Y/N) N pH: Dilution Factor: 1.00 CONCENTRATION UNITS: CAS NO. COMPOUND (ug/L or ug/Kg) UG/KG Q 330 U 91-20-3-----Naphthalene_ 330 U 208-96-8-----Acenaphthylene 330 U 83-32-9-----Acenaphthene____ 86-73-7-----Fluorene 330 U 85-01-8-----Phenanthrene____ 330 U 330 U 120-12-7-----Anthracene 206-44-0----Fluoranthene 330 U U 129-00-0-----Pyrene 330 330 U 56-55-3----Benzo(a) anthracene 330 U 218-01-9-----Chrysene_ 205-99-2----Benzo(b) fluoranthene U 330 207-08-9----Benzo(k) fluoranthene 330 U 330 U 50-32-8-----Benzo(a) pyrene U 193-39-5----Indeno(1,2,3-cd)pyrene____ 330 330 IJ 53-70-3----Dibenz(a,h)anthracene____ 191-24-2----Benzo(g,h,i)perylene____ 330 U

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CKAGE COMPLETENESS AND DELIVERABLES	CONTROL CASE NUMBER: 4	078 V2	TE BNA	/ Premis
	IAB: Mb. Spectro			Inc.
	SITE: motoroly			
O Data Completeness and Deliverables		YES	NO	N/A
1.1 Have any missing deliverables been to the data package.	n received and added	[]		<u>/</u>
ACTION: Call lab for explanation / missing deliverables. If note the effect on review the "Contract Problems/Nor of reviewer narrative.	lab cannot provide them, of the package under			
1.2 Was SMO CCS checklist included wit	th package?	(X)		
Cover Letter/Case Narrative				
2.1 Is the Narrative or Cover Letter p	present?	(X)		
2.2 Are Case Number and/or SAS number Narrative or Cover Letter?	contained in the	[<u>×</u>]		
Data Validation Checklist				
The following checklist is divided int is filled out if the data package cont Part B for any BNA analyses and Part C	ains any VOA analyses,			
Does this package contain:				
VOA data?		<u> </u>		
RVA data?		\angle		
Pesticide/PCB data?			\times	
ACTION: Complete corresponding parts	of checklist.			

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				PART A:	VOA ANALYSI	<u>s</u>	YES	NO	N/A
.0	Tra	ffic Repo	orts and La	boratory Narrat	<u>ive</u>				
	1.1		If no, ∞	port Forms pres not provided intact lab for r ble copies.	by contrac	tor	<u></u>	X	* —
	1.2	problems analytic	with samp	orts or lab Nar le receipt, cor s or special no data?	dition of sa	mples,			<u></u>
		ACTION:	Use profe effect on	ssional judgeme the quality of	ent to evaluate the data.	ite the			
	٠	ACTION:	If any sa than 50% estimated	mple analyzed a water, all data (J).	s a soil cor should be f	ntains more Nagged as			
)		ACTION:	If both V flag all	OA vials for a positive result	sample have s "J" and al	air bubbles, 1 non-detect	s "R".		
0	<u>Hol</u>	ding Time	<u>s</u>						
}	2.1			ng times, deter of analysis, b				ιŽi	
		within 7 be analy acid and volatile about pro	days of control of the control of th	ueous aromatic ollection and no 14 days. If put 4°C, then both analyzed within a contact the superserved.	on-aromatic reserved wit aromatic and 14 days. I	volatiles mu h hydrochlor i non-aromat f uncertain	nst ric ic		
,		A ten-day	y holding 1	time for soil s	amples is re	commended.			
,		Table (of Holding	Time Violation	S				
		Sample	Sample Matrix	Preserved ?	(See Traff Date Sampled	ic Report) Date Lab Received	Date Analyzed		
				N/A					
i		ACTION:	If holding	times are exce	eeded, flag	all positive	results as		

estimated ("J") and sample quantitation limits as estimated ("U"), and document in the narrative that holding times

were exceeded.

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YES NO N/A If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. The reviewer may determine that non-detect data are unusable ("R"). Surrogate Recovery (Form II) 3.1 Are the VOA Surrogate Recovery Summaries (Form II) present for each of the following matrices: a. Low Water b. Med Water c. Low Soil d. Med Soil 3.2 Are all the VOA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices: a. Low Water b. Med Water c. Low Soil d. Med Soil ACTION: Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative. 3.3 Were outliers marked correctly with an asterisk? ACTION: Circle all outliers in red. 3.4 Was one or more VOA surrogate recovery outside of contract specifications for any sample or method blank? If yes, were samples reanalyzed? Were method blanks reanalyzed? ACTION: If surrogate recoveries are > 10% but all do not

meet SOW specifications:

Flag all positive results as estimated ("J").
 Flag all non-detects as estimated detection limits ("W").

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YES NO N/A If any surrogate has a recovery of <10%: 1. Flag all positive results as estimated ("J"). 2. Flag all non-detects as unusable ("R"). Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas. 3.5 Are there any transcription/calculation errors between raw data and Form II? ACTION: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions". 4.0 Matrix Spikes (Form III) 4.1 Is the Matrix Spike Duplicate/Recovery Form (Form III) present? 4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices: a. Low Water b. Med Water c. Low Soil d. Med Soil ACTION: If any matrix spike data are missing, take the action specified in 3.2 above. 4.3 How many VOA spike recoveries are outside QC limits? Water Soils out of 10 out of 10 4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits? Water Soils out of 5 out of 5 ACTION: If MS and MSD both have less than 10% recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for the MS/MSD analysis. Use professional judgement in applying this criterion to other

samples in the package.

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	YES	NO	N/A
5.0 Blanks (Form IV)			
5.1 Is the Method Blank Summary (Form IV) present?	\swarrow		
5.2 Frequency of Analysis: for the analysis of VOA TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent?	<u>(×</u> 1		
5.3 Has a VOA instrument blank been analyzed at least once every twelve hours for each GC/MS system used?			
ACTION: If any method blank data are missing, call lab for explanation / resubmittal. If not available, reject all associated positive data ("R").			
5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.			
Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs?	X		
ACTION: Use professional judgement to determine the effect on the data.			
.0 <u>Contamination</u>			
NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.			
6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for VOAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor.		ιX	
6.2 Do amy field/trip/rinse blanks have positive VOA results (TCL and/or TIC)?		(<u>X</u>)	
ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)			
NOTE: Only field/rinse blanks taken the same day as the samples are used to qualify data. Trip blanks are used to qualify only those samples with which they were shipped. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate, spectral, tuning or calibration QC problems.			

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ACTION: 1	Follow the directions NCL results due to com	in the table below to	qualify	NO 1	N/A		
,	value from all the ass	ociated blanks.	largest				
	Sample conc > CRQL but < 10x blank	Sample conc < CRQL & is < 10x blank value	Sample conc : value & >10x	> CRQL blank value	† 		
Acetor	de Flag sample result ne with a 'U'; cross ne out 'B' flag	Reject sample result and report CRQL; cross out 'B' flag	No qualificat is needed	ion			
	Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > value & > 5 b	CRQL lank value			
Other Contaminant	s with a 'U'; cross	Reject sample result and report CRQL; cross out 'B' flag	No qualificat: is needed	ion			
ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).							
6.3 Are there sample?	field/rinse/equipment	blanks associated wit	th every	X			
E E	or low level samples, here is no associated xception: samples tak o not have associated	field/rinse/equipment wen from a drinking wa	blank.	L nune	300 mitteel		
0 GC/MS Tuning a	nd Mass Calibration (F	'orm V)					
7.1 Are the GC, present fo	/MS Tuning and Mass Ca r Bromofluorobenzene (libration Forms (Form BFB)?	(V)		_		
7.2 Are the end (m/z) list; hour shift:	hanced bar graph spect ing for the BFB provid ?	rum and mass/charge ed for each twelve	(<u>×</u>)				
7.3 Has a tunin twelve hou	ng performance compoun rs of sample analysis	d been analyzed for e per instrument?	very [X]		_		
	f any tuning data are : pecified in 3.2 above.						
ar	ist date, time, instru malyses for which no a mata are available.	ment ID, and sample ssociated GC/MS tuning	3				

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,		·			YES	NO	N/A
	DATE	TIME	INSTRUMENT	SAMPLE NUMBER	S		
<u>!</u>						/	_
		- ,			·	NA	3
}				ļ	 .		
AC	gene		provide missing data de an acceptable tw				
	ve the i o n strument us		riteria been met fo	reach	X		
AC			hich do not meet ion h a separate sheet)				
AC	a s so H o we (S ee revi	ciated samp ver, if exp 1988 Funct	pration is in error, ple data as unusable anded ion criteria a cional Guidelines), t expet data with appro-	("R"). are met the data			
mas	ss lists an	transcript d Form Vs? found, che	ion / calculation en (Check at least two ck more.)	rrors between o values but			
bee	en reported		ber of significant of t least two values, ues.)				
AC.	resu	b m ittal, ma	exist, call lab for ke necessary correct conclusions".				
	e the sp e ct eptabl e?	ra of the m	ass calibration comp	cound	(X)		
ACI	whet	h er ass∝ia	l judgement to deter ted data should be fied, or rejected.	mine			
0 Target	Compound L	ist (TCL) A	nalytes				
pre	sent wi th :		Data Sheets (Form 1 ader information on llowing:				
a.	Samples an	d/or fracti	ons as appropriate		\bowtie		
b.	Matrix spi	kes and mat	rix spike duplicates	;	[]		\succeq
c.	Blanks				<u>[X]</u>		

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mass s data s	e VOA Reconstructed Ion Chromatograms, the pectra for the identified compounds, and the ystem printouts (Quant Reports) included in mple package for each of the following?	YES	Ю	N/A	
a. Sam	ples and/or fractions as appropriate	\swarrow			
	rix spikes and matrix spike duplicates ss spectra not required)	[]		X	
c. Bla	nks .	(X)			
ACTION	: If any data are missing, take action specified in 3.2 above.				
8.3 Are th	e response factors shown in the Quant Report?	[]	\angle		
	omatographic performance acceptable with				
respec	Baseline stability				
	Resolution				
	Peak shape	(X)			
	Full-scale graph (attenuation)	(\angle)			
	Other:			X	
ACTION	: Use professional judgement to determine the acceptability of the data.				
	e lab-generated standard mass spectra of the fied VOA compounds present for each sample?	\bigotimes			
ACTION	If any mass spectra are missing, take action specified in 3.2 above. If Lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".	·			
	RRT of each reported compound within 0.06 RRT of the standard RRT in the continuing calibration?	<u>£</u> _1			
relati	l ions present in the standard mass spectrum at a ve intensity greater than 10% also present in the mass spectrum?	íΧ			
8.8 Do sam within	ole and standard relative ion intensities agree 20%?	(<u>X</u>)	. 		
ACTION	Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected, flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (at the calculated detection limit).				

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	YES	NO	N/A
.0 Tentatively Identified Compounds (TIC)			
9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "J" qualifier?	(X)		_
9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:	·		
a. Samples and/or fractions as appropriate	(X)		<u>.</u>
b. Blanks	$i \times i$		
ACTION: If any TIC data are missing, take action specified in 3.2 above.			
ACTION: Add "J" qualifier if missing and "N" qualifier to all identified TIC compounds on Form I, Part B.			
9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene—a VOA TCL—and should not be reported as a TIC)?	_		
ACTION: Flag with "R" any TCL compound listed as a TIC.			
9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?	(<u>X</u>)		
9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?			
ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.			
0.0 <u>Compound Quantitation and Reported Detection Limits</u>			
10.1 Are there any transcription / calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?		<u>(</u> \(\times_1\)	
10.2 Are the CRQIs adjusted to reflect sample dilutions and, for soils, sample moisture?	(<u>X</u>)	[<u>\(\)</u>]	

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				•		
				YES	NO	N/A
		ACTION:	If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
			When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.	1		
1.0	<u>Stan</u>	dards Da t	a (GC/MS)			
	11.1	system p	Reconstructed Ion Chromatograms, and data rintouts (Quant. Reports) present for initial inuing calibration?	ıΣı		
		ACTION:	If any calibration standard data are missing, take action specified in 3.2 above.			
2.0	GC/M	S Initial	Calibration (Form VI)			
	12.1		Initial Calibration Forms (Form VI) present lete for the volatile fraction?	\bowtie		
		ACTION:	If any calibration standard forms are missing, take action specified in 3.2 above.			
	12.2		onse factors stable for volatiles over the ation range of the calibration (RSD <30%)?	(<u>X</u>)		
		ACTION:	Circle all outliers in red.			
		ACTION:	When RSD >30%, non-detects may be qualified using professional judgement. Flag all positive results "J". When RSD >90%, flag all non-detects as unusable ("R"). (Region II policy.)			
	12.3	Do any α	empounds have an average RRF < 0.05?			
		ACTION:	Circle all outliers in red.			
		ACTION:	If any volatile compound has an average RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").			

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	12.4	the rep &RSD?	Are there any transcription / calculation errors in the reporting of average response factors (RRF) or &RSD? (Check at least two values but if errors are found, check more.)			N/A
		ACTION:	Circle errors in red.		المكيا	
		ACTION:	If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".	·		
3.0	GC/M	S Contin	ing Calibration (Form VII)			
	13.1	Are the and comp	Continuing Calibration Forms (Form VII) present plete for the volatile fraction?	ιXi		
	13.2	Has a co for ever instrume	ontinuing calibration standard been analyzed by twelve hours of sample analysis per ent?	ι <u>X</u>		
		ACTION:	List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.			
				N	/A	
		ACTION:	If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation / resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").			
	13.3	Do any c a RRF <	ontinuing calibration standard compounds have 0.05?		(<u>X</u>)	
	A	CTION:	Circle all outliers in red.			
	•	ACTION:	If any volatile compound has a RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").			
נ	13.4 1	Do any co continui	ompounds have a % difference between initial and ng calibration RRF > 25%?		Ķι	
	ž	ACTION:	Circle all outliers in red and qualify associated sample data as outlined in the table below:			

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				-	YES	NO	N/A
•	*	DIFFERENCE					·
2:	5-50	50 -9 0	>90	†			
J' pos			'J' positive	†			
		•	results, "R"				
]			
13.5 Are then	e a ny transcr	iption / cal	culation errors	in the			
			tors (RRF) or di ng RRFs? (Check			^	
			e found, check m			(X)	
ACTION:	Circle error	s in red.					
ACTION:			l lab for explan				
	resubmittal,		cessary correcti usions".	ons and			
.0 Internal Stan	dande (Form V	TTT)					
			Form VIII) of ev and lower limit		\ <u>/</u>		
for each	continuing o	alibration?			[X]		
ACTION:	List all the	outliers be	low.				
Sample #	Internal	Std Are	a Lower Limi	t Upp	er Limit		
	_		·				
							1.
						_	N/A
						'	,
	_				· · · · · · · · · · · · · · · · · · ·		
	(Attach	additional	sheets if necess	ary.)			
ACTION:			area count is c			or	
			J" all positive itated with this			đ.	
	If extremely	low area ∝	unts are reporte	d, or if	performa	nce	
	detects as u		<pre>drop off, flag a).</pre>	HI associ	aced non	-	
			iternal standards bration standard				_
ACTION:			should be used to mes differ by mo				

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YES NO N/A

5.0 Field Duplicates

15.1 Were any field duplicates submitted for VOA analysis?

× _ _

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer

narrative. However, if large differences exist,

identification of field duplicates should be

confirmed by contacting the sampler.

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		PART	B: BNA ANALYS	ES	YES	NO N/A
0 <u>Traffic Rep</u>	orts and La	boratory Narr	ative			4
1.1 Are the	Traffic Re	port Forms pr	esent for all	samples?	ட	<u> </u>
ACTION:	If m, ∞	entact lab for ble copies.				
problems analytic	s with samp	orts or Lab N le receipt, c s or special : data?	ondition of sa	amples.	·	· <u> </u>
ACTION:	Use profe effect on	ssio nal jud ge the quality	ment to evaluate of the data.	ate the		
ACTION:	If any sa than 50% estimated	mple analyzed water, all da (J).	as a soil cor ta should be :	ntains more flagged as		
Holding Time	×s					
2.1 Have any collecti	· B VA h ol di on t o da te	ng times, deta of extraction	ermined from o	iate of led?		<u> </u>
must be collecti	extracted on. Extra	alysis, both swithin seven of the must be and featraction.	lays of the da	ate of		
	<u>Tab</u>	le of Holding	Time Violatio	ons.		
Sample	Sample Matri x	Date Sampled	(See Traff Date Lab Received	ic Report) Date Extracted	Da te Analyzed	
						
						A1/A
						NA
•						
						
ACTION:	estimated	times are ex ("J") and sam d document i	ple quantitat	ion limits as	estimated	

were exceeded.

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YES W N/A

If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. The reviewer may determine that non-detect data are unusable ("R").

	Summate	e Recovery	(FOrm	TTY
P • •	<u>surruau</u>	s vernoria	LEOTH	<u> </u>

. 0	Sur	roga	te R	ecovery (Form II)	•		
	3.1			BNA Surrogate Recovery Summaries (Form II) present h of the following matrices:			
		a.	Low	Water	(X)		
		b.	Med	Water	[]		\times
		c.	Low	Soil	[X]		
		d.	Med	Soil			$\underline{\times}$
	3.2			the ENA samples listed on the appropriate Surrogate y Summaries for each of the following matrices:			
		a.	Low	Water	(\angle)		
		b.	Med	Water			
		c.	Low	Soil	(\angle)		
		d.	Med	Soil	[]		7
		ACT:	ION:	Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative.			
	3.3			tliers marked correctly with an asterisk?	(X)		
		ACT:	ION:	Circle all outliers in red. See Support Decom	millation	- Folke	wing page.
	3.4	Were	e two	o or more base-neutral <u>OR</u> acid surrogate recoveries specification for any sample or method blank?		ι×i	
		If y	yes,	were samples reanalyzed?	[]		X
		Were	e met	thod blanks reanalyzed?		·	X
		ACT.	ion:	If all RVA surrogate recoveries are > 10% but two within the base-neutral or acid fraction do not meet SCW specifications, for the affected fraction only (i.e. base-neutral OR acid compounds):			

1. Flag all positive results as estimated ("J"). 2. Flag all non-detects as estimated detection

limits ("W").

2D SOIL SEMIVOLATILE SURROGATE RECOVERY

Name:	VERSAR	INC	Contract	•
-------	--------	-----	----------	---

Code: VERSAR Case No.: 4078 SAS No.: SDG No.: 2

el:(low/med) LOW

	EPA	S1	S2	S3	S4	S5	S6	OTHER	TOT
	SAMPLE NO.	(NBZ)#	(FBP)#	(TPH) #	(PHL) #	(2FP)#	(TBP) #		OUT
	=========	======	=====	=====		22222	=====	======	===
01	MGSS01-01	96	126 \$	107	108	114	115	0	1 1
02	MGSS02-01	68	79	77	66	66	72	o	0
3	MGSS03-01	25	32	35	30	30	30	o	Ō
04	SBLK61	6 9	84	85	71	62	70	0	0
1								_	

			QC LIMITS
Sl	(NBZ)	= Nitrobenzene-d5	(23-120)
S2	(FBP)	= 2-Fluorobiphenyl	(30-115)
		= Terphenyl	(18-137)
		= Phenol-d5	(24-113)
S5	(2FP)	= 2-Fluorophenol	(25-121)
		= 2,4,6-Tribromophenol	(19-122)

[#] Column to be used to flag recovery values

^{*} Values outside of contract required QC limits

D Surrogates diluted out

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		12,1010		
	If any base-neutral or acid surrogate has a recovery of <10%: 1. Flag all positive results for that fraction (i.e. all acid or base-neutral compounds) "J". 2. Flag all non-detects for that fraction "R".	YES	NO	N/A
	Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas.			
3.5 Are ther data and	re any transcription/calculation errors between raw I Form II?		ιXi	
ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
0 Matrix Spike	s (Form III)			
4.1 Is the M present?	Matrix Spike Duplicate/Recovery Form (Form III)			X
4.2 Were mat for each	rix spikes analyzed at the required frequency of the following matrices:			
a. Low	Wa ter	[]		X
b. Med	Water	[]		_×
c. Low	So il			
d. Med	Soi l	[]		X
ACTION:	If any matrix spike data are missing, take the action specified in 3.2 above.			
4.3 How marry	EVA spike recoveries are outside QC limits?			
	<u>Water</u> <u>Soils</u>	1	يد ز	
<u>-</u>	out of 22 out of 22	/ 0	11	
4.4 How many duplicate	RPD's for matrix spike and matrix spike recoveries are outside QC limits?			
	Water Soils	Nº/	A	
i –	out of 11 out of 11			
ACTION:	If MS and MSD both have less than 10% recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for MS/MSD analysis. Use professional judgement in applying this criterion to other samples.			

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	ı		
	YES	NO	N/A
0.0 Blanks (Form IV)			
5.1 Is the Method Blank Summary (Form IV) present?	(X)		
5.2 Frequency of Analysis: for the analysis of BNA TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent?	ι <u>Χ</u> ί	<u> </u>	
5.3 Has a BNA instrument blank been analyzed for each GS/MS system used.	<u>(</u>		
ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If not available, reject all associated positive data ("R").			
5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.			
Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs?			
ACTION: Use professional judgement to determine the effect on the data.			
.0 Contamination			
NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.			
6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for BNAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor.		(<u>X</u>)	
6.2 Do any field/rinse blanks have positive ENA results (TCL and/or TIC)?			\angle
ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)			
NOTE: Only field/rinse blanks taken the same day as the samples are used to qualify data. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate, spectral, tuning or calibration QC problems.		,	

					·			
	ACTION:	10	low the direction results due to c ue from all the a	s in the table belo ontamination. Use ssociated blanks.	w to qualify the largest	YES	NO	N/I
		•	Sample conc > CR but < 10x blank	OL Sample conc < CR is < 10x blank v	QL & Sample of alue &	>20nc > >10x b	CRQL lank val	ue
	Common Phthalate Esters	e 	Flag sample result with a 'U'; crossout 'B' flag	Reject sample re and report CRQL; cross out 'B' fl	is neede	ificati ed	on	
		· ·	Sample conc > CR but < 5x blank	DL Sample conc < CR is < 5x blank va	QL & Sample of Value &	> 5 bl	CRQL ank valu	e
	Other Contamina	ants	Flag sample result with a 'U'; cross out 'B' flag	Reject sample resided and report CRQL; cross out 'B' fla	is neede	fication	on.	
	ACTION:	tami	s than five times	the concentration the concentration blank, flag the sar	in the most o	7777-		
5.3	Are ther sample?	e fie	eld/rinse/equipmer	t blanks associated	I with every		X	
	ACTION:	ther Exce	re is no associate	, note in data assed field/rinse/equip aken from a drinkir d field blanks.	ment blank.			
:C/1	MS Tuning	an d	Mass Calibration	(Form V)				
'.1	Are the opresent :	GC/MS for D	Tuning and Mass ecafluorotripheny	Calibration Forms (lphosphine (DFTPP)?	(Form V)	\bowtie		
.2	Are the (π/z) lishour ship	sting	ced bar graph spe for the DFIPP pr	ctrum and mass/char ovided for each twe	lve	ıΣı		
.3	Has a tur twelve h	ning ; ours	performance compo of sample analysis	und been analyzed f s per instrument?	or every			
	ACTION:	If a	ny tuning data and ified in 3.2 above	e missing, take act e.	ion			-
	ACTION:	analy	date, time, instructions of the date of th	rument ID, and samp associated GC/MS to	le uning			

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	-					YES	NO	N/A
	DA	TE	TIME	INSTRUMENT	SAMPLE NUMBER	క		
		j				 -	/	; A
							10/7	A
	•		-					
) 	ACTION:	gene		provide missing data ide an acceptable tw				
7.4	1 Have the	ion	abumdance o	riteria been met fo	r each	· 		
}	instrume	_			e cua.	\swarrow		
1	ACTION:			which do not meet io th a separate sheet)				
	ACTION:	asso Howe (See revi	ciated samp ver, if exp 1988 Funct	pration is in error, ole data as unusable panded ion criteria cional Guidelines), exept data with appr	("R"). are met the data			
7.5	mass lis	ts an		tion / calculation e (Check at least tw eck more.)				
7.6	been rep	orted		mber of significant at least two values, ues.)		\bowtie		
	ACTION:	resu	b m ittal, ma	exist, call lab for the necessary correct Conclusions".				
7.7	Are the acceptable		ra of the m	mass calibration com	pound	\swarrow		
	ACTION:	whet	her associa	il judgement to deter ted data should be fied, or rejected.	mine			
.0 <u>Tar</u>	get Compo	und L	ist (TCL) A	nalytes				
8.1	present v	with:		Data Sheets (Form) Pader information on Allowing:		1.1		
t	a. Sample	es and	d/or fracti	ons as appropriate		(X)		
	b. Matri	x s pil	kes and mat	rix spike duplicate	3	[_]		X
1	c Blanks	=		-		r × 1		

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8.2 Are the BVA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printcuts (Quant Reports) included in the sample package for each of the following?	YES	NO	N/A
a. Samples and/or fractions as appropriate	K		
 b. Matrix spikes and matrix spike duplicates (Mass spectra not required) 			X
c. Blanks	\boxtimes		
ACTION: If any data are missing, take action specified in 3.2 above.		عد	
8.3 Are the response factors shown in the Quant Report?		\leq	
8.4 Is chromatographic performance acceptable with formal respect to:	present	2103	⊊ `
Baseline stability	K		·
Resolution	(X)		
Peak shape	\triangle		
Full-scale graph (attenuation)	(X)		
Other:			
ACTION: Use professional judgement to determine the acceptability of the data.			
8.5 Are the lab-generated standard mass spectra of the identified ENA compounds present for each sample?	$\langle \angle \rangle$		
ACTION: If any mass spectra are missing, take action specified in 3.2 above. If Lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".			
8.6 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration? # no positive results are reported.	ي []		×
8.7 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum? * no fositive results are reported*	<u></u>		*
8.8 Do sample and standard relative ion intensities agree within 20%? ** no positive results are reported	[]		<u>×</u>
ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected, flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (at the calculated detection limit).			

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•			•			
·			YES	NO	N/A	_
.0 <u>Ter</u>	ntatively	Identified Compounds (TIC)				
 	Part B) or reter qualifie		·		X	
9.2	compound	mass spectra for the tentatively identified is and associated "best match" spectra included cample package for each of the following:				
J	a. Sampl	es and/or fractions as appropriate	[]		\angle	
	b. Blank	os estados estados estados estados estados estados estados estados estados estados estados estados estados esta	[]		X	
	ACTION:	If any TIC data are missing, take action specified in 3.2 above.				
· 	ACTION:	Add "J" qualifier if missing and "N" qualifier to all <u>identified</u> THC compounds on Form I, Part B.				
9.3	TIC COMP	TCL compounds (from any fraction) listed as ounds (example: 1,2-dimethylbenzene is xylene- L-and should not be reported as a TIC)?				
i	ACTION:	Flag with "R" any TCL compound listed as a TIC.				
9.4	relative	ions present in the reference mass spectrum with a intensity greater than 10% also present in the ass spectrum?			\preceq	
9.5		nd "best match" standard relative ion intensities thin 20%?	[]		X	
	ACTION:	Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.				
).0 <u>co</u>	mpound Qu	antitation and Reported Detection Limits				
10	Form I Verify ion, a	ere any transcription / calculation errors in results? Check at least two positive values. that the correct internal standard, quantitation and RRF were used to calculate Form I result. my errors found?		ıΧi		
10		e CRQLs adjusted to reflect sample dilutions or soils, sample moisture?	ι <u>X</u> ı	ι <u>Χ</u>		

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	YES	NO	N/A	_
If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".				

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

1.0 <u>Standards Data (GC/MS)</u>

11.1	Are the Reconstructed Ion Chromatograms, and data
	system printouts (Quant. Reports) present for initial and continuing calibration?
	and continuing caribration?

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

12.0 GC/MS Initial Calibration (Form VI)

12.1 Are the Initial Calibration Forms (Form VI) present and complete for the ENA fraction?

ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.

12.2 Are response factors stable for ENAs over the concentration range of the calibration (RSD <30%)?

ACTION: Circle all outliers in red.

ACTION: When RSD >30%, non-detects may be qualified

using professional judgement. Flag all positive results "J". When RSD >90%, flag all non-detects as unusable ("R"). (Region

II policy.)

12.3 Do any compounds have a RRF < 0.05?

ACTION: Circle all outliers in red.

ACTION: If any BNA compound has an average

RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").

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				YES	NO	N/A
	12.4	the repo	re any transcription / calculation errors in orting of average response factors (RRF) or (Check at least two values but if errors are		• /	ŕ
1			theck more.)	—	(Δ)	
J		ACTION:	Circle errors in red.		*	
		ACTION:	If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
3.0	GC/M	S Continu	ing Calibration (Form VII)			
	13.1	Are the and comp	Continuing Calibration Forms (Form VII) present plete for the BNA fraction?			
ì	13.2	Has a confor ever	ontinuing calibration standard been analyzed by twelve hours of sample analysis per ent?	(X)		
		ACTION:	List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.			
				N	A	
		ACTION:	If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation / resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").			
1	13.3	Do any c a RRF <	ontinuing calibration standard compounds have 0.05?	·	Ki	
	7	ACTION:	Circle all outliers in red.			
		ACTION:	If any EVA compound has a RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").			
	13.4		ompounds have a % difference between initial and ng calibration RRF > 25%?		ι <u>Χ</u> ι	
ı		ACTION:	Circle all outliers in red and qualify associated sample data as outlined in the table below:			

					-		
1		% DIFFERENCE			YES	NO	N/A
	25– 50	50-90	>90	Ì			
n	J' positive esults, no action or non detects		'J' positive results, "R" non detects				
i					•		
rej (%!	e there any transc porting of average D) between initial ast two values but	e response fact and continuir	ors (RRF) or dif g RRFs? (Check	ference at			
ACT	MON: Circle erro	ers in red.					
ACI	MON: If errors a resubmittal note errors	re large, call , make any neo under "Conclu	essary correction	ation / ons and			
4.0 <u>Internal</u>	Standards (Form	VIII)					
sam	e the internal stample and blank wit each continuing	hin the upper	orm VIII) of eve and lower limits	ry			
ACI	MON: List all th	e outliers bel	ow.				
Sam	ple # Interna	l Std Area	Lower Limit	Uppe	r Limit		
							
				<u> </u>	· · · · · · · · · · · · · · · · · · ·	- ,	N/A
						_	
					 	_	
	(Attack	n additional s	neets if necessar	ry.)	· •	-	
ACT	lower limit, detects (U v If extremely exhibits a n	, flag with "J" values) qua ntit v low area cour	area count is out all positive retated with this ints are reported, rop off, flag all	esults and internal s , or if be	l non- standard erforman		
14.2 Are 30 s	the re tention timeseconds of the ass	nes of the inte	ernal standards w	vith in [Xı		
ACT	ION: Professional		wild be used to g		•	_	_

30 seconds.

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YES NO N/A

0 Field Duplicates

15.1 Were any field duplicates submitted for BYA analysis?

·× _ _

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer narrative. However, if large differences exist,

identification of field duplicates should be

confirmed by contacting the sampler.

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	PART C: PESTICIDE/PCB ANALYSES	YES	NO	N/A	
.0 <u>Traffic Repo</u>	orts and Laboratory Narrative				
1.1 Are the	Traffic Report Forms present for all samples?			X	
ACTION:	If no, contact lab for replacement of missing or illegible copies.				
problems analytic	raffic Reports or lab Narrative indicate any with sample receipt, condition of samples, all problems or special notations affecting ity of the data?		<u>(Χ</u>)		
ACTION:	Use professional judgement to evaluate the effect on the quality of the data.				
ACTION:	If any sample analyzed as a soil contains more than 50% water, all data should be flagged as estimated (J).				
0 Holding Time	<u>s</u>				
2.1 Have any collecti	PEST/PCB holding times, determined from date of on to date of extraction, been exceeded?		[]	X	
must be collecti	for PEST/PCB analysis, both soils and waters, extracted within seven days of the date of on. Extracts must be analyzed within 40 the date of extraction.				
0 <u>Surrogate Re</u>	covery (Form II)				
	PEST/PCB Surrogate Recovery Summaries (Form II) for each of the following matrices:				
a. Low	Wa ter	[]		\times	
b. Med	Water	[]		\times	
c. Low	Soil Soil	[]		\times	
d. Med	Soi l	[]		\geq	
	the PEST/PCB samples listed on the appropriate Recovery Summaries for each of the following:				
a. Low 1	Water .	[]		\underline{X}	
b. Med 1	Nat er	[]		X	
c. Low S	50i 1	[]		\times	
d. Med S	Soi l	r)		\times	

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			YES	NO	N/A	_
	ACTION:	Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative.				
;	3.3 Were out	liers marked correctly with an asterisk?			\times	
	ACTION:	Circle all outliers in red.	•			
:	3.4 Was surr specific	rogate (DBC) recovery outside of the contract ration for any sample or blank?		[]	X	
	ACTION:	No qualification is done if surrogates are diluted detection. If recovery is below contract limit zero), flag all results for that sample "J". zero, flag positive results "J" and non-detects recovery for the blank is zero, flag non-detect associated samples "R". If recovery is above a limit, flag all positive results for that sample in the reviewers professional judgement the highing due to co-eluting interference (check the as blank - if recovery is high there also, flag the data).	t (but above If recovery is If "R". If ts for all contract le "J", unless th recovery ssociated			
3	3.5 Are ther data and	e any transcription/calculation errors between r Form II?	.aw	[]	X	
	ACTION:	If large errors exist, call lab for explanation resubmittal, make any necessary corrections and note errors under "Conclusions".	1 /			
.0 <u>M</u>	atrix Spike	s (Form III)				
4	.1 Is the M present?	atrix Spike Duplicate/Recovery Form (Form III)	<u></u>		\times	
4	.2 Were mata for each	rix spikes analyzed at the required frequency of the following matrices:				
	a. Low V	Water	[]		X	
	b. Med V	Mater	[]		\times	
	c. Low S	50 i l	[]		\angle	
	d. Med S	Soil			\preceq	
	ACTION:	If any matrix spike data are missing, take the action specified in 3.2 above.				
4.	.3 How many	PEST/PCB spike recoveries are outside QC limits	?			
		Water Soils				
	_	out of 12 out of 12				

4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?	YES	NO	N/A
<u>Water</u> <u>Soils</u>			
out of 6out of 6			
ACTION: If MS and MSD both have less than zero recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for MS/MSD analysis. Use professional judgement in applying this criterion to other samples.			
0 Blanks (Form IV)			
5.1 Is the Method Blank Summary (Form IV) present?			$\underline{\times}$
5.2 Frequency of Analysis: for the analysis of Pesticide TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent?	r 1		X
5.3 Chromatography: review the blank raw data - chromatograms, quant reports or data system printouts.			
Is the chromatographic performance (baseline stability) for each instrument acceptable for PEST/PCBs?	[]		X
ACTION: Use professional judgement to determine the effect on the data.			
0 <u>Contamination</u>			
NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are <u>not</u> used to qualify data. Do not confuse them with the other QC blanks discussed below.			
6.1 Do any method/instrument/reagent blanks have positive results for PEST/PCBs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor.			<u>×</u>
6.2 Do any field/rinse blanks have positive PEST/PCB results?			X
ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)			

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	NOT	as the samples a may not be quali in another blank	e blanks taken the same are used to qualify dat fied because of contant . Blanks may be qualifical, tuning or calibra	ta. Blanks mination ified for	YES	NO.	N/A
	ACT	TCL results du	rections in the table he to contamination. I the associated blanks	Jse the largest			
		Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value				
	-	Flag sample result with a "U"; cross out "B" flag	Reject sample result and report CRQL; cross out "B" flag	No qualification is needed	n		
6.3	sam	ION: For low level there is no as Exception: sa	equipment blanks associated field/rinse/suples taken from a driscolated field blanks.	assessment that equipment blank. inking water tap	[]	_	X
0 <u>Cal</u>	ibra	tion and GC Performa	nœ				
7.1	Pri:	ntouts for both Prim nfirmation standards	hromatograms and Data ary and Confirmation not required if there above CRQL) column pr	•			
	a.	Evaluation Standard	Mix A		[]		\times
	b.	Evaluation Standard	Mix B		[]		X
ı	c.	Evaluation Standard	Mix C		[]		$\frac{\times}{}$
	d.	Individual Standard			[]		X
	e.	Individual Standard			[]		$\frac{\times}{\checkmark}$
	f.	_	ticides Toxaphene & Ch	lordane			\sim
	g.	Aroclors 1016/1260	1040 1040 3 1000		[]		$\stackrel{\sim}{>}$
	h.	Arociors 1221, 1232	, 1242, 1248, and 1254		L}		.

ACTION: If no, take action specified in 3.2 above

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_					
	7.2 Is Form VIII Pest-1 present and complete for each GC column (primary and confirmation) and each 72 hour sequence of analyses?	YES	NO	N/A	
,	ACTION: If no, take action specified in 3.2 above.				
ļ	7.3 Are there any transcription/calculation errors between raw data and Form VIII?			X	
•	ACTION: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".	•			
1	7.4 Has the total breakdown on quantitation or confirmation column exceeded 20% for DDT?		[]	$\underline{\times}$	
	- for Endrin?			\times	
	or if Endrin aldehyde <u>and</u> 4,4'-DOD co-elute and there is a peak at their retention time, has the combined DOT and Endri breakdown exceeded 20%?	n 		\times	
	ACTION: a. If DDT breakdown is greater than 20% on quantitation col beginning with the samples following the last <u>in control</u>	umn standa	rd:		
1	 Flag all positive DOT results "J". If DOT was not detected but DOD and/or DOE are positiflag the DOT non-detect "R". Flag positive DOD and DOE results "JN". If DOT breakdown is > 20% on confirmation column and is identified on quantitation column but not on conficulum, use professional judgement to determine wheth should be reported on Form I (if reported, flag resulted) 	DDT rmation er DDT			
	b. If Endrin breakdown is > 20% on quantitation column, beg the samples following the last <u>in control</u> standard:	inning	with		
	 Flag all positive Endrin results "J". If Endrin was not detected, but Endrin Aldehyde and/o Ketone are positive, flag the Endrin non-detect "R". Flag Endrin Ketone positive results "JN". If Endrin breakdown is > 20% on confirmation column at Endrin is identified on quantitation column but not confirmation column, use professional judgement to determine whether Endrin should be reported on Form I (if reported, flag result "N"). 	nd	n		
	c. If the combined breakdown is used (it can only be used if the conditions in 7.4 above are met) and is > 20% on quantitation column beginning with the last in control standard, take the actions specified in 7.4 a and b above If the combined breakdown is >20% on confirmation column and Endrin or DDT is identified on quantitation column	.			

but not on confirmation column, use professional judgement to determine whether Endrin or DDF should be reported on

Form I (if reported, flag result "N").

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L						
	7.5	Ts the 1	inearity check RSD of all four calibration factors	YES	МО	N/A
			the quantitation column?			\angle
			If no, flag positive hits for all pesticide and PCB analytes "J" for all associated samples. Do not flag toxaphene or DOT if they are quantified from a 3-poin calibration curve.	t		
	7.6	(quantit	% difference between the EVAL A and each analysis ation and confirmation) DBC retention time within s (2% for packed column, 0.3% for capillary [I.D. m], 1% for megabore [0.32 < I.D. < 2 mm]) ?	· 		X
		ACTION:	DBC retention time cannot be evaluated if DBC is not detected. If it is present and has a retention time out of QC limits, then use professional judgement to determine the reliability of the analysis and flag results "R", if appropriate.			
l	7.7		proper analytical sequence followed for each period of analyses (page PEST D-36 in 8/87 SOW).			X
		ACTION:	If no, use professional judgement to determine the severity of the effect on the data and accept or reject it accordingly. Generally, the effect is negligible unless the sequence was grossly altered or the calibration was also out of limits.			
0	<u>Pes</u>	ticide/PC	B Standards Summary			
]	8.1	Is Form : 72 hr sec	IX present and complete for each GC column and quence of analyses?	[]		X
		ACTION:	If no, take action specified in 3.2 above.			
	8.2		e any transcription/calculation errors between and Form IX?			X
		ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
	8.3		etention time for packed columns > 12 min OV-1 and OV-101 columns)?	[]		X
		ACTION:	If no, check that there is adequate resolution between individual components. If not, flag results for compounds that interfere with each other (co-elute) "R".			
	8.4		tandard retention times fall within the windows	ſ 3		

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	ACTION:	Beginning with the samples following the last <u>in control</u> standard, check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and, DBC is visible non-detects are valid. If peaks are present and cannot be identified through "pattern recognition" or a consistent shift in standard retention times, flag all affected compound results "R".	YES	NO	N/A
8.5	factors 20% (for beginnin	continuing calibration standard calibration within 15% (for quantitation column) or confirmation column) of the initial (at g of 72 hr sequence) calibration factors?			X
		If no, flag all associated positive results "J". Use professional judgement to determine whether or not to flag non-detects.			
.0 <u>Pes</u>	ticide/PC	B Identification			
9.1	Is Form : pesticid	X complete for every sample in which a e or PCB was detected?			$\underline{\times}$
	ACTION:	If no, take action specified in 3.2 above.			
9.2	Are then data and	e any transcription errors between raw Form X?		[]	X
	ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
9.3	calculate	ntion times of sample compounds within the ed retention time windows for both quantitation immation analyses?			\times
	Was GC/Mi compound	concentration provided when required (when concentration is > 10 ug/ml in final extract)?			×
	ACTION:	Reject ("R") all positive results (meeting quantitation column criteria, but missing confirmation by a second column or GC/MS (if appropriate). Also, reject ("R") all positive results not meeting retention time window criteria unless associated standard compounds are similarly biased (i.e. base on RRT to DBC).			
9.4	the multi	romatograms for false negatives, especially for ple peak components toxaphene and PCB's. Were false negatives?		[]	X
l	ACTION:	If appropriate PCB standards were not analyzed, or if the lab performed no confirmation analysis, flag the appropriate data with an "R".			

Page: 35 of 36 Date: March 1990

10.0	Comp	ound Ou	antitation and Reported Detection Limits	YES	Ю	N/A
; }	10.1	Form I	ere any transcription / calculation errors in results? Check at least two positive values. ny errors found?		[]	X
		NOTE:	Simple peak pesticide results can be checked for rough agreement between quantitative results obtained on the two GC columns. The reviewer should use professional judgement to decide whether a much larger concentration obtained on one column versus the other indicates the presence of an interfering compound. If an interfering compound is indicated, the lower of the two values should be reported and qualified as presumptively present at an estimated quantity ("JN"). This necessitates a determination of an estimated concentration on the confirmation column. The narrative should indicate that the presence of interferences has obscured the attempt at a second column confirmation.			
! !	10.2	Are the and, fo	e CRQLs adjusted to reflect sample dilutions or soils, sample moisture?		[]	X
! !		ACTION:	If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
		ACTION:	When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.			
.0 <u>c</u>	hrom	atogram	Quality			
1	1.1 7	Were bas	selines stable?			\angle
1	.1.2 V	vere any Xeaks) (electropositive displacement (negative or unusual peaks seen?		 [] 	X
l 1	а	nalytes		<u></u>		\leq
] }	Α	CTION:	For 11.1 and 11.2, comment only. For 11.3, reject ("R") those analytes that are not sufficiently resolved.			

Page: 36 of

Date: March 1990

Revision 7

12.0 Field Duplicates

YES NO N/A

12.1 Were any field duplicates submitted for PEST/PCB analysis?

[__]

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer

narrative. However, if large differences exist, identification of field duplicates should be

confirmed by contacting the sampler.

Region II Organic Dala Valid.

ATTACHMENT 1 SOP NO. HW-6

PAGE 1 OF 12

TOTAL REVIEW

DATA ASSESSMENT: The current functional guidelines (1988) for evaluating orgadata have been applied. All data are valid and acceptable except those analytes when have been qualified with a "J" (estimated), "U" (non-detects), (unusable), or "JN" (presumptive evidence for the presence of material at an estimated value). All action is detailed on attached sheets. Two facts should be noted by all data users. First, the flag means that the associated value is unusable. In other wor due to significant QC problems the analysis is invalid and provino information as to whether the compound is present or not. values should not appear on data tables because they cannot relied upon, even as a last resort. The second fact to keep mind is that no compound concentration, even if it has passed QC tests, is guaranteed to be accurate. Strict QC serves increase confidence in data but any value potentially contagency.	ahid Case	No	S	DG No	LABORATO	RY (see behin)	SITE <u>ms+</u>	<u>s /s</u>
The current functional guidelines (1988) for evaluating orga data have been applied. All data are valid and acceptable except those analytes wh have been qualified with a "J" (estimated), "U" (non-detects), (unusable), or "JN" (presumptive evidence for the presence of material at an estimated value). All action is detailed on attached sheets. Two facts should be noted by all data users. First, the flag means that the associated value is unusable. In other wor due to significant QC problems the analysis is invalid and provino information as to whether the compound is present or not. values should not appear on data tables because they cannot relied upon, even as a last resort. The second fact to keep mind is that no compound concentration, even if it has passed QC tests, is guaranteed to be accurate. Strict QC serves increase confidence in data but any value potentially contains the second fact is the contains the confidence in data but any value potentially contains the confidence in data but any value potentially contains the confidence in data but any value potentially contains the confidence in data but any value potentially contains the confidence in data but any value potentially contains the confidence in data but any value potentially contains the confidence in data but any value potentially contains the confidence in the confidenc	MSS	= mb.	Spectral	Services,	Inc.	Versar (6	NA fractio	(n)
All data are valid and acceptable except those analytes wh have been qualified with a "J" (estimated), "U" (non-detects), (unusable), or "JN" (presumptive evidence for the presence of material at an estimated value). All action is detailed on attached sheets. Two facts should be noted by all data users. First, the flag means that the associated value is unusable. In other wor due to significant QC problems the analysis is invalid and provino information as to whether the compound is present or not. values should not appear on data tables because they cannot relied upon, even as a last resort. The second fact to keep mind is that no compound concentration, even if it has passed QC tests, is guaranteed to be accurate. Strict QC serves increase confidence in data but any value potentially contains the second contains the confidence in data but any value potentially contains the contains the confidence in data but any value potentially contains the contain	DATA	ASSESS	MENT:					
have been qualified with a "J" (estimated), "U" (non-detects), (unusable), or "JN" (presumptive evidence for the presence of material at an estimated value). All action is detailed on attached sheets. Two facts should be noted by all data users. First, the flag means that the associated value is unusable. In other wor due to significant QC problems the analysis is invalid and provino information as to whether the compound is present or not. values should not appear on data tables because they cannot relied upon, even as a last resort. The second fact to keep mind is that no compound concentration, even if it has passed QC tests, is guaranteed to be accurate. Strict QC serves increase confidence in data but any value potentially conta				_	elines (198	8) for eval	uating or	gai
due to significant QC problems the analysis is invalid and provino information as to whether the compound is present or not. values should not appear on data tables because they cannot relied upon, even as a last resort. The second fact to keep mind is that no compound concentration, even if it has passed QC tests, is guaranteed to be accurate. Strict QC serves increase confidence in data but any value potentially conta	have (unus mater	b e en q a b le), i a l a t	ualified or "JN" an est	with a "J" (presumptiv	(estimated) e evidence	for the p	-detects resence o), of
	due to no in value relie mind QC to incre	o sign format s show d upor is tha ests, ase co	ificant (ion as t ild not a i, even a t no com is guara	C problems on whether the appear on do a last repound concest to be a last to be a	the analysis he compound lata tables esort. The htration, eserciates	s is invali is presen because t second fa ven if it Strict	d and protein to real to the control of the control	ot ep ed a

ATTACHMENT 1 SOP NO. HW-6

DATA ASSESSMENT:

1. HOLDING TIME: All holding times were met

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detects (sample quantitation limits) will be flagged as estimated, "J", or unusable, "R", if the holding times are grossly exceeded.

The following action was taken in the samples and analytes shown due to excessive holding time.

DATA ASSESSMENT:

2. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip field, rinse and water blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field blanks measure cross-contamination of samples during field operations. If the concentration of the analyte is less than 5 times the blank contaminant level (10 times for the common contaminants), the analytes are qualified as non-detects, "U". The following analytes in the samples shown were qualified with "U" for these reasons:

A) Method blank contamination

None

B) Field or rinse blank contamination ("water blanks" or "distilled water blanks" are validated like any other sample)

There are no associated field or rinse blanks

C) Trip blank contamination

None

DATA ASSESSMENT:

3. MASS SPECTROMETER TUNING: All criteria were met

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds, and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organics is bromofluorobenzene (BFB) and for semi-volatiles is decafluorotriphenyl- phosphine (DFTPP).

If the mass calibration is in error, all associated data will be classified as unusable, "R".

DATA ASSESSMENT:

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) RESPONSE FACTOR:

Till quality control entena wire mel.

The response factor measures the instrument's response to specific chemical compounds. The response factor for the Target Compound List (TCL) must be ≥ 0.05 in both the initial and continuing calibrations. A value < 0.05 indicates a serious detection and quantitation problem (poor sensitivity). Analytes detected in the sample will be qualified as estimated, "J". All non-detects for that compound will be rejected ("R").

DATA ASSESSMENT:

- 5. CALIBRATION: All quality criteria were met
- A) PERCENT RELATIVE STANDARD DEVIATION (%RSD) AND PERCENT DIFFERENCE (%D):

Percent RSD is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent D compares the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be <30% and %D must be <25%. A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J" and non-detects are flagged "UJ" (if %D or RSD >50%). If there is a gross deviation of %RSD and %D, the non-detects may be rejected ("R").

For the PCB/PESTICIDE fraction, %RSD for aldrin, endrin, DDT, and dibutylchlorendate must not exceed 10%. Percent D must be within 15% on the quantitation column and 20% on the confirmation column.

DATA ASSESSMENT:

6. SURROGATES:

All samples are spiked with surrogate compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

The percent recovery of a-fluorobiphenyl for Sample MGSSOI-OI exceed quality control criteria. No action was required because only a sinsle surresate for their fraction didn't meet quality criteria. All surresate recoveries were greater than 10 percent.

(see attached Form 2D)
insert following Page 5 of Checklist

DATA ASSESSMENT: All quality criteria were met

7. INTERNAL STANDARDS PERFORMANCE:

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every experimental run. The internal standard area count must not vary by more than a factor of 2 (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary more than ± 30 seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated, "J", and all non-detects as "UJ", or "R" if there is a severe loss of sensitivity.

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgment to determine either partial or total rejection of the data for that sample fraction.

DATA ASSESSMENT:

8. COMPOUND IDENTIFICATION: All criteria were met

A) VOLATILE AND SEMI-VOLATILE FRACTIONS:

TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and by comparison to the ion spectra obtained from known standards. For the results to be a positive hit, the sample peak must be within \pm 0.06 RRT units of the standard compound and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For the tentatively identified compounds (TIC) the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

B) PESTICIDE FRACTION:

The retention times of reported compounds must fall within the calculated retention time windows for the two chromatographic columns and a GC/MS confirmation is required if the concentration exceeds 10 ng/ml in the final sample extract.

DATA ASSESSMENT: N/A

9. MATRIX SPIKE/SPIKE DUPLICATE, MS/MSD:

The MS/MSD data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for some additional qualification of the data.

DATA ASSESSMENT:

10. OTHER QC DATA OUT OF SPECIFICATION: Not 9/plicable

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued on next page if necessary):

No problems encountered

12. CONTRACT PROBLEMS NON-COMPLIANCE:

none

13. This package contains re-extraction, re-analysis or dilution. Upon reviewing the QA results, the following form I(s) are identified to be used.

Not applicable.

DATA ASSESSMENT:

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued):

No major problems encountered

(No. of Compounds/No. of Fractions (Samples)

	Date: 3/7/9/ Case #: 40	78
Type of Review: Data Validation	Lab Name: MD Spectral Services Toc. (V.	od Fraction
Project: <u>mo toro la</u>	Number of Samples: //	
Reviewer's Initials: Am 3	·	
Analytes Rejected Due to	Exceeding Review Criteria:	

			0.141	LGB Contamination Method: "Like Contamination	false tue False -ve. ID	Other	Total # Samples	Total # Rejected/ Total # in all Samples
	}	Holding Time	Calibration	Contamination	0	HA	0	0/0
Acids (15) PAH ^S 16	<u> </u>	U			0	NA	7	0/112
B/N (50)	0	0	<u> </u>	\mathcal{O}	0	NA.		0/385
VOA (35)	0	0	0	0	0	NA	///	- /-
PEST (20)	0	0	0	0	\bigcirc	NA	\bigcirc	<u>070</u>
		0			0_	NA	0	0/0
PCB (7)		0		NA				-
TCOD (1)	-			1	<u>, L </u>	<u>,L</u>		

#"M" qualified.

Analytes Estimated Due to Exceeding Review Criteria for:

	^	0	0	0	0	0	0	0/0
Acids (15) PAHJ 16 B/N (50)	\bigcirc	0	0	0	0	0	0	0/112
VOA (35)	0	0	0	Ö	0	0	0	0/385
PEST (20)	0	0	0	O	0	0	0	010
PCB (7)	0	0	0	0	0	0	0.	0/0
TCDO (1)				N/A				

ORGANIC REGIONAL DATA ASSESSMENT

	New York State Protocol (ASP89) EPA Method 8040 NYS 1989	REVIEW!	ER'S NAME _ Jean	7 mmer mar
PO:	ACTIONFYI	COMPLE	TION DATE 2 /	7 / 9 /
	DATA ASSE	SSMENT SU	MMARY	
		VOA	BNA (PAHS ONLY) PEST	OTHER
	HOLDING TIMES		O NA	
	GC/MS TUNE/INSTR. PERFORM.		0	•
	CALIBRATIONS		0	
١.	BLANKS		0	
	SURROGATES	0	X	<u> </u>
5.	MATRIX SPIKE/DUP	NA	NA	
'.	OTHER QC (TB, PB, WB)	NA_	NA	-
3.	INTERNAL STANDARDS		0	
).	COMPOUND IDENTIFICATION	_0_	0	
).	SYSTEM PERFORMANCE		0	
Ι.	OVERALL ASSESSMENT	_0_	0 4	
Y 1	O = Data had no problems/or qualified du = Data qualified due to major problems. U = Data unacceptable. X = Problems, but do not affect data.		•	
				
RE	AS OF CONCERN: X - Percent	Recovery	FBP Surregate	> Q (limi

APPENDIX A: QUALIFIED

LABORATORY RESULTS

EPA SAMPLE NO.

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Matrix: (soil/water) SOIL Lab Sample ID: 90121446

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 121446

Level: (low/med) LOW Date Received: 12/11/90

% Moisture: not dec. 5
Date Analyzed: 12/16/90

Column: (pack/cap) CAP Dilution Factor: 1.0

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) UG/KG Q

CAS NO.	COMPOUND (di	g/L or ug/kg	g) UG/KG	Q
				1
	Chloromethane		11	U
74-8 3- 9- 	Bromomethane	<u> </u>	11	ַ
75-01-4	Vinyl Chloride		11	ע
75-0 0- 3	Chloroethane		11	ע
75-0 9- 2- -	Methylene Chloride		5	ע .
67-6 4- 1- -	Acetone		11	[U
75-1 5- 0	Carbon Disulfide		5	U
75-3 5-4	1,1-Dichloroethene	1	5	ן ט
75-3 5 -3	1,1-Dichloroethane		5	U
540 -59-0	1,2-Dichloroethene (total)	5	U
67-6 6- 3	Chloroform		5 5 5 5	ַ <u></u> ַ
107-06-2	1,2-Dichloroethane		5	U
78-9 3 -3	2-Butanone		11	ַ <u>'</u>
71-5 5- 6- 	1,1,1-Trichloroethan	e	5	ן ט
56-2 3 -5	Carbon Tetrachloride		5	ן ט
108-05-4	Vinvl Acetate	1	11	ן ט
75-2 7-4	Bromodichloromethane		5	ַ ע [
78-8 7- 5	1,2-Dichloropropane		5 5 5 5 5 5 5	ן ט
10061-02-6	cis-1,3-Dichloroprop	ene	5	U
79-0 1- 6	Trichloroethene		5	ן ט
124-48-1	Dibromochloromethane		5	ו טו
79-0 0- 5- -	1,1,2-Trichloroethan	е	5	ן ט
71-43-2	Benzene		5	ן ט
10061-02-6	trans-1,3-Dichloropr	opene	5	U
75-2 5- 2- 	Bromoform		5	ן ט
108-10-1	4-Methyl-2-Pentanone		11	ן טו
591 -78-6	2-Hexanone		11	ן ט
127-18-4	Tetrachloroethene		5	ט
79-34-5	1,1,2,2-Tetrachloroe	thane	5	U
108- 88 -3	Toluene		5	ן ט
108- 90 -7	Chlorobenzene		5	ן ט
100-41-4	Ethylbenzene		5 5 5 5	ט
100-42-5	Styrene		5	Ū
133-02-7	Xylene (total)		5	Ū
				Ī
				+

FORM I VOA

1/87 Rev.

EPA SAMPLE NO.

Q

La Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

La Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Marrix: (soil/water) SOIL Lab Sample ID: 90121447

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 121447

Level: (low/med) LOW Date Received: 12/11/90

% Moisture: not dec. 17 Date Analyzed: 12/16/90

CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/KG

Cclumn: (pack/cap) CAP Dilution Factor: 1.0

COMPOUND

CAS NO.

74-87-3-----Chloromethane 12 TĪ 74-83-9-----Bromomethane 12 U 75-01-4-----Vinyl Chloride 12 U 75-00-3-----Chloroethane 12 U 75-09-2-----Methylene Chloride U 6 67-64-1-----Acetone 12 U 75-15-0-----Carbon Disulfide IJ 75-35-4----1,1-Dichloroethene_ U 6 75-35-3----1,1-Dichloroethane 6 U 540-59-0----1,2-Dichloroethene (total) 6 U 67-66-3-----Chloroform 6 U 107-06-2----1,2-Dichloroethane_ 6 U 78-93-3----2-Butanone U 12 71-55-6----1,1,1-Trichloroethane U 6 56-23-5-----Carbon Tetrachloride 6 U 108-05-4-----Vinyl Acetate U 12 75-27-4-----Bromodichloromethane 6 U 78-87-5----1,2-Dichloropropane_ 6 U 10061-02-6----cis-1,3-Dichloropropene 6 U 79-01-6-----Trichloroethene U 6 124-48-1-----Dibromochloromethane U 6 79-00-5-----1,1,2-Trichloroethane_ 6 U 71-43-2----Benzene 6 U 10061-02-6----trans-1,3-Dichloropropene 6 U 75-25-2-----Bromoform 6 U 108-10-1----4-Methyl-2-Pentanone 12 U 591-78-6----2-Hexanone 12 U 127-18-4----Tetrachloroethene 6 Ų 79-34-5----1,1,2,2-Tetrachloroethane б U 108-8**8-**3-----Toluene U 6 108-90-7----Chlorobenzene U 6 100-41-4----Ethylbenzene 6 U 100-42-5-----Styrene U 133-02-7-----Xylene (total) U

EPA SAMPLE NO.

MGSS03-01

La. Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

La: Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Marrix: (soil/water) SOIL Lab Sample ID: 90121448

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 121448

Letel: (low/med) LOW Date Received: 12/11/90

% Poisture: not dec. 19 Date Analyzed: 12/16/90

Column: (pack/cap) CAP Dilution Factor: 1.0

		CONCENTRATION UNI	ITS:	
CAS NO.	COMPOUND	(ug/ ${f L}$ or ug/ ${f K}$ g) (JG/K G	Q
		1		1
	Chloromethane	·	12	ับ
	Bromomethane		12	Ŭ
75-0 1- 4	Vinyl Chloride		12	ΙÜ
75-0 0- 3	Chloroethane		12	ַ <u>'</u>
75-0 9- 2	Methylene Chlo	ride	6	Ŭ
67-64-1	Acetone		12	ט
75 -15- 0	Carbon Disulfic		6	Ŭ
75-3 5-4	1,1-Dichloroet	hene	6	U
75-3 5- 3	1,1-Dichloroet	hane	6 6	Ū
540- 59 -0 -	1,2-Dichloroet	hene (total)	6	ַט
67-6 6- 3	Chloroform		6	U
107-06-2	1,2-Dichloroet	hane	6	ָוֹ י
78-9 3- 3	2-Butanone		12	U
71-5 5 -6	1,1,1-Trichlor	oethane	6	י ט ו
56-2 3- 5	Carbon Tetrach.	loride	6	וֹ ט
108-05-4	Vinyl Acetate_		12	ו ד
75-2 7- 4	Bromodichlorom	ethane	6	Ū
78-8 7- 5	1,2-Dichloropre	opane	6	Ū
10061-02-6	cis-1,3-Dichlo	ropropene	6	Ťΰ
79-01-6	Trichloroethen	e -	6	Ü
124-48-1	Dibromochlorom	ethane	6	ĺΰ
79-00-5	1,1,2-Trichlor	oethane	- 6	ี่ บั
71-43-2	Benzene		6	Ū
10061-02-6	trans-1,3-Dich	oropropene	6	Ŭ
75-25-2	Bromoform		6	Ü
108-10-1	4-Methyl-2-Pen	tanone	12	Ϊ́Ū
591-78-6	2-Hexanone		12	บั
	Tetrachloroeth	ene	6	Ü
	1,1,2,2-Tetrac		6	Ü
108-88-3	Toluene		6	บี
108-90-7	Chlorobenzene_		-6	ŭ
100-41-4	Ethylbenzene		6	Ü
100-42-5	Styrene		6	υ
133-02-7	Xylene (total)		6	ŭ
133 02 /3	Agresse (Cocar)		J	10

MGGW02-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121455

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID:

121455

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/16/90

Column: (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND	(ug/L or ug/)	Kg) UG/L	Q
	Chloromethane_		10	U
	Bromomethane		10	Ŭ
75-01-4	Vinyl Chloride		10	U
75-0 0 -3	Chloroethane		10	U
75-09-2	Methylene Chlo	ride	5	U
67-64-1	Acetone		10	Ū
	Carbon Disulfic		5	U
/5-35-4	1,1-Dichloroet	nene	5	ŭ
75-3 5- 3	1,1-Dichloroet	nane	5 5 5 5 5	ָטַ עַ
540-59-0	1,2-Dichloroet	nene (fotal)	5	U
	Chloroform		5	U
107-06-2	1,2-Dichloroet	hane		U
78-9 3 -3 	2-Butanone		10	ŢŪ
71-5 5 -6 	1,1,1-Trichlor	oethane	5	∐U -
56-2 3 -5	Carbon Tetrach	loride	5	IJ
108 -0 5-4	Vinyl Acetate_	/	10	Ŭ
75-2 7 -4	Bromodichlorom	ethane	5	Ŭ
78-8 7 -5	1,2-Dichloropre	opane	5	បែ
1006 1 -02-6	cis-1,3-Dichlo	ropropene	5	Ū
79-01-6	Trichloroethen	e	5	Ū
124-48-1	Dibromochlorom	ethane	5 5 5 5 5 5 5 5	บ
79-0 0- 5	1,1,2-Trichlore	oethane	5	Ū
71-43-2	Benzene		5	บั
10061-02-6	Benzene trans-1,3-Dich	loropropene	Š	Ü
75-25-2	Bromoform		5	Ū
108-10-1	4-Methyl-Z-Pen	tanone	10	ŭ
591-78-6	2-Hexanone		10	Ū
	Tetrachloroeth	ene	5	ט
	1,1,2,2-Tetrac		5 5	Ü
108 -8 8- 3-			2	บี
108-90-7	Chlorobenzene_		5	Ŭ.
100-30-7	Ethylbenzene_		5 5 5 5	Ü
100-41-4	·Styrene		ב	T U
100-42-55	Xylene (total)		5	Ü

EPA SAMPLE NO.

MGGW02-01 DP

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 90121454

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: 121454

Level: (low/med) Date Received: 12/11/90

% Moisture: not dec. Date Analyzed: 12/16/90

Column: (pack/cap) CAP Dilution Factor: 2.5

CONCENTRATION UNITS: CAS NO. COMPOUND (ug/L or ug/Kg) UG/L Q 74-8**7**-3-----Chloromethane 25 U 74-83-9-----Bromomethane 25 U 75-01-4-----Vinyl Chloride 25 U 75-00-3-----Chloroethane 25 U 75-09-2-----Methylene Chloride 13 U 67-64-1------Acetone 25 U 75-15-0-----Carbon Disulfide 13 U 75-35-4----1,1-Dichloroethene_ 13 U 75-35-3----1,1-Dichloroethane 13 U 540-59-0----1,2-Dichloroethene (total) 13 U 67-66-3-----Chloroform U 13 107-06-2----1,2-Dichloroethane 13 Ŭ 78-93-3----2-Butanone 25 U 71-5**5**-6-----1,1,1-Trichloroethane 13 U 13 56-23-5-----Carbon Tetrachloride U 108-05-4-----Vinyl Acetate 25 U 75-27-4-----Bromodichloromethane U 13 78-87-5-----1,2-Dichloropropane_ 13 U 10061-02-6----cis-1,3-Dichloropropene_ 13 U 79-01-6----Trichloroethene 13 U 124-48-1-----Dibromochloromethane 13 Ų 79-0**0**-5----1,1,2-Trichloroethane 13 U 71-43-2----Benzene 13 U 10061-02-6----trans-1,3-Dichloropropene 13 U 75-25-2----Bromoform 13 U 108-10-1----4-Methyl-2-Pentanone 25 U 591-78-6----2-Hexanone 25 U 127-18-4-----Tetrachloroethene 13 U 79-34-5----1,1,2,2-Tetrachloroethane 13 U 108-88-3----Toluene 13 U 108-90-7-----Chlorobenzene 13 U 100-41-4----Ethylbenzene 13 U 100-42-5----Styrene 13 U 133-02-7------Xylene (total)

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 90121453

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: 121453D

Level: (low/med) Date Received: 12/11/90

% Moisture: not dec. Date Analyzed: 12/15/90

Column: (pack/cap) CAP Dilution Factor: 2.5

CAS NO.	COMPOUND		ATION UNITS: ug/Kg) UG/L	a
			,	1
74-8 7- 3- -	Chloromethane		25	ט
74-83-9	Bromomethane		2.5	ט ד
75-01-4	Vinyl Chloride		25	
75-00-3	Chloroethane		25	י ט'
75-09-2	Methylene Chlo	ride		
67-64-1	Acetone		25	
75-15-0	Carbon Disulfi	de	13	
75-35-4	1,1-Dichloroet	hene	13	
75-35-3	1,1-Dichloroet	hane	i	
540-59-0	1,1-Dichloroet 1,2-Dichloroet	hene (total)	13	
67-66-3	Chloroform	· · · · · · · · · · · · · · · · · · ·	13	
	1,2-Dichloroet	hane	13	
	2-Butanone			1 -
	1,1,1-Trichlor	cethane	390	
	Carbon Tetrach		13	
108-05-4	Vinyl Acetate		25	
75-27-4	Bromodichlorom	ethane		
79-97-5	1,2-Dichloropr	chane	13	
10061-02-6	cis-1,3-Dichlo	opane	— l 13	
70-01-6	·Trichloroethen	robrobette		
	Dibromochlorom		44	
			13	
	1,1,2-Trichlor	oetnane	13	
/1-43-2	Benzene	·		
10061-02-6	trans-1,3-Dich	toropropene_	13	
75-25-2	Bromoform		13	
108-10-1	4-Methyl-2-Pen	tanone	2.5	
	2-Hexanone		2.5	
	Tetrachloroeth		13	
	<u>1</u> , <u>1</u> ,2,2-Tetrac	hloroethane_		
108-88-3				
108-9 0 -7	Chlorobenzene_		13	
100-41-4	Ethylbenzene		13	ี [บ
100-42-5	Styrene			ប
133-02-7	Xylene (total)		13	ប

EPA SAMPLE NO.

MGGW04-01

La: Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lat. Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121449

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121449

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/15/90

Column: (pack/cap) CAP

Dilution Factor: 1.0

CAS NO. COMPOUND

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Q

CAS NO.	COMPOUND (ug/h of ug/		*
	Chl augusthana	10	**
	Chloromethane	10	Ŭ
74-83-9	Bromomethane	10	ŭ
75-01-4	Vinyl Chloride	10	Ŭ
75-00-3	Chloroethane	10	U
75-0 9 -2 	Methylene Chloride	5	Ŭ
67-64-1	Acetone Carbon Disulfide	10	U
75-1 5 -0	Carbon Disulfide	5	ט
75-3 5 -4	1,1-Dichloroethene	5	U
75-3 5 -3	1,1-Dichloroethane 1,2-Dichloroethene (total)	5	Ŭ
540 -5 9 -0	1,2-Dichloroethene (total)	5	υ
67-6 6 -3 <i></i>	Chloroform	5 5 5 5 5 5	U
107- 0 6-2	1,2-Dichloroethane	5	U
78-9 3 -3	2-Butanone	10	U
71-5 5 -6 -	1,1,1-Trichloroethane	5 [Ŭ
56-2 3- 5	Carbon Tetrachloride	5	U
108- 0 5-4	Vinyl Acetate	10 [U
75-2 7-4		- 5	U
78-8 7 -5	1.2-Dichloropropane	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	U
1006 1 -02-6	cis-1.3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-0 0- 5 	1,1,2-Trichloroethane	5	U
71-43-2	Benzene trans-1,3-Dichloropropene	5	U
10061-02-6	trans-1.3-Dichloropropene	5	Ū
75-2 5 -2	Bromoform	5	Ū
108-10-1	4-Methyl-2-Pentanone	10	Ū
		10	Ū
127-18-4	2-Hexanone		Ŭ
79-34-5	1,1,2,2-Tetrachloroethane	Š	Ŭ
108-88-3	Toluene	5 1	Ŭ
108-90-7	Chlorobenzene	5	Ŭ
100-41-4	Ethylbenzene	5 5 5 5 5	Ŭ
100-42-5	Styrene	7	ับ
133-02-7	Xylene (total)	5	บั
133-02-13	Allene (cocal)	٦	9

EPA SAMPLE NO.

MGRW01-01

SDG No.:

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.:

% Moisture: not dec.

Lab Sample ID: 90121450 Matrix: (soil/water) WATER

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: 121450

Date Received: 12/11/90 Level: (low/med) Date Analyzed: 12/15/90

Dilution Factor: 1.0 Column: (pack/cap) CAP

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or	ug/Kg)	UG/L	Q
74 07 3	Oblamanthama			10	ָ _U
	Chloromethane_	 		10	Ü
	Bromomethane				ם ח
75-01-4	Vinyl Chloride	<u> </u>		10	-
75-00-3	Chloroethane Methylene Chlo	ara a		10	บ บ
		eride	<u> </u>	5	_
67-64-1	Carbon Disulfi	do		10 5	ָ ט
75-25-4	1,1-Dichloroet	hene	!	5	บั
75-35-4	1,1-Dichloroet	hane		5	บ
540- 5 0-0	1,1-Dichloroet	hono (total)		5	ü
540-59-0	1,1-Dichloroet 1,2-Dichloroet Chloroform_	mene (cocar)		5 5 5	Ü
107-06-3	1,2-Dichloroet	hano	I	5	Ü
70/-06-2	1,2-bichioroet 2-Butanone	.nane		10	ָ ט
				10	
/1-55-5	1,1,1-Trichlor Carbon Tetrach	lorido	<u></u> 1	5 5	U
		itotide	 j	10	Ŭ
108-05-4	Vinyl Acetate			10	Ū
/5-2/-4	Bromodichloro	etnane	·	5 5 5 5 5 5 5 5 5	U
78-87-5	1,2-Dichloropr	opane		5	ū
10061-02-6	cis-1,3-Dichlo	ropropene		5	U
	Trichloroether		l	5	U
124-48-1	Dibromochlorom	etnane	<u> </u>	5	U
79-00-5	1,1,2-Trichlor	coetnane		5	U
71-43-2	Benzene_			5	U
10061-02-6	trans-1,3-Dick	lloropropene_	İ	5	U
75-25-2	Bromoform_	·-, · . · . · . · ·		5	Ŭ
108-10-1	4-Methyl-2-Per	ntanone		10	U
	2-Hexanone		I	10	U
	Tetrachloroeth		1	5	Ŭ
79-34-5	1,1,2,2-Tetrac	chloroethane_	1	5	U
108-88-3	Toluene		1	5	ַ ט
	Chlorobenzene		[5	[บ
	Ethylbenzene			5 5 5 5 5 5 5 5	Ŭ
100-42-5	Styrene			5	บ
133-02-7	Xylene (total)			5	ับ
					<u> </u>

EPA SAMPLE NO.

MGRW02-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS

Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121451

Sample wt/vol:

5.0 (g/mL) ML

Lab File ID:

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/15/90

Column: (pack/cap) CAP

Dilution Factor: 1.0

CAS NO.

COMPOUND

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND	(49/11	or ug/Kg)	00/11	Q
74-97-3	Chloromethane			1.0	
74-87-3	Bromomethane			10 10	บ บ
75-01-4	Vinyl Chloride		 -	10	ט
75-01-4	Chloroethane		1	10	ט
75-00-3	Methylene Chlo	2140			
75-09-2	Acetone	t tue		5	U U
75-15-0	Carbon Disulfic	30		10	Ü
75-25-4	1,1-Dichloroet	2000		5 5 5 5 5 5 5	บี
75-35-3	1,1-Dichloroet	16116	[5	Ü
540-59-0	1,2-Dichloroet	name (tota	• · · · · (5	Ü
67-66-3	Chloroform	rene (coca.	*' [5	Ü
	1,2-Dichloroet	2200		5	ט
	2-Butanone	10116		10	Ü
71-55-6	1,1,1-Trichlore	acthana	 !		
56-23-5	Carbon Tetrach	Jethane		5 5	ָ ט
100-05-4	Vinyl Acetate	rorrae			
75 27 4	Bromodichlorom			10	U
75-27-4	1,2-Dichloropre	ethane		5 5 5 5 5 5 5 5 5	U
10061 03 6	I, 2-Dichtoropro	opane		5	U
10061-02-6-	cis-1,3-Dichlo	ropropene_		5	U
/9-01-6	Trichloroethen	 		5	U
124-48-1	Dibromochlorom	etnane	 	5	U
79-00-5	1,1,2-Trichlore	pethane		5	Ŭ
71-43-2	Benzene			5	Ŭ
10061-02-6-	trans-1,3-Dich	loropropen	e	5	U
75-25-2	Bromoform			5	Ŭ
	4-Methyl-2-Pen			10	U
591-78-6	2-Hexanone Tetrachloroethe			10	U
127-18-4	Tetrachloroeth	ene		5	Ŭ
79-34-5	1,1,2,2-Tetrac	nloroethan	e	5	U
108-88-3	Toluene			. 5	Ŭ
108-90-7	Chlorobenzene_			5 5 5 5 5	ַ <u>U</u>
100-41-4	Ethylbenzene			5	Ŭ
100-42-5	Styrene				[บ
133-02-7	Xylene (total)			5	Ĭΰ

EPA SAMPLE NO.

MGRW03-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121452

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121452

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/15/90

CONCENTRATION UNITS:

Column: (pack/cap) CAP

Dilution Factor: 1.0

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane		10	ט -
	Bromomethane		10	[.บ
75-01-4	Vinyl Chloride	9	10	[ซ
	Chloroethane		10	[ซ
75-09-2	Methylene ChTo	oride	5	[U
	Acetone		10	ับ
75-1 5 -0 -	Carbon Disulf:	ide	5	ט
75-3 5-4	1,1-Dichloroet	thene	5	ט
75-3 5 -3 	1,1-Dichloroet	thane	5	U
540 -5 9 -0	1,2-Dichloroet	thene (total)	5	ט
	Chloroform	,	5	ן ט
107-06-2	1,2-Dichloroet	thane	5 5 5 5 10	ט
78-9 3 -3	2-Butanone		10	បៃ
71-5 5 -6	1,1,1-Trichlor	roethane	5	י ו
56-2 3- 5	Carbon Tetrach	nloride	5	ט ו
108-05-4	Vinyl Acetate		10	ט
	Bromodichloro	nethane	5	ט
78-8 7- 5	1,2-Dichloropa	copane		ן ען
10061-02-6	cis-1,3-Dichlo	propropene	5	โบ้ ไ
79-01-6	Trichloroether	ne	5	บ
124-48-1	Dibromochlorom	nethane	5	tū l
79-0 0- 5	1,1,2-Trichlor	roethane	5	וֹט ו
71-43-2	Benzene		5	Tu l
10061-02-6	trans-1,3-Dic	loropropene	5 5 5 5 5 5 5 5 5	lu l
75-2 5 -2	Bromoform		5	U
	4-Methyl-2-Per	ntanone	10	บี
	2-Hexanone		10	ט
127-18-4	Tetrachloroeth	nene	5	ט ו
	1,1,2,2-Tetrac			U
108-88-3			5	U
108-90-7	Chlorobenzene		5	Ū
	Ethylbenzene		5 5 5 5 5	Ū
100-42-5			5	Ū
	Xylene (total)		5	Ū
	- ,			
				• —— •

EPA SAMPLE NO.

TRIP-BLANK

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER .

Lab Sample ID: 90121456

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: 121456

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/16/90

Dilution Factor: 1.0

Column: (pack/cap) CAP

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/		Q
74-87-3 74-83-9 75-01-4 75-09-2 67-64-1 75-35-4 75-35-3 67-66-3 78-93-3 107-06-2 78-93-3 108-05-4 75-27-4 124-48-1 124-48-1 124-48-1 124-48-1 124-48-1 124-48-1 124-48-1 124-48-1 124-48-1 124-48-1 124-48-1 124-13-2 1061-02-6 75-25-2 108-10-1 127-18-4 108-88-3 108-90-7 100-41-4 100-42-5	ChloromethaneBromomethaneVinyl ChlorideChloroethaneMethylene ChlorideCarbon Disulfide1,1-Dichloroethe1,2-Dichloroethe1,2-Dichloroethe2-Butanone1,1,1-TrichloroeCarbon TetrachloroetheVinyl AcetateBromodichlorome1,2-Dichloroethe1,2-Dichloroethe	ide eene ane ene (total) ane ethane oride thane opropene thane ethane opropene	10 10 10 10 10 10 10 10 10 10 10 10 10 1	מממממממממממממממממממממממממממ

Name: <u>VERSAR INC</u>	Contract	:	MGGW02-01
code: <u>VERSAR</u> Case No.	: 4078 SAS No.	: SDG	No.: 2
taix: (soil/water) <u>WATER</u>		Lab Sample ID:	39835
mple wt/vol: 870	(g/mL) ML	Lab File ID:	W1510
v1: (low/med) <u>LOW</u>		Date Received:	12/11/90
Moisture: not dec	dec	Date Extracted:	12/12/90
taction: (SepF/Cont/Son	CONT	Date Analyzed:	01/11/91
Cecleanup: (Y/N) N	рн:	Dilution Factor	: 0.50
CAS NO. COMPO		ENTRATION UNITS: L or ug/Kg) <u>UG/L</u>	. Q
91-20-3Napht 208-96-8Acena 83-32-9Acena 86-73-7Fluor 85-01-8Phena 120-12-7Anthr 206-44-0Fluor 129-00-0Pyren 56-55-3Benzo 218-01-9Benzo 207-08-9Benzo 50-32-8Benzo 193-39-5	phthylene phthene ene acene anthene (a) anthracene ene (b) fluoranthene (k) fluoranthene (a) pyrene (1,2,3-cd) pyrene (a,h) anthracene		6 UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU

Mame: VERSAR INC		Contract:		MGC	W02-01DP
Code: <u>VERSAR</u>				No.:	2
x: (soil/water)	WATER	I	Lab Sample ID:	3983	34
mple wt/vol:	910 (g/mL) ML	I	Lab File ID:	<u>W150</u>)9
(low/med)	LOW	I	Date Received:	12/1	11/90
Maisture: not dec.	dec	[Date Extracted:	12/1	<u>12/90</u>
raction: (SepF/	Cont/Sonc) <u>CO</u>	<u>nt</u> i	Date Analyzed:	01/	11/91
Calleanup: (Y/N)	<u>N</u> pH:		Dilution Factor	: <u>0.5</u>	50
CAS NO.	COMPOUND		ration units: or ug/Kg) <u>UG/L</u>	-	Q
208-96-8 83-32-9 86-73-7 85-01-8 120-12-7 206-44-0 129-00-0 56-55-3 218-01-9 205-99-2 207-08-9 50-32-8 193-39-5	NaphthaleneAcenaphthyleneAcenaphtheneFluorenePhenanthreneAnthraceneFluoranthenePyreneBenzo(a) anthraChryseneBenzo(b) fluoraBenzo(k) fluoraBenzo(a) pyreneIndeno(1,2,3-c)Dibenz(a,h) ant	nthene nthene cd)pyrene		5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	ח מ מ מ מ מ מ מ מ מ מ מ

Name: VERSAR INC	Contract:		MGGWU3-U1
Code: <u>VERSAR</u> Case No.: 4078	_ SAS No.:	SDG N	No.: 2
ix: (soil/water) WATER	Lab Sa	ample ID:	39833
ple wt/vol: <u>1000</u> (g/mL)	ML Lab F.	ile ID:	W1508
l: (low/med) <u>LOW</u>	Date 1	Received:	12/11/90
oisture: not dec dec.	Date	Extracted:	12/12/90
raction: (SepF/Cont/Sonc)	CONT Date	Analyzed:	01/11/91
Cleanup: (Y/N) N pH:	Dilut	ion Factor:	0.50
CAS NO. COMPOUND	CONCENTRATION (ug/L or ug/		Q
91-20-3Naphthalene 208-96-8Acenaphthyle 83-32-9	pracene		5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5

Name: VERSAR INC	Contract:	MGC	3WU4-U1
Code: VERSAR Case No.: 4078		_ SDG No.:	2
rx: (soil/water) WATER	Lab Sam	ple ID: <u>398</u> 3	32
iple wt/vol: 950 (g/mL) 1	<u>ML</u> Lab File	e ID: <u>W15</u> (07
/e: (low/med) LOW	Date Re	ceived: <u>12/1</u>	11/90
Moisture: not dec dec	Date Ex	tracted: <u>12/</u>	12/90
traction: (SepF/Cont/Sonc)	<u>CONT</u> Date An	alyzed: 01/	11/91
leanup: (Y/N) N pH:	Dilutio	n Factor: <u>0.</u>	50
CAS NO. COMPOUND	CONCENTRATION (ug/L or ug/K		Q
91-20-3Naphthalene 208-96-8Acenaphthylen 83-32-9Acenaphthene	ne	5 5 5	บ บ บ
86-73-7		5 5 5 5	U U U
129-00-0Pyrene 56-55-3Benzo(a)anth: 218-01-9Chrysene	racene	5 5 5	บ บ บ
205-99-2Benzo(b) fluo: 207-08-9Benzo(k) fluo: 50-32-8Benzo(a) pyre:	ranthene ranthene ne	5 5 5	U U U
193-39-5Indeno(1,2,3- 53-70-3Dibenz(a,h)a: 191-24-2Benzo(g,h,i)	nthracene	5 5 5	ט ט ט

	MGSS01-01
Name: <u>VERSAR INC</u> C	
Code: <u>VERSAR</u> Case No.: 4078	
ix: (soil/water) <u>SOIL</u>	Lab Sample ID: 39829
mple wt/vol: 30.6 (g/mL) G	Lab File ID: W1536
l: (low/med) LOW	Date Received: <u>12/11/90</u>
Moisture: not dec. 10 dec.	Date Extracted: 12/12/90
action: (SepF/Cont/Sonc) SONC	Date Analyzed: 01/14/91
Cleanup: (Y/N) N pH: 7.	7 Dilution Factor: 4.0
	CONCENTRATION UNITS:
CAS NO. COMPOUND	(ug/L or ug/Kg) UG/KG Q
91-20-3Naphthalene	1400 U
208-96-8Acenaphthytene	1400 0
83-32-9Acenaphthene	1400 U
86-73-7Fluorene	1400 U
■ 85-01-8Phenanthrene	1400 U
120-12-7Anthracene	1400 U
206-44-0Fluoranthene	1400 U
129-00-0Pyrene	1400 U
56-55-3Benzo(a) anthrace	ene 1400 U
218-01-9Chrysene	1400 U
205-99-2Benzo(b) fluorant	hene 1400 U
207-08-9Benzo(k) fluorant	heneU
50-32-8Benzo(a)pyrene	1400 U
193-39-5Indeno(1,2,3-cd)	pyrene 1400 U
53-70-3Dibenz(a,h)anthr	racene 1400 U
191-24-2Benzo(g,h,i)pery	lene 1400 U

MGSS02-01 Name: VERSAR INC Contract: tode: VERSAR Case No.: 4078 SAS No.: ____ SDG No.: 2 Lab Sample ID: 39830 ix: (soil/water) SOIL ple wt/vol: 30.5 (g/mL) G____ Lab File ID: W1514 (low/med) LOW Date Received: 12/11/90 Moisture: not dec. 19 dec. Date Extracted: 12/12/90 ction: (SepF/Cont/Sonc) SONC Date Analyzed: 01/11/91 Dilution Factor: 1.0 Cleanup: (Y/N) N pH: 6.8 CONCENTRATION UNITS: CAS NO. COMPOUND (ug/L or ug/Kg) UG/KG Q 400 U 91-20-3-----Naphthalene 208-96-8-----Acenaphthylene 400 U 83-32-9----Acenaphthene 400 U 86-73-7----Fluorene 400 U U 85-01-8-----Phenanthrene 400 U 120-12-7-----Anthracene 400 206-44-0----Fluoranthene 400 U 129-00-0-----Pyrene 400 U 56-55-3----Benzo(a) anthracene 400 U 218-01-9-----Chrysene 400 U U 205-99-2----Benzo(b) fluoranthene 400 207-08-9----Benzo(k) fluoranthene____ 400 U 50-32-8-----Benzo(a)pyrene 400 U 193-39-5----Indeno(1,2,3-cd)pyrene 400 U 53-70-3----Dibenz(a,h)anthracene 400 U 191-24-2----Benzo(g,h,i)perylene____ 400 U

MGSS03-01 Name: VERSAR INC _____ Contract: ____ Code: VERSAR Case No.: 4078 SAS No.: SDG No.: 2 ix: (soil/water) SOIL Lab Sample ID: 39831 30.7 (g/mL) G le wt/vol: Lab File ID: W1515 Date Received: (low/med) LOW___ 12/11/90 Noisture: not dec. ____ dec. ____ Date Extracted: 12/12/90 ction: (SepF/Cont/Sonc) SONC Date Analyzed: 01/11/91 Cleanup: (Y/N) N pH: 6.6 Dilution Factor: 1.00 CONCENTRATION UNITS: CAS NO. COMPOUND (ug/L or ug/Kg) UG/KG 0 91-20-3-----Naphthalene 400 U 208-96-8-----Acenaphthylene 400 U 83-32-9----Acenaphthene 400 U 86-73-7-----Fluorene 400 U 85-01-8-----Phenanthrene 400 U 120-12-7-----Anthracene 400 U 206-44-0----Fluoranthene U 400 129-00-0----Pyrene 400 U 56-55-3----Benzo(a) anthracene___ 400 U 218-01-9-----Chrysene 400 U 205-99-2----Benzo(b) fluoranthene 400 U 207-08-9----Benzo(k) fluoranthene 400 U 50-32-8-----Benzo(a)pyrene_ 400 U 193-39-5----Indeno(1,2,3-cd)pyrene 400 U 53-70-3----Dibenz(a,h)anthracene____ U 400 191-24-2----Benzo(g,h,i)perylene____ 400 U

Wersar Laboratories inc.

ANALYSIS REPORT General Inorganic Chemistry Section

DATE: 04-JAN-91

CODE / CONTROL #: HYDROSEA / 4078 CLIENT / SITE: HYDROSEARCH / MOTOROLA PROJECT / BATCH: 420.98.0 / 2

PAGE: 1

Lab#	Field #	TOTAL PHENOL (mg/L)	
39847 39848 39849 39850	MGGW04-01 MGGW03-01 MGGW02-01DP MGGW02-01	< 0.010 0.060 < 0.010 < 0.010	
			-

C. Throson Laboratory Manager

APPENDIX B: TICS

1E VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGSS01-01

L: Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

La Code: MSS

Case No.: VR4078 SAS No.:

SDG No.:

M: rix: (soil/water) SOIL

Lab Sample ID: 90121446

Sa ple wt/vol:

5.0 (g/mL) G

Lab File ID: 121446

Le il: (low/med) LOW

Date Received: 12/11/90

% pisture: not dec. 5

Date Analyzed: 12/16/90

Cc umn (pack/cap) CAP

Dilution Factor: 1.0

Nu per TICs found: 0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
				=====

1E VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGSS02-01

La Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

La Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Ma:rix: (soil/water) SOIL

Lab Sample ID: 90121447

Sa. ple wt/vol: 5.0 (g/mL) G

Lab File ID: 121447

Le el: (low/med) LOW

Date Received: 12/11/90

% : pisture: not dec. 17

Date Analyzed: 12/16/90

Column (pack/cap) CAP

Dilution Factor: 1.0

Nu. per TICs found: 0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
Į	= =====================================	=======================================	*****		=====

1E VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGSS03-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) SOIL

Lab Sample ID: 90121448

Sample wt/vol:

5.0 (g/mL) G

Lab File ID: 121448

Level: (low/med) LOW

Date Received: 12/11/90

% Moisture: not dec. 19

Date Analyzed: 12/16/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1E VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGGW04-01

La. Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

La: Code: MSS Case No.: VR4078 SAS No.: SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121449

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID:

121449

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/15/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found:

CAS NUMBER COMPOUND NAME RT EST. CONC.

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGRW01-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS

Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121450

Sample wt/vol:

5.0 (g/mL) ML

Lab File ID:

121450

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/15/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found: 0

,	CAS NUMB E R	COMPOUND NAME	RT	EST. CONC.	0
	*********			**********	=====
					·

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGRW02-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121451

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121451

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/15/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found:

EST. CONC. CAS NUMBER COMPOUND NAME RT

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

MGRW03-01

Lab Code: MSS Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121452

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID:

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/15/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found: 0

1	•	,	'		
	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
	=======================================				=====

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGGW03-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS

Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121453

Sample wt/vol:

5.0 (g/mL) ML

Lab File ID: 121453D

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/15/90

Dilution Factor: 2.5

Column (pack/cap) CAP

Number TICs found: 1

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	<i>.</i>	<u> </u>			
	cas numb er	COMPOUND NAME	RT	EST. CONC.	Q
1	=======================================				=====
	76-13-1	1,1,2-TRICHLOROTRIFLUOROETHAN	E 10.50	50	J

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGGW02-01 DP

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121454

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID:

121454

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/16/90

Column (pack/cap) CAP

Dilution Factor: 2.5

Number TICs found:

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	•				
	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
=	******				=====

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGGW02-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121455

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID:

121455

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/16/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found:

CAS NUMB E R	COMPOUND NAME	RT	EST. CONC.	Q
**========		=======	=========	.====
				l !

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

TRIP-BLANK

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4078

Lab Code: MSS

Case No.: VR4078 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID:

90121456

Sample wt/vol:

5.0 (g/mL) ML

Lab File ID:

121456

Level: (low/med)

Date Received: 12/11/90

% Moisture: not dec.

Date Analyzed: 12/16/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS:

Number TICs found:

(ug/L or ug/Kg) UG/L

•				l j
CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	
=======			*******	=====
			•	

Control No. 4078/4/01 - Make

STANDARD OPERATING PROCEDURE	Page 4 or 35		
Title: Evaluation of Metals Data for the Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)	Date: Feb. 1990 Number: HW-2 Revision: 10		
A.I.1 Contract Compliance Screening Report (CCS) - Present? ACTION: If no, contact RSCC.	YES NO NA		
A.1.2 Record of Communication (from RSCC) - Present? ACTION: If no, request from RSCC.	<u></u>		
ACTION: If no, contact RSCC for trip report.	[_]		
A.1.4 Sample Traffic Report - Present or on file? Legible? ACTION: If no, request from Regional Sample Control	[]		
Center (RSCC). ** NOT PROVIDED BY CONTRACTOR. A.1.5 Cover Page - Present? Is cover page properly filled in and signed by the lab manager or the manager's designee?	[<u>/</u>]		
ACTION: If no, prepare Telephone Record Log, and contact laboratory.			
Do numbers of samples correspond to numbers on Record of Communication? * RECC NOT PRONDED BY CONTRACTOR. Do sample numbers on cover page agree with sample numbers on:			
(a) Traffic Report Sheet? **TRAFFIC REDURT NOT PROVIDED BY CONTRACTOR. (b) Form I's?			
ACTION: If no for any of the above, contact RSCC for clarification.			

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Title: Evaluation of Metals for the Contract

Laboratory Program

Appendix A.1: Data Assessment - Contract Compliance (Total Review - Imorganics)

Date: Feb. 1990 Number: HW-2 Revision: 10

l.			
	Other Metals analysis to	YES	NO N/A
	Other Metals analysis (6 months) exceeded?		t√1
	NOTE: Prepare a list of all samples and analytes for which holding times have been exceeded. the number of days from date of collection of preparation (from raw data). Attach to determine the collection of preparation (from raw data).	Specify to the date Thecklist.	
	ACTION: If yes, reject (red-line) values less than Instrument Detection Limit (III) and flag as estimated (J) the values above III even though sample(s) was preserved properly.		
A.1.8	Ray Data		
A.1.8.	l Digestion Log* for flame AA/ICP (Form XIII) present?	1/1	
	Digestion Log for furnace AA Form XIII present?	· <u>·</u> ·	
ı	Distillation Log for mercury Form XIII present?	[_]	
	Distillation Log for cyanides Form XIII present?	[]	
	Are pH values (pH<2 for all metals, pH>12 for cyanide) present?	٠،	<u>~</u>
)	*Weights, dilutions and volumes used to obtain values.	[]	
	Percent solids calculation present for soils/sediments	7 [/]	
	Are preparation dates present on Digestion Log?		
A.1.8.2	Measurement read out record present? ICP		
	Flame AA	[]	<u> </u>
	Furnace AA		
	Mercury	[]	
)	Cyanides	f t	1/

Title:	Evaluation of Metals Data for the Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)	Number	Feb. 199 : HW-2 on: 10	
		YES	NO	N/3
	ACTION: Flag associated data as estimated if standards are not within ±10% of true values (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.			
A.1.9.1	3 Is correlation *coefficient less than 0.995 for:			
	Mercury Analysis?	- <u></u>	[]	<u>:/</u>
	(Net applicable to Titumbus Method) Atomic Absorption Analysis?			<u></u>
<u>ACTI</u> (N: If yes, flag the associated data as estimated.			
A.1.9.2	Form II A (Initial and Continuing Calibration Verification	<u>ຫ</u> − ຶ		
A.1.9.2.	l Present and complete for every metal and cyanide?	$(\sqrt{1})$		
	Present and complete for AA and ICP when both are used for same analyte?	[]	 -	<u> </u>
	ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.			
A.1.9.2.	Circle all values on data summary sheet that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?	,		
	Metals 90-110%	<u>[\sqrt{3}</u>		
	Hg - 80-120%	[]		
	Cyanides 85-115%	[]		<u>~</u>

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 $[\]star$ The reviewer will calculate correlation coefficient.

Title: Evaluation of Metals Data for the

Narrative.

Page 10 of 35

Date: Feb. 1990

7	Appendix A	aboratory Program A.1: Data Assessment - Contract (Total Review - Inorganics)	Date: Fe Number: Revision:	HW-2	
A.1.9.3.2	Was CRI	analyzed after ICV/ICB and before the final 3, and for every four hours of ICP rum?	YES []	70	N/A
	ACTION:	If no, write in Contract Problem/Non-Compliance Section of the "Data Assessment Narrative".	è		
A.1.9.3.3	Circle acc ep ta	all values on summary sheet that are outside not windows.			
	Are CRA	and CRI standards within control limits: Metals 80 - 120%R?	[
	Is mid-	range standard within control limits: Cyanide 80 - 120%R?	[] _		
	ACTI Q I:	Flag as estimated all data within the affected ranges if the recovery of the standard is between 50-79%; flag only positive data if the recovery is between 121-150%; reject (red line) all data if the recovery is less than 50%; reject only positive data if the recovery is greater than 150%.			
A.1.9.4	Form III	(Initial and Continuing Calibration Blanks)			
A.1.9.4.1	Present	and complete?	[·
	For both	AA and ICP when both are used for same analyte?	[]		\leq
	Was an i	nitial calibration blank analyzed?	[1]		
	Was a co every 10 frequent	ntinuing calibration blank analyzed after samples or every 2 hours (whichever is more)?			
	ACTION:	If no, prepare Telephone Record Log, contact laboratory and write in the contract-problems/non-compliance section of the Data Assessment			

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11tle: 	Contract I Appendix A	n of Metals Data for the Laboratory Program A.l: Data Assessment - Contract e (Total Review - Inorganics)	Date: Fe Number: Revision:	H.√-2)
	<u>actio</u> n:	If yes, reject (red-line) all associated data greater than CRDL concentration but less than times the prep. blank value found in the raw da	YES en ta.	NO	N/A
A.1.9.5.	.3 Do cond IDL whe	entrations of prep. blank fall below two times in IDL is greater than CRDL?	[]		$\sqrt{}$
	<u>achio</u> n:	If no, reject (red-line) all positive data that has a concentration less than 10 times the prep. blank value in the raw data.			
A.1.9.5.	4 Is conc	entration of prep. blank below the negative CRDL?		<u>[\sqrt{1}]</u>	
	<u>actio</u> y:	If yes, reject (red-line) all associated data that has a concentration less than 10xCRDL.			
A.1.9.6	Form IV	(1CP Interference Check Sample)	/		
A.1.9.6.	l Pres e nt	and complete?	[]		
	(NOTE:	Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)			
	Was ICS (or at	analyzed at beginning and end of run least twice every 8 hours)?	[]		
	ACTION:	If no, flag as estimated (J) all samples for which AL, Ca, Fe, or Mg is higher than in ICS.			
A.1.8.6.2	than + 2	all values on Data Summary Sheet that are more 20% of true or established mean value. Are all rence Check Sample results inside of control (+ 20%)?	[<u>√</u>]		
	If n o, i than i n	is concentration of Al, Ca, Fe, or Mg lower ICS?	[]		$\sqrt{}$
		If no, flag as estimated (J) those positive sults for which ICS recovery is between 121-150%;			

flag all sample results as estimated if ICS recovery falls within 50-79%; reject (red-line) those sample results for which ICS recovery is less than 50%; if ICS recovery is above 150%, reject positive results only (not flagged with a "U").

SDAYCHAD OFFRATER PROCEDURE Page 14 of 35 Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Appendix A.1: Data Assessment - Contract Number: H~-2 Revision: 10 Compliance (Total Review - Inorganics) N/A Are results outside the control limits (75-125%) flagged with "N" on Form I's and Form VA? ACTION: If no, write in the Contract - Problem/Non -Compliance section of "Data Assessment Narrative". A.1.9.7.4 <u>Acreeus</u> Are any spike recoveries: (a) less than 30%? (b) between 30-74%? (c) between 126-150%? (d) greater than 150%? ATTION: If less than 30%, reject all associated aqueous data; if between 30-74%, flag all associated agreeus data as estimated (J); if between 126-150%, flag as estimated (J) all associated agreeous data not flagged with a "U"; if greater than 150%, reject (red-line) all associated aqueous data not flagged with a mum. A.1.9.7.5 <u>Soil/Sediment</u> Are any spike recoveries: (a) less than 10%? (b) between 10-74%? (c) between 126-200%?

ACTION: If less than 10%, reject all associated data; if between 10-74%, flag all associated data as estimated; if between 126-200%, flag as estimated all associated data was not flagged with a "U"; if greater than 200%, reject all associated data not flagged with a "U".

(d) greater than 200%?

STANDARD OPERATING PROCEDURE Page 16 01 35 Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Number: HN-2 Appendix A.1: Data Assessment - Contract Revision: 10 Compliance (Total Review - Inorganics) YES $N\!O$ $N\Delta$ 2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria. A.1.9.8.4 Is any value for sample duplicate pair less than CROL* and other value greater than or equal to 10 x *CRDL? ACTION: If yes, flag the associated data as estimated (J). A.1.9.8.5 Agueous Circle all values on Data Summary Sheet that are: RPD > 50%, or Difference > ± CRDL* Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRIL? Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL? ACTION: If yes, flag the associated data as estimated. A.1.9.8.6 Soil/Sediment Circle all values on Data Summary Sheet that are: RPD > 100%, or Difference > 2 x CRDL* Is any RPD (where sample and duplicate are both greater than or equal to 5 times *CRDL) : > 100%?

Is any **difference between sample and duplicate

(where sample and/or duplicate is less than 5x*CRIL):

> 2x*CRDL?

^{*} Substitute IDL for CRDL when IDL > CRDL.

^{**} Use absolute values of sample and duplicate to calculate the difference.

6

FIELD DUPLICATES

MGGW02-01 and MGGW02-01DP

ANALYTE	SAUPLE (5)	DUPLICATE (D)	RPD
Cr Fb Ni	53.5 120000 131 165	47.4 125000 164 161	12.1 4.1 16.1 3.8
	MGGWOZ-OIF a	and MIGGWO DPF	
ANALYTE	SAMPLE (3)	DUPUCATE (D)	FPD
Cr Pb Ni	6.0 U 1.0 U 12.0 U	G. 1 IC U IZ.O U	1

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)

Date: Feb. 1990 Number: H.:- 2 Revision: 10

YES $N\overline{A}$ M A.1.9.9.4 Soil/Sediment Circle all values on Form VI for field duplicates that are:

Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both greater than 5 times *CRDL):

>100%?

RPD >100%, or

Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x *CRDL):

>2x *CRDL?

ACTION: If yes, flag the associated data as estimated.

A.1.9.10 Form VII (Laboratory Control Sample) (Note: LCS - not required for aqueous Hg and cyanide analyses.)

A.1.9.10.1 Was one LCS prepared and analyzed for:

every 20 water samples?

every 20' solid samples?

both AA and ICP when both are used for same analyte?

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory for submittal of results of LCS. Flag as estimated (J) all

data for which ICS was not analyzed.

If only one LCS was analyzed for more than 20 NOTE:

samples, then first 20 samples close to LCS do not have to be flagged as estimated.

^{*} Substitute IDL for CROIL when IDL > CROIL.

^{**}Use absolute values of sample and duplicate to calculate the difference.

Title:	Contr ac t I Appendix A	of Metals Data for the aboratory Program 1.1: Data Assessment - Core (Total Review - Inorganic	ntract cs)	Date: Number: Revisio		
				YES	<u>w</u>	N/A
A.1.9.1	l Form I	X (ICP Serial Dilution) -				
	NOTE:	Serial dilution analysis for initial concentration greater than 10 x IDL.	is required only as equal to or	•		
A.1.9.1	1.1 Wa s Se	rial Dilution analysis per	formed for:			
* Je	rial Dilutie	nanalysis was not	each 20 samples?	[]		XX
' (સ	equivad for	-this SDG.	each matrix type?	[]	 -	*\ _*
•		each concentration rang	e (i.e. low, med.)?	[]		
A.1.9.11	2 Wa s fie	If no for any of the ab data greater than or eq estimated (J) for which was not performed, and on the DPO report.	ual to 10xIDLs as Serial Dilution Analys summarize the deficienx al Dilution Analysis?	sis Ty —	()	
	NOTE:	If yes, flag all associates estimated (J).				
	19014.	Serial dilution analysis on a field blank when is sample in SDG.	s should be performed t is the only aqueous			
A.1.9.11	on Form	nults outside control limit I's and Form IX when init is equal to 50 times IDL	ial concentration on	[]		<u>/</u>
	ACTION:	If no, write in the control compliance section of the Narrative".	ract-problem/non- Property Pata Assessment			
A.1.9.11.	control	all values on Data Summary limit for initial concent x IDLs only. Are any % d	rations equal to or gra	e eater		
		•			ŧ J	- /
			≥ 100%?		[]	<u>√</u>

STANDARD OPERATING PROCEDURE Page 20 of 35

Title: Evaluation of Metals Data for the

Contract Laboratory Program

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Date: Feb. 1990

Hv!-2

Number:

Appendix A.1: Data Assessment - Contract Revision: 10 Compliance (Total Review - Inorganics) YES NO NΔ A.1.9.13 Form VIII (Method of Standard Addition Results) A.1.9.13.1 Present? If no, is any Form I result coded with "S" or a "+"? ACTION: If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII. A.1.9.13.2 Is coefficient of correlation for MSA less than 0.990 for any sample? ACTION: If yes, reject (red-line) affected data. A.1.9.13.3 Was *MSA required for any sample but not performed? Is coefficient of correlation for MSA less than 0.995? Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical rum? ACTION: If yes for any of the above, flag all the associated data as estimated (J). A.1.9.13.4 Was proper quantitation procedure followed correctly as outlined in the SOW on page E-16 through E-17? ACTION: If no, note exception under contract problem/ non-compliance of data assessment narrative, or prepare a separate list. A.1.9.14 Dissolved/Total or Inorganic/Total Analytes -A.1.9.14.1 Were any analyses performed for dissolved as well as total analytes on the same sample(s). Were any analyses performed for inorganic as well as total

(organic + inorganic) analytes on the same sample(s)?

^{*} MSA is not required on LCS and prep. blank.

Title: Evaluation of Metals Data for the

value.

Page 24 o: 35

Date: Feb. 1990

	Appendix A		Number: Re vision	HW-2 : 10	
			YES	<u>w</u>	N/A
A.1.9.19		computation/transcription errors exceed 10% of divalues on Forms I-IX for:			
	(NOTE:	Check all forms against raw data.)			
		(a) all analytes analyzed by ICP?		1	
		(b) all analytes analyzed by GFAA?		دکدا	- .
		(c) all analytes analyzed by AA Flame?		[]	ر کے
		(d) Mercury?			<u>_</u> /
		(e) Cyanide?		[]	<u>L.</u>
	<u>actiq</u> i:	If yes, prepare Telephone Log, contact laboratory for corrected data and correct errors with red pencil and initial.			
A.1.9.16	Form I	(Field Blank) -			
		all field blank values on Data Summary Sheet e greater than CRDL, 2 x IDL when IDL > CRDL.			
	(or 2 x	entrations of field blank(s) fall below CRDL IDL when IDL > CRDL) for all parameters of ted aqueous and soil samples?	[]		∠,
		was field blank value already rejected due to criteria?	[]		
	ACTION:	If no, reject (except field blank results) all associated positive sample data less than or equal to five times the field blank			

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)

Date: Feb. 1990 Number: HW-2 Revision: 10

		YES	770	N/A
A.1.9.17.3	Form XI (Linear Ranges)			
	Was any sample result higher than high linear range of ICP.		[<u>√</u>]	
	Was any sample result higher than the highest calibration standard for non-ICP parameters?		[<u>~</u>]	
	If yes for any of the above, was the sample diluted to obtain the result on Form I?	[]		<u></u>
	ACTION: If no, flag the result reported on Form I as estimated(J).			
A.1.9.18	Percent Solids of Sediments		,	
	Is soil content in sediment(s) less than 50%?		[]	• .
	ACTION: If yes, qualify as estimated all data			

not previously rejected or flagged due

to other ∞ criteria.

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.2: Data Assessment Narrative

Date: Feb. 1990 Number: HW-2 Revision: 10

Case#	4078	Site	Molada-Machais	Matrix:	Soil
SDG#	MGGWOZ	Lab .	Versar Labs:		Water
Contrac	tor Hydroscarch	Reviewer	Kren Smecky		Other
A.2.1	The case description an	ð evc or ∗i	one if amy are noted	bolovini	D vanan(a)
,,,,,,,	for rejection or qualif	ication a	s estimated value(s) J.	Delow wif	reason(s)
	- Est water sa	mples	(including tu	willed	Cholicate)
	Saus) and	4 pais	Danple were	I axa	lemed for
	Chronium, lea	Lak	d-rickel. To	www w	afettered.
	water sample	1 tacié	alis analy	CC I	ac cin
	and harn	ess.	umples disc	axite	L 11-11
	are Littered	sam	des 2. No sul	l'ar	reviate)
	Market were	inch	uder in the	is sam	ephiaet.
	The chear for	their	ie) arealepeal	LUETX	Waluatel)
	acordina to	Real	KIN I Validat	line i	ristand
	Mo sudalista	diole	were made	the The	le data.
	<u> </u>				
		•		· · · · · · · · · · · · · · · · · · ·	

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.2: Data Assessment Narrative

Date: Feb. 1990 Number: HW-2 Revision: 10

(continuation)						
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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.3: Contract Non-Compliance

(S:D Report)

Date: Feb. 1990 Number: HW-2 Revision: 10

CONTRACT NON-COMPLIANCE (SMD REPORT)

Regional Review of Uncontrolled Hazardous Waste Site Contract Laboratory Data Package

The hardcopied (laboratory name) 1850 Al Add Wold &	4098
Inorganic data package received at Region II has been reviewed and the quality performance data summarized. The data reviewed included:	assurance and
- Filt	
Conc. & Matrix:	
Contract No. <u>WA87-K025_K025_K027(SCW787)</u> requires that specific analytical work that associated reports be provided by the contractor to the Regions, EMSL-LV, general criteria used to determine the performance were based on an examination — Data Completeness — Duplicate Analysis Results — Matrix Spike Results — Blank Analysis Results — Calibration Standards Results — MSA Results	and the
Items of non-compliance with the above contract are described below.	
Comments:	
	·
•	
(DAS) Por KMS 2/14/91	•
Reviewer's Initial Date	

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.7: CLP Data Assessment Checklist

Inorganic Analysis

Date: Feb. 1990 Number: HW-2 Revision: 10

INORGANI	C REGIONAL DATA AS	SESSMENT	Region /
CASE NO. <u>4078</u>		re Matrofa -	The losis
1200		. OF SAMPLES!	TITUMALLE
LABORATORY VENSOR LOBORATORIA	MAC	RIX <u>8/Waters</u>	1 4 /sili
SDC# MGG WCZ		ľ	
50W# 7/29	, Rev	TEWER (IF NOT)	ESD) _ 1100 (OK
SOW# 1 CO	RE	TEWER'S NAME	Karn machin
DPO: ACTIONFYI	co	PLEMON DATE	02/02/01
DATE	A ASSESSMENT SUMMAR	X Z Z Z	<u> </u>
1. HOLDING TIMES 2. CALIBRATIONS ————————————————————————————————————	1CP AA O O O	Hg 74	CYANIDE
3. BLANKS —— 4. ICS ——			
5. LCS —			
6. DUPLICATE ANALYSIS)
7. MATRIX SPIKE	NA MA	:	
8. MSA 9. SERIAL DILUTION	1/4		
10. SAIPLE VERIFICATION	- MA		
11. OTHER QC	0		
12. OVERALL ASSESSMENT			
O = Data has no problems/or qual M = Data qualified due to major;	ified due to minor	problems.	
4 - Data unacceptable.			
X = Problems, but do not affect of	iata.		
ACTION ITEMS:			
.2114 11275:		·	
	· · · · · · · · · · · · · · · · · · ·		
AREAS OF CONCERN:			
	·		
NOTABLE PERFORMANCE:			
			

<u> ^</u>	7 <u>1 NOTX</u>	A.5				SUNCE	ARY (<u> </u>	JRGAN	SICS	QUA	LITY	CON	IRUL	UA±4						
LA B	ZOR.IC	RY: <u></u>	lisy	ولما	<u>()</u> c	ASE	NO	407	18	s	א עכ	o. <u>7/</u>	38	SAM	LE IY	PE/SI)G: ¼	DIC.	5/vla	 G()	——. NCZ
SI	TE/STU	DY DE	SCRIP	CION:	Mrt	orta		Mesc	hose	5 S/	LMPL!	E NO!	بن 41. ام/4 : S:	5 NO:	z-01, M.	ÉGWUT	2-011	", Me	400	2-01	DP ,
. 6 u	nteisé	450	ils -in	(Pr	1/18	Fh	15	d. 100	101		t 1	[a)	. <u>~</u>	M GC	5 NU4 -	CI p M	بربا <u>حکری</u> ۱۸ وکات ۱	<u> </u>	1. F ; 1	465,	3-61- 5
FI	FID DI	o # 1	M66	WCZ	-01 4	MGG.	NC2-6	oclop	<u> </u>	، تع <u>دن</u> ا	९०) 4 ु. F 1।	eld 1	ارحمان Blani	ر د	njA	1, MC	*>S¢ :	5-0·	1443	50.3	·-C;
			5 : <u>M</u> €G ∧	102-211	= £MS	WHICZ:	-하다	LAB DU	iP. #	''S:_		<u>iA</u>			MATRI	X SP	IKE	#:	NA		-
SE	LAZOR TORY: WISCOND CASE NO. 4078 SON NO. 7/88 SAMPLE TYPE/SDG: WATERS MEGNICZ SITE/STUDY DESCRIPTION: MATCH — MOTHERS SAMPLE NOS: MOGNICZ-CIT, MOG																				
	Detec	tion		C	alib	Ve	٠.	CRDL	.s Std	C	11 111	II Tati	lon	P	I ICP	VICS	V TM S	VI	VII	IX	
ara- eter	UG/	ts L	Field	-		neir	wed	Ver.	Z R		B1:	inks		R	7	R	t p	Dup	LCS	Dil	e
J	CRDL	IDL	<u>' </u>	In	<u>it 1</u>	2	3	Init	Fin	Ini	t 1	2	3	P	N Init	Fin	r i x k	RPD Diff	Z R	z D	t h
Al Sb	200	ļ	NA		1	<u> </u>															
<u>s b</u>	60	<u> </u>																			
As	10									<u> </u>			 	 	 						
As Ba	200						 			-			+-	+-							
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Cd Ca	5000			1					 						 		ļ				
Cr	10	6-0		<		-	Ai	L DA	Ar	IET	00	RE	DUIF	EN	EVT.		NΑ	NΛ	 >	NД	V0
Cr Co	50			1	-					FEFT	3	UF	- XX	1 9	XC- 1			11/4			10
Cu	25		T									<u> </u>	 								
Fe	100	5.0		~	ALL	C/ S T	n n	et a	c Z	ξQ _U	PEN	KN	13					NΆ		Λ'Δ	1/0
Pb	3	1.0		-	-		124-1	11		YYY		<u> </u>	 			1				NA NA	
	5000																1411	NA		/474	
Mg Mn	15			T																	
	0.2		1																		
Hg Ni		iz.C		—		- 0/2	7 0.	da teci	ma	+	12.C.	an	ten	عز ۔	 		NA	./^		114	740
ĸ	5000						الاخت ليوا	٠٧٠٤	10.62	<u> بال</u>	3	- S	acc)			10 4/	NA		NA	-
Se	5														 						
Je Jg	10		- 						+												
Na	5000		 -						-			-						-+			
11	10			1					-							-					
7	50		<u> </u>						-								-	-	-+		
Zn	20	1	1		-		1									-+	+		-	-	
, N	10	1	V						-							+			+	-	
				<u> </u>							_	1	Į.	,	1		1	ſ	į į	1	1

APPENDIX A: QUALIFIED

LABORATORY RESULTS

INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO.
-----	--------	-----

	IN	ORGANIC AN	IALYSES DATA SI	HEET		,	
Lab Name: VERSAR_	LABORATOR	EIES_INC	Contract:	: MA	CHAIS_	MGSS01	-01
Lab Code: VERSAR	Case	No.: 4078_	SAS No.:	:		SDG No.:	MGGW02
Matrix (soil/wate	r): SOIL_				Lab	Sample ID:	398 36 _
Level (low/med):	LOW				Date 1	Received: 1	.2/11/90
% Solids:90.2							
Conce	entration	Units (ug,	/L or mg/kg dry	y we	ight):	MG/KG	
	CAS No.	Analyte	Concentration	С	Q	м	
177	29-90-5	Aluminum		 		NR	
		Antimony		- -		NR	
	40-38-0	Arsenic		- -		NR	
	40-39-3			- -		NR	
72	40-41-7	Beryllium		1-1-		NR	
	40-43-9-			- -		NR	
	40-70-2			- -		NR	
1		Chromium	2.5	-}-		P	
	440-48-4		·	- -		NR	
	40-50-8			- -	· · · · · · · · · · · · · · · · · · ·	NR	
	139-89-6			- -	·	NR	
74	139-92-1	Lead	608			P	
74	139-95-4	Magnesium				NR	
		Manganese		_ _		NR	
	43 9-97-6 <u> </u>			1_1_		NR	
· •	440-02-0		11.7			P_[
	440-09-7_			_ _		NR	
	782-49-2			_ _		NR	
	440-22-4			_ _		NR	
	440-23-5			_ _		NR↓	
	440-28-0	Thallium_		1_1_		NR	
	440-62-2	Vanadium_		1_1_		NR	
71	440-66-6		·			NR	
· -		Cyanide		- -		NR	
Color Before: BR	оwи <u></u> иwс	Clari	ty Before:		•	Texture:	COARSE
Color After: YE	LLOW	Clar	ity After: CLE	AR_		Artifacts:	YES
Comments: _ARTIFACTSR	ocks;				·	•••	

FORM I - IN

7/88

1 INORGANIC ANALYSES DATA SHEET

EPA	~ 3	MENT	•	NO.
r.PA	- A	ועמי		N()

		01.012.20 12.	ALIBES DATA OF			. ————	
oh Namo: VEDSI	ND I NBADNEAD	otre inc	Contract:	• W X /	רשאדכ	MGSSO	2-01
ab Name. VERSE	r_nanorator	TED_THC		· MAN		- !	 .
ab Code: VERS	AR Case	No.: 4078_	SAS No.:	:		SDG No.	: MGGWO
atrix (soil/wa	ater): SOIL_				Lab	Sample ID	: 398 37
evel (low/med)	: LOW				Date 1	Received:	12/11/9
Solids:82	. 4						
Coi	n centration	Units (ug,	L or mg/kg dry	y we	ight):	MG/KG	
	CAS No.	Analyte	Concentration	c	Q	м	
				_ _			
	7 429- 90-5_	Aluminum_		_ _		NR	
	7440-36-0	Antimony_		_ _		NR	
	7440-38-2			_ _		NR	
	7440-39-3	Barium		1-1-		NR	
	7440-41-7			1-1-		NR	
	7440-43-9-			1-1-		NR	
	7440-70-2_	·		1-1-		NR	
	7440-47-3_		4.6	1-1-		P_	
	7440-48-4_			1-1-		NR	
	7440-50-8			- -		NR	
	7439-89-6					NR	
	7439-92-1_		19.7	 - -		F	
	7439-95-4_		·	1-1-		NR	
	7439-96-5_			_ _		NR	
	7439-97-6	Mercury		1-1-		NR	
	7440-02-0	Nickel	10.2	- -		P	
	7440-09-7	Potassium		. _ _		NR	
	7782-49-2	Selenium_				NR	
	7440-22-4			-		NR	
	7440-23-5	Sodium_		- - -		NR	
	7440-28-0			· - -		NR	
	7440-62-2	_		. _ -		NR	
	7440-66-6			.		NR	
		Cyanide		- - -		NR	
Color Before:	BROWN	Clari	ty Before:			Texture:	COARSI
Color After:	YELLOW	Clar	ity After: CLE	AR_		Artifacts:	YES
Comments: _ARTIFACTS	ro c ks;						

INORGANIC ANALYSES DATA SHEET

	EPA	SAMPLE	NO.
--	-----	--------	-----

MGSS03-01

Lab	name.	A EVSVICTURE	010110111		
ab	Code:	VERSA R	Case No.: 4078	SAS No.:	SDG No.: MGGW02

b Name: VERSAR LABORATORIES INC. __ Contract: MACHAIS__

Matrix (soil/water): SOIL_____

Lab Sample ID: 39838_

Level (low/med): LOW_____

Date Received: 12/11/90

Solids: __80.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	c	Q	M
742 9- 90-5	Aluminum		_		NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium]_	1	NR
7440-41-7					NR
7440-43-9-			_		NR
	Calcium		_		NR
7440-47-3	Chromium	6.0	_		P_
7440-48-4	Cobalt		_		NR
7440-50-8	Copper		1_	İ	NR
7439-89-6	,			İ	NR
7439-92-1	Lead	13.6	1_	. İ	[F_]
7439-95-4	Magnesium		. _		NR
7439-96-5	1 -	1			NR
7439-97-6	-				NR
7440-02-0	Nickel	13.3			P_
7440-09-7	Potassium		. [_		NR
7782-49-2					NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium		_ _		NR
7440-62-2	Vanadium -				NR
7440-66-6	Zinc		_ _		NR
_	Cyanide				NR
	- -				1

Color Before:	BROWN	Clarity Before:		Texture:	MEDIUN
Color After:	YELLOW	Clarity After:	CLEAR_	Artifacts:	
Comments:					
					

7/88

INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO
	SAMPLE	(11)

_		INORGANI	C ANALYSI	es data shi	SET	1	,
Lab Name: VE	RSAR_LABO	RATORIES_IN	īc	Contract:	MACHAIS	MGSB01-	01
Lab Code: VE	RSAR	Case No.: 4	1078	SAS No.:		SDG No.:	MGGW02
Matrix (soil	/water):	SOIL			Lab	Sample ID:	40129_
Level (low/m	ned): LOW_				Date R	eceived: 12	/13/90
% Solids:	87.5						
	Concentra	tion Units	(ug/L or	mg/kg dry	weight):	MG/KG	٠

CAS No.	Analyte	Concentration	C	Q	M
7.20 00 5	33	· · · · · · · · · · · · · · · · · · ·	_		
7429-90-5_	Aluminum_				NR
7440-36-0_	Antimony_		_		NR
7440-38-2	Arsenic		_		NR
7440-39-3	Barium				NR
7440-41-7_	Beryllium		_		NR
7440-43-9-	Cadmium_		_		NR
7440-70-2_	Calcium_				NR
7440-47-3_	Chromium_	1.1	B.		P_
7440-48-4	Cobalt		_		NR
7440-50-8	Copper		-		NR
7439-89-6	Iron		-		NR
7439-92-1	Lead	5.5			F
7439-95-4	Magnesium		-		NR
7439-96-5	Manganese		-		NR
7 43 9-97-6	Mercury		-		NR
7440-02-0	Nickel	9.6	-		P
7440-09-7	Potassium		-		NR
7782-49-2	Selenium		-		NR
7440-22-4	Silver -		-		NR
7440-23-5	Sodium		-	1	NR
7440-28-0	Thallium		_	1	NR
1	Vanadium	· · · · · · · · · · · · · · · · · · ·	-	1	NR
7440-66-6	Zinc		-		NR
_	Cyanide		-		NR
			-		† · · · · · · · · · · · · · · · · · · ·
· ————————————————————————————————————	·	·	٠		-

Color Before:	BROWN	Clarity Before:		Texture:	FINE
Color After:	YELLOW	Clarity After:	CLEAR_	Artifacts:	
Comments:					

TIN ORM DE NO	EPA	SAMPLE	МО
---------------	-----	--------	----

	IN	ORGANIC AN	1 WALYSES DATA S H	EET			EPA SAM	IPLE NO.
Ich Name: UPDEN	D INDADAMAD	OTES INC	Contract	W	CURTO		MGGW04	-01 F
Lab Name: VERSA	R_LABORATOR	ites_inc	_ contract:	TATE	CHAIS	'		 .
Lab Code: VERSA	AR Case	No.: 4078_	SAS No.:				SDG No.	: MGGWD2
Matrix (soil/wa	ter): WATER	<u> </u>			La	b Sa	imple II): 398 39 _
Level (low/med)	: LOW				Date	Rec	ceived:	12/11/90
% Solids:0.	0							
Cor	centration	Units (va.	/L or mg/kg dry	7 1474	ei <i>a</i> ht\	• 110	2/T.	
			a dr may neg dr				., <u></u>	
	CAS No.	Analyte	Concentration	С	Q	·M		
	7429-90-5_	Aluminum		- -	-	NR		
,	7440-36-0	Antimony -	·	- -		NR		
	7440-38-2	Arsenic		-1-		NR		
	7440-39-3	Barium —		- -		NR		
	7440-41-7	Beryllium		- -		NR		
	7 4 40-43-9- 7440-70-2	Cadmium		- -		NR	Ī	
	7440-70-2_	Calcium_				NR		
	7440-47-3	Chromium_	6.0	Ū		P_		
	7440-48-4	Cobalt		_		NR		
	7440-50-8	Copper				NR	[
	7439-89-6	Iron				NR		
	7439-92-1	Lead	1.0	<u></u> ַ	W	F_	I	
	7439-95-4	Magnesium		_ .		NR	l	
	7439-96-5	Manganese		_ .		NR	1	
•	7439-97-6_			_ .		NR	1	
	7440-02-0		12.0	<u>ַ</u>		P_	1	
	7440-09-7			1_1.		NR	1	
	7782-49-2_			1_1.		NR	1	
	7440-22-4_		ļ	1-1		NR	1	
	7440-23-5		·	1-1		NR		
	7440-28-0	· —		1-1		NR		
	7440-62-2_	1		-		NR	.	
	7440-66-6_		. 	1-1		NR	ļ	
		Cyanide		1-1		NR		
				1_1		_	1	
Color Before:	COLORLESS	Clari	ty Before: CLE	AR_		•	Texture	:
Color After:	COLORLESS	Clar	ity After: CLE	AR_		Ar	tifacts	:
Commonts								
Comments:	ידויהבסבירו שאיי	FR ATTOMO	•					
_THIS_IS_A_F	TLIERED_WAT	EK_WITGOOT	· /					
							·	
							 	

FORM I - IN

7/88

INORGANIC ANALYSES DATA SHEET

	CLICATO	110
EPA	SAMPLE	NO.

		OLIGIE: TO IN	ALYSES DATA SH			
ab Name: VERSA	AR LABORATOR	IES INC.	Contract:	MA	CHAIS	MGGW04-01
	_		- SAS No.:			
atrix (soil/wa	iter): WATER	-	_		 Lab	Sample ID: 398
					D-4-	Danisand. 12/21
evel (low/med)	: LOW				Date	Received: 12/11
Solids:0	. 0					
			·			
Co	ncentration	Units (ug,	'L or mg/kg dry	y we	ight):	: UG/L_
·	CAS No.	Analyte	Concentration	С	Q	М
	74 29- 90 - 5	Aluminum		- -		NR
	7440-36-0			- -		NR
	7440-38-0	Arsenic		- -		NR
	7440-39-3			!		NR
	7440-41-7			<u> - -</u>		NR
	7440-43-9-			[-[-		NR
	7440-70-2			- -		NR
	7440-47-3		50.0			P_
	7440-48-4	Cobalt				NR
	7440-50-8	Copper				NR
	74 39- 89-6		120000			P_ F
	7439-92-1		16.4]_]_	_s	
	7439-95-4_					NR
	7439-96-5_			1-1-		NR
	7439-97-6			1-1-		NR
	7440-02-0		96.8			P
	7440-09-7			- -		NR
	7782-49-2	Selenium_		[-]-		NR NR
	7440-22-4_ 7440-23-5			- -		NR
	7440-23-3			- -		NR
	7440-62-2			- -		NR
		Zinc	<u> </u>	1-1-		NR
	/ 4 4 0 0 0 _	Cyanide		 - -	- · · · · · · · ·	NR
olor Before:	GREY	Clari	ty Before: OPA	QUE		Texture:
Color After:	YELLOW	Clar	ity After: CLE	AR_		Artifacts:
omments: _HARDNESS_=_	635_mg_equi	valent_CaC	0 ₃ /L;			

INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO.
-----	--------	-----

Lab Name: VERSAR_LABORATORIES_INC	Contract: MACHAIS MGGW03-01 F
Lab Code: VERSAR Case No.: 4078	SAS No.: SDG No.: MGGW02
Matrix (soil/water): WATER	Lab Sample ID: 39840
Level (low/med): LOW	Date Received: 12/11/9

% Solids: ___0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

					
CAS No.	Analyte	Concentration	С	Q	М
7429-90-5	Aluminum		-		NR
7440-36-0	Antimony -		_		NR
7440-38-2	Arsenic		_		NR
7440-39-3	Barium		_		NR
7440-41-7	Beryllium		_		NR
7440-43-9-	- .		_		NR
7440-70-2	Calcium		_		NR
7440-47-3	Chromium	6.0	Ū		P_
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	1.0	Ī		F_
7439-95-4	Magnesium		_		NR
7439-96-5	Manganese		<u> </u>		NR
7439-97-6	Mercury				NR
7440-02-0	Nickel	12.0	Ū		P_
7440-09-7	Potassium		1_		NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
_	Cyanide				NR
					i
1	. 1				

Color Before:	COLORLESS	Clarity Before:	CLEAR_	Texture:
Color After:	COLORLESS	Clarity After:	CLEAR_	Artifacts:
Comments: _THIS_IS_A_	FILTERED_WATER_	ALIQUOT;		

1 EP. INORGANIC ANALYSES DATA SHEET	A SAMPLE NO.
Lab Name: VERSAR_LABORATORIES_INC Contract: MACHAIS	MGGW03-01
Lab Code: VERSAR Case No.: 4078_ SAS No.: SD	G No.: MGGWO
Matrix (soil/water): WATER Lab Samp	le ID: 39844
Level (low/med): LOW Date Recei	ved: 12/11/96
Solids:0.0	, ,
Concentration Units (ug/L or mg/kg dry weight): UG/L	<u>-</u>
CAS No. Analyte Concentration C Q M	
T429-90-5	
7440-23-5 Sodium NR NR NR NR NR NR NR N	
Color Before: GREY Clarity Before: OPAQUE Tex	ture:
Color After: YELLOW Clarity After: CLEAR_ Artif	acts:
Comments: _HARDNESS_=_399_mg_equivalent_CaCO3/L;	-

FORM I - IN

INORGANIC	1 EPA SAMPLE NO. ANALYSES DATA SHEET			
Lab Name: VERSAR_LABORATORIES_INC	MGGW02-01DP F Contract: MACHAIS			
Lab Code: VERSAR Case No.: 40	SAS No.: SDG No.: MGGW02			
Matrix (soil/water): WATER Lab Sample ID: 3984				
Level (low/med): LOW	Date Received: 12/11/90			
% Solids: 0.0				
Concentration Units ((ug/L or mg/kg dry weight): UG/L_			
I				
CAS No. Analyt	te Concentration C Q M			
7420 00 5 33::				
7429-90-5 Aluminu 7440-36-0 Antimor				
7440-38-0 Ancimor	~ - - - - - - - - - - 			
7440-38-2 Risenic 7440-39-3 Barium	- NR			
7440-39-3 Barlum 7440-41-7 Beryll	ium NR NR			
7440-41-7 Berylli 7440-43-9- Cadmiur				
7440-70-2 Calcium				
7440-47-3 Chromiv				
7440-48-4 Cobalt				
7440-50-8 Copper				
7439-89-6 Iron	NR NR			
7439-92-1 Lead	1.0 U W F			
7439-95-4 Magnes				
7439-96-5 Mangan				
7439-97-6 Mercur				
7440-02-0 Nickel				
7440-09-7 Potass				
7782-49-2 Seleni	um NR			
7440-22-4 Silver	NR NR			
7440-23-5 Sodium	NR NR			
7440-28-0 Thalli				
7440-62-2 Vanadi	um NR			
7440-66-6_ Zinc	NR			
Cyanid	eNR			
Color Before: COLORLESS C1	arity Before: CLEAR_ Texture:			
Color After: COLORLESS C	larity After: CLEAR_ Artifacts:			
Comments:THIS_IS_A_FILTERED_WATER_ALIQ	UOT;			

FORM I - IN

7/88

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L.PA	/	4 M P I	·r.	NU

	INORGANIC ANA	l Lyses data s h	EET	EPA SAMPLE NO.
·				MGGW02-01DP
Lab Name: VERSAR_LABORAT	ORIES_INC	Contract:	MACHAIS_	
Lab Code: VERSAR Cas	e No.: 4078	SAS No.:		SDG No.: MGGW02
Matrix (soil/water): WAT	ER		Lal	o Sample ID: 39845_
Level (low/med): LOW			Date	Received: 12/11/90
% Solids:0.0				
3	III.itaa (12 <i>a</i> (7		. waidht\	• IIC / I
Concentration,————	on Units (ug/I	or mg/kg dry	weight)	· · · · · · · · · · · · · · · · · · ·
CAS No.	Analyte C	Concentration	c Q	м
7/30-00-6	Aluminum			NR
	Antimony -		-	NR
	Arsenic	···-·	- 	NR
		 -		NR
7440-39-	Barium Beryllium			NR
	Cadmium		-	NR
	Calcium			NR
	Chromium	47.4		P
7440-48-	Cobalt			NR
7440-50-	Copper		1-1	NR
7439-89-	Iron	125000		† P
7439-92-	Lead	154	-	F
	Magnesium			NR
7 43 9-96-	Manganese			NR
	6 Mercury			NR
7440-02-	Nickel	161		[P_]
7440-09-	7 Potassium			NR
1,,02	2 Selenium		_	NR
7440-22-			1_1	NR
7440-23-			_	NR
7440-28-			_ -	NR
7440-62-			_ _	NR
7440-66-				NR
l .	Cyanide		1_1	NR
			. _	_
Color Before: BROWN	Clarit	y Before: OPA	QUE	Texture:
Color After: YELLOW	Clari	ty After: CLE	AR_	Artifacts:
Comments: HARDNESS = 730 mg eq	uivalent_CaCO	3/L;		

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	1		
TNORGANIC	ANALYSES	DATA	SHEET

EPA	SAMPLE	ИО
-----	--------	----

	Contract: MACHAIS MGGW02-01 F	
ab Name: VERSAR_LABORATORIES_INC		
ab Code: VERSAR Case No.: 4078	SAS No.: SDG No.: MGGWO	2
Matrix (soil/water): WATER	Lab Sample ID: 39842	_
and (low/med): IOW	Date Received: 12/11/9	C

3 Solids: ___0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

					† †
CAS No.	Analyte	Concentration	c	Q	М
7429-90-5	Aluminum		_		NR
7440-36-0	Antimony				NR
	Arsenic		-		NR
7440-38-2_	Barium		-		NR
7440-39-3_			-		NR
7440-41-7_	Beryllium		-		NR
7440-43-9-	· · · · · · · · · · · · · · · · · · ·		-		NR
7440-70-2_	Calcium_	6.0	ប៊		P
7440-47-3_	Chromium_				NR
7440-48-4_	Cobalt		 -		NR
7440-50-8	Copper		-	ļ ———	NR
7439-89-6	Iron		==	- W	F
7439-92-1	Lead	1.0	שׁ	l—"—	NR
7439-95-4	Magnesium	·	_	 	_
7439-96-5	Manganese		-		NR
7439-97-6	Mercury				NR
7440-02-0	Nickel	12.0	Ū	Ī	_ P_
7440-09-7			. _		NR
7782-49-2					_ NR
7440-22-4	_		- -		NR
7440-23-5	_	-	- -		NR
	_	-	-		NR
7440-28-0		-	- -		NR
	Vanadium		- -	•	- NR
7440-66-6	Zinc	_	- -	-	NR
	Cyanide_	_	- -	-	-
	_	_	_ _	-!	_

Color Before: COLORLESS	Clarity Before:	CLEAR_	Texture:
Color After: COLORLESS	Clarity After:	CLEAR_	Artifacts:
Comments: _THIS_IS_A_FILTERED_WATER_	ALIQUOT;		
			7/00

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INORGANIC ANALYSES DATA SHEET

א כו ים	SAMPLE	NO.
LPA	SAMPLE	NU.

Lab Name: VERSAR_LABORATORIES_INC	Contract: MACHAISMGGW02-01
Lab Code: VERSAR Case No.: 4078	SAS No.: SDG No.: MGGW02
Matrix (soil/water): WATER	Lab Sample ID: 39846_
Level (low/med): LOW	Date Received: 12/11/90
% Solids:0.0	

Concentration Units (ug/L or mg/kg dry weight): UG/L_

					\top
CAS No.	Analyte	Concentration	С	Q	M
7429-90-5	Aluminum		-		NR
7440-36-0	Antimony		-		NR'
7440-38-2	Arsenic		-		NR
7440-39-3	Barium —		-		NR
7440-41-7_	Beryllium		-		NR
7440-43-9-	Cadmium_		Ι		NR
7440-70-2_	Calcium_				NR
7440-47-3	Chromium_	53.5	1		P_
7440-48-4	Cobalt		_		NR
7440-50-8	Copper				NR
7 43 9-89-6_	Iron	120000	_	l	P_
7439-92-1_	Lead	131			F_
7439-95-4_	Magnesium				NR
7439-96-5_	Manganese		 _		NR
7439-97-6_	Mercury		_		NR
7440-02-0_	Nickel	155	_		P_
7440-09-7_	Potassium				NR
7782-49-2	Selenium_				NR
7440-22-4	Silver				NR
7440-23-5_	Sodium_		1_		NR
7440-28-0	Thallium_				NR
7440-62-2	Vanadium_	,			NR
7440-66-6_	Zinc				NR
	Cyanide_				NR
			1_		_

Color Before: BROWN Clarity Before: OPAQUE Texture: Color After: YELLOW Clarity After: CLEAR Artifacts:
Color After: YELLOW Clarity After: CLEAR _ Artifacts:
Comments: _HARDNESS_=_680_mg_equivalent_CaCO3/L;

Title: Franchism of Many	Page 4 01 35
Title: Evaluation of Metals Data for the Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)	Date: Feb. 1990 Number: HW-2 Revision: 10
A.1.1 Contract Compliance Screening Report (CCS) - Present? ACTION: If no, contact RSCC.	YES NO NA
A.1.2 Record of Communication (from RSCC) - Present? ACTION: If no, request from RSCC.	[_] _/* _
* COCUMENT NOT PROVIDED BY CONTRACTOR A.1.3 Trip Report - Present and complete? ACTION: If no, contact RSCC for trip report.	<u> </u>
* TOCCIMENT NOT PROVIDED BY CONTRACTOR A.1.4 Sample Traffic Report - Present or on file? Legible? ACTION: If no, request from Regional Sample Control Center (RSCC).	[_] \/* _
A.1.5 Cover Page - Present? Is cover page properly filled in and signed by the lab manager or the manager's designee? ACTION: If no, prepare Telephone Record Log, and	(<u>\langle</u>)
Do numbers of samples correspond to numbers on Record of Communication? **RECC NOTPROVIDED BY CONTRACTOR Do sample numbers on cover page agree with sample numbers on:	[_]/*
(a) Traffic Report Sheet? * TRAFFIC REPORT NOT PROVIDED BY CONTRACTOR (b) Form I's? ACTION: If no for any of the above, contact RSCC for Clarification	

STANDARD OPERATING PROCEDURE Page Title: Evaluation of Metals for the Contract 6 of 35 Laboratory Program Date: Feb. 1990 Appendix A.1: Data Assessment - Contract Number: Compliance (Total Review - Inorganics) Hw-2 Revision: 10 YES NO Other Metals analysis (6 months). . . exceeded? N/2NOTE: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist. ACTION: If yes, reject (red-line) values less than Instrument Detection Limit (III) and flag as estimated (J) the values above III even though sample(s) was preserved properly. A.1.8 Ray Data A.1.8.1 Digestion Log* for flame AA/ICP (Form XIII) present? [<u>V</u>] Digestion Log for furnace AA Form XIII present? Distillation Log for mercury Form XIII present? Distillation Log for cyanides Form XIII present? Are pH values (pH<2 for all metals, pH>12 for cyanide)

IP

Flame AA

Mercury

Cyanides

Furnace AA

[__]

*Weights, dilutions and volumes used to obtain values.

Are preparation dates present on Digestion Log?

A.1.8.2 Measurement read out record present?

Percent solids calculation present for soils/sediments?

Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)		Feb. 199 HX-2 DD: 10	
	YES	NO	N/A
ACTION: Flag associated data as estimated if standards are not within ±10% of true values (except CRIL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.			
A.1.9.1.3 Is correlation *coefficient less than 0.995 for:			
Mercury Analysis?		[]	<u>/</u>
(Net applicable to Titumethe Method) Atomic Absorption Analysis?			
ACTION: If yes, flag the associated data as estimated.			
A.1.9.2 Form II A (Initial and Continuing Calibration Verification	<u>n)</u> –		,
A.1.9.2.1 Present and complete for every metal and cyanide?	[]		
Present and complete for AA and ICP when both are used for same analyte?	[]		
ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.			
A.1.9.2.2 Circle all values on data summary sheet that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?			
Metals 90-110%	1_1		
Hg - 80-120%	[]		_
Cyanides 85-115%	[]		<u> </u>

Title: Evaluation of Metals Data for the

Page 8 of 35

Date: Feb. 1990

^{*} The reviewer will calculate correlation coefficient.

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		5 5	01 33
	Evaluation of Metals Data for the Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)	Date: Fe Number: Revision:	Hw-2
		YES	NO NA
A.1.9.3.	Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?	t√1	
	ACTION: If no, write in Contract Problem/Non-Compliance Section of the "Data Assessment Narrative".	.	
A.1.9.3.3	Circle all values on summary sheet that are outside acceptance windows.		
	Are CRA and CRI standards within control limits: Metals 80 - 120%R?	[1/2]	
	Is mid-range standard within control limits: Cyanide 80 - 120%R?	[]	- — -
	ACTION: Flag as estimated all data within the affected ranges if the recovery of the standard is between 50-79%; flag only positive data if the recovery is between 121-150%; reject (red line) all data if the recovery is less than 50%; reject only positive data if the recovery is greater than 150%.		
A.1.9.4	Form III (Initial and Continuing Calibration Blanks)		
A.1.9.4.1	Present and complete?	1/1	
	For both AA and ICP when both are used for same analyte?	·	
	Was an initial calibration blank analyzed?	<u>-</u>	
	Was a continuing calibration blank analyzed after every 10 samples or every 2 hours (whichever is more		

ACTION: If no, prepare Telephone Record Log, contact laboratory and write in the contract-problems/non-compliance section of the Data Assessment Narrative.

frequent)?

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Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Number: H--2 Appendix A.1: Data Assessment - Contract Revision: 10 Compliance (Total Review - Inorganics) ∞ $N\Delta$ ACTION: If yes, reject (red-line) all associated data greater than CRDL concentration but less than ten times the prep. blank value found in the raw data. A.1.9.5.3 Do concentrations of prep. blank fall below two times IDL when IDL is greater than CRIE? ACTION: If no, reject (red-line) all positive data that has a concentration less than 10 times the prep. blank value in the raw data. A.1.9.5.4 Is concentration of prep. blank below the negative CRDL? ACTION: If yes, reject (red-line) all associated data that has a concentration less than 10xCRDL. A.1.9.6 Form IV (1CP Interference Check Sample) A.1.9.6.1 Present and complete? (NOTE: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.) Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)? ACTION: If no, flag as estimated (J) all samples for which AL, Ca, Fe, or Mg is higher than in ICS. A.1.8.6.2 Circle all values on Data Summary Sheet that are more than + 20% of true or established mean value. Are all

ACTION: If no, flag as estimated (J) those positive results for which ICS recovery is between 121-150%; flag all sample results as estimated if ICS recovery falls within 50-79%; reject (red-line) those sample results for which ICS recovery is less than 50%; if ICS recovery is above 150%, reject positive results only (not flagged with a "U").

Interference Check Sample results inside of control

If no, is concentration of Al, Ca, Fe, or Mg lower

limits (+ 20%)?

than in ICS?

5A SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Lab Code: Matrix (se		Case No.: 4067	SAS No.	: _	 	DG No.:	
	•	 			Level (lo	w/med):	LOV
Solids :	for S am pl	e:58.3					
	.						
	Concen	tration Units (ug	/L or mg/kg dr	y w	eight): MG/	KG	
Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR)	С	Spike Added (SA)	₹R	Q
Aluminum					· · · · · · · · · · · · · · · · · · ·	ļ ———	_ _
ntimony -			·	·†-			
rsenic						<u> </u>	-1-1
arium		· · · · · · · · · · · · · · · · · · ·					-1-1
eryllium admium							
alcium		· · · · · · · · · · · · · · · · · · ·		· ·		·	
hromium_	75 -1 25	61.5000	6.4600		57.18	96.3	-
obalt				1-1			-1-1
opper		· · · · · · · · · · · · · · · · · · ·					-1-1
ron	75-125	35.3000		. _			-
agnesium	/3 123-		20.9200_	- - -	6.66_	215.9	N)
anganese				1-1	····		- -
ercury				1-1			-
ickel	75 -1 25_	153.1100	14.0400		142.94	97.3	-1-1
otassium elenium							- -
ilver					·		- -
odium			ļ ————————————————————————————————————	 _ .			╺╎╼┤
hallium		-		 - -			-
anadium				1-1			-
inc				[-]			-†-†
yanide							- [- [
	1		l	1_1.			
							•
omments:							
	RCENT SOL	IDS_LAB_SAMPLE_ID	NIMBER TS 307	11.	ስውጥቸውስ <i>ር</i> ጥር -	- COTOUC	

STATUAN OFFRATER PROTECTIVE Page 14 of 35 Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Appendix A.1: Data Assessment - Contract Number: Hv-2 Compliance (Total Review - Inorganics) Revision: 10 E.2 Are results outside the control limits (75-125%) flagged with "N" on Form I's and Form VA? ACTION: If no, write in the Contract - Problem/Non -Compliance section of "Data Assessment Narrative". A.1.9.7.4 Acriecus Are any spike recoveries: (a) less than 30%? (b) between 30-74%? (c) between 126-150%? (d) greater than 150%? ACTION: If less than 30%, reject all associated aqueous data; if between 30-74%, flag all associated agreeous data as estimated (J); if between 126-150%, flag as estimated (J) all associated aqueous data not flagged with a "U"; if greater than 150%, reject (red-line) all associated aqueous data not flagged with a "U". A.1.9.7.5 <u>Soil/Sediment</u> Are any spike recoveries: (a) less than 10%? (b) between 10-74%?

ACHION: If less than 10%, reject all associated data; if between 10-74%, flag all associated data as estimated; if between 126-200%, flag as estimated all associated data was not flagged with a "U"; if greater than 200%, reject all associated data not flagged with a "U".

(c) between 126-200%?

(d) greater than 200%?

See Support Documentation (previous page)

6 DUPLICATES

EPA SAMPLE NO.

ab Name: VERSAR_LABORATORIES_INC	Contract: MACHAIS MGTP03-01D	
ab Code: VERSAR Case No.: 4067	SAS No.: SDG No.: MGS	B02
Matrix (soil/water): SOIL	Level (low/med): LOW	I
Solids for Sample:58.3	<pre>% Solids for Duplicate:5</pre>	8.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Aluminum Antimony	-		_			M
	_ 1					NR
	_11		_			NR
Arsenic	_]		_[]		1_	NR
Barium	_		_		1	NR
Beryllium			_		_	NR
Cadmium	_		-		ļ_	NR
Calcium	- '		-	18.6	-	NR
Chromium 3.1 6.4600	-	5.3600_	-		1-	P NR
Cobalt	-		-		-	NR
Copper	-		-		1-	NR
Lead 20.9200	-	26.3800	-	23.1	1	
Magnesium	 - 		-			NR'
Manganese	-		-		-	NR
Mercury	1-1		-		-	NR
Nickel 12.5 14.0400	1-1	15.3600	-	9.0	-	P
Potassium	-		_			NR
Selenium						NR
Silver			_			NR
Sodium			_		_	NR
Thallium	_		_		↓	NR
Vanadium_	1_1		_		_	NR
Zinc	1-1		_		↓ 	NR
Cyanide	1-1		_		 	NR

The lead data are rejected because of exercisive mutue spike 3 no faither action necessary.

		rage	10 01 3	35
Title:	Evaluation of Metals Data for the Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)	Numbe:	Feb. 199 r: HN-2 ion: 10	90
		YES	<u>w</u>	<u>n.a</u> _
	 If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria. 	•		
A.1.9.8	.4 Is any value for sample duplicate pair less than CRUL* and other value greater than or equal to 10 x *CRUL?		[]	
	ACTION: If yes, flag the associated data as estimated (J).			
A.1.9.8.	5 Acueous Circle all values on Data Summary Sheet that are: RPD > 50%, or Difference > ± CRDL*			
	Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL?		[_ _]	
	Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL?		[]	<u> </u>
	ACTION: If yes, flag the associated data as estimated.			
A.1.9.8.	6 Soil/Sediment Circle all values on Data Summary Sheet that are: RPD > 100%, or			
	Difference > 2 x CRDL*			
	Is any RPD (where sample and duplicate are both greater than or equal to 5 times *CRDL):			
	> 100%?		[
	Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x*CRDL):		- -	
	> 2x*CRDL?		1/1	

^{*} Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)

Date: Feb. 1990 Number: HW-2 Revision: 10

YES M $N\Delta$ A.1.9.9.4 <u>Soil/Sediment</u> Circle all values on Form VI for field duplicates that are: RPD >100%, or Difference > 2 x CRDL* Is any RPD (where sample and duplicate are both greater than 5 times *CRDL): >100%? Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x *CRDL): >2x *CRDL? ACTION: If yes, flag the associated data as estimated. Form VII (Laboratory Control Sample) (Note: LCS - not A.1.9.10 required for aqueous Hg and cyanide analyses.) A.1.9.10.1 Was one LCS prepared and analyzed for: every 20 water samples? every 20' solid samples? both AA and ICP when both are used for same analyte? [__] ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory for submittal of results of LCS. Flag as estimated (J) all data for which LCS was not analyzed. NOTE: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

^{*} Substitute IDL for CRDL when IDL > CRDL.

^{**}Use absolute values of sample and duplicate to calculate the difference.

STANDARD OPERATING PROCEDURE Page 20 of 35

	Contract I Appendix A	aboratory Program L1: Data Assessment - Contract (Total Review - Inorganics)	Date: Fe Number: Revision:	HW-2	
			YES	<u>w</u>	_ <u>N/A</u> -
A.1.9.11	Form I	X (ICP Serial Dilution) -			
	MOTE:	Serial dilution analysis is required only for initial concentrations equal to or greater than 10 x IDL.			
A.1.9.11	.1 Was Se	rial Dilution analysis performed for: each 20 samples?	[_1		
		each matrix type?	[<u>/</u>]		
		each concentration range (i.e. low, med.)?	[]		
	ACTIO!	If no for any of the above, flag all positive data greater than or equal to 10xIDLs as estimated (J) for which Serial Dilution Analy was not performed, and summarize the deficier on the DPO report.	rei e	,	
A.1.9.11.		eld blank(s) used for Serial Dilution Analysis?		1/1	
	ACTION:	If yes, flag all associated data \geq 10 x TDL as estimated (J).			
	NOTE:	Serial dilution analysis should be performed on a field blank when it is the only aqueous sample in SDG.			
4.1.9.11.	on Form	ults outside control limit flagged with an "E" I's and Form IX when initial concentration on is equal to 50 times IDL or greater.	[]	·	
	ACTUON:	If no, write in the contract-problem/non-compliance section of the "Data Assessment Narrative".			
.1.9.11.	control	all values on Data Summary Sheet that are outsid limit for initial Concentrations equal to or go x IDLs only. Are any % difference values:	le reater		

≥ 100%?

Page 22 01 35

Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Number: Appendix A.1: Data Assessment - Contract Hv!-2 Revision: 10 Compliance (Total Review - Inorganics) YES MA.1.9.13 Form VIII (Method of Standard Addition Results) A.1.9.13.1 Present? If no, is any Form I result coded with "S" or a "+"? ACTION: If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII. A.1.9.13.2 Is coefficient of correlation for MSA less than 0.990 for any sample? ACTION: If yes, reject (red-line) affected data. A.1.9.13.3 Was *MSA required for any sample but not performed? Is coefficient of correlation for MSA less than 0.995? Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical rum? ACTION: If yes for any of the above, flag all the associated data as estimated (J). A.1.9.13.4 Was proper quantitation procedure followed correctly as outlined in the SOW on page E-16 through E-17? ACTION: If no, note exception under contract problem/ non-compliance of data assessment narrative, or prepare a separate list.

* MSA is not required on LCS and prep. blank.

Dissolved/Total or Inorganic/Total Analytes -

Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)?

A.1.9.14.1 Were any analyses performed for dissolved as well as total analytes on the same sample(s).

A.1.9.14

Page 24 or 35

Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Number: H-V-2 Appendix A.1: Data Assessment - Contract Revision: 10 Compliance (Total Review - Inorganics) YES ∞ N/AA.1.9.15.2 Do any computation/transcription errors exceed 10% of reported values on Forms I-IX for: (NOTE: Check all forms against raw data.) (a) all analytes analyzed by ICP? (b) all analytes analyzed by GFAA? (c) all analytes analyzed by AA Flame? (d) Mercury? (e) Cyanide? ACTION: If yes, prepare Telephone Log, contact laboratory for corrected data and correct errors with red pencil and initial. A.1.9.16 Form I (Field Blank) -Circle all field blank values on Data Summary Sheet that are greater than CRDL, 2 x IDL when IDL > CRDL. Do concentrations of field blank(s) fall below CRDL (or 2 x IDL when IDL > CRDL) for all parameters of associated aqueous and soil samples?

ACTION: If no, reject (except field blank results) all associated positive sample data less than or equal to five times the field blank value.

If no, was field blank value already rejected due to

other QC criteria?

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)

Date: Feb. 1990 Number: HW-2 Revision: 10

		YES	<u>100</u>	N/A	
A.1.9.17.	3 Form XI (Linear Ranges)				
	Was a ny sample result higher than high linear range of IC P.	·	[]		
	Was any sample result higher than the highest calibration standard for non-ICP parameters?		(<u>U</u>)		
	If yes for any of the above, was the sample diluted to obtain the result on Form I?	()			
	ACTION: If no, flag the result reported on Form I as $estimated(J)$.				
A.1.9.18	Percent Solids of Sediments		/		
	Is soil content in sediment(s) less than 50%?		[]		
	ACTION: If yes, qualify as estimated all data	- —			

not previously rejected or flagged due

to other ∞ criteria.

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.2: Data Assessment Narrative

Date: Feb. 1990 Number: HW-2 Revision: 10

CONTROL CASE#	4067	Site	Motorota - Machaio Matrix:	soil _
SDG#	MG5802	Lab .	Versor Laboratories	Water
Contractor	Holosench	Reviewer	Karen Smecker	Other

The case description and exceptions, if any, are noted below with reasons for rejection or qualification as estimated value(s) J. BIX ON DOMPHY (NOUNTING, DRA FIELD OFFICERE) FAR. WERE AND LIFE MANUEL M. MENSING MARKED LICALLY MEDICAL		
were malyed for aknomium had and rickel. No field hlacks or rensite blacks in the remote sit. he chata was lived by acceptable for all acceptable from the data is acceptable from the secretable from the sec	2.1 I	ne case description and exceptions, if any, are noted below with reason(s) or rejection or qualification as estimated value(s) J.
were included in the sample sie. he states were included a monding to Region To Dieta Middleton protocolo. The data is acceptable for all alalytis, except lead. Positive fear Fresults are regional, R), due to extremely higher	_	Gix soil samples (including the field deplicate) pair)
were included in the sample sie. Kecheta was waluated a mondrig to Region To Dieta Validation protocols. The data is acceptable for all alabetes, except lead. Positive fra Fresults are regional, R), due to extremely higher		were analyted for thronium had and
List beginded amoderig to Region To Dieta - Validation protocolo. The data is acceptable - for all alegans, except lead. Positive fra frequent ari, regional, R), due to extremely higher		nokel. no field Marks in rensite Warks
- Validation pytearle. The data is acretalle - for all adalytes, except lead. Positive lead Fresults are regional, R), due to extremely higher		were moveded in the verige sit hechte
for all abolitis), except lead. Positive lead	1	uns lunewated andding to Region II Vieta
Tresult) are registed (R), due to extremely higher	-	Mulition getterer. The data is acceptable
- Jane 10 To Tallaction of the for the first the first	_	you are applying, except lead. Positive lead
Yellowry (70R) was > 200.)	~	Jane De Marie Jane Jane Jane Jane Jane Jane Jane Jan
	_	recovery (%RUMOS > 200.)
	_	· i
	_	
	_	
	_	

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.2: Data Assessment Narrative

Date: Feb. 1990 Number: HW-2 Revision: 10

		
		
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	· · · · · · · · · · · · · · · · · · ·	
		
		

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.3: Contract Non-Compliance

(SD Report)

Date: Feb. 1990 Number: HW-2 Revision: 10

CONTRACT NON-COMPLIANCE (SMD REPORT)

Regional Review of Uncontrolled Hazardous Waste Site Contract Laboratory Data Package

CASE NO.	4067
The hardcopied (laboratory name) / UBOY LOUGLINES	/
Inorganic data package received at Region II has been reviewed and the quality	assurance and
Conc. & Matrix:	
Contract No. WA87-K025_K026_K027(SOW787) requires that specific analytical work that associated reports be provided by the contractor to the Regions, EMSL-LV, general criteria used to determine the performance were based on an examination — Data Completeness — Duplicate Analysis Results — Matrix Spike Results — Blank Analysis Results — Calibration Standards Results — MSA Results	be done and
Items of non-compliance with the above contract are described below.	
Comments:	
	-
	·
(DAS) For KMS 2/14/91	
Reviewer's Initial Date	

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.7: CLP Data Assessment Checklist

Inorganic Analysis

Date: Feb. 1990 Number: HW-2 Revision: 10

INCRGANIC REC	HONAL DATA ASSESSMENT	Region 2
CASE NO. 4/06/7		
	SITE //iotorola	-Mochais
LABORATORY Versar Laboratories	NO. OF SAMPLES/	
	MAIRIX 6 / 5	oils
5DG#_ MGSB02	REVIEWER (IF NOT	TO MA MARA
SOW# 4/99	TOTEMER (IF NOT	EST) 1/05 (A/O)
SW#	REVIEWER'S NAME	havir mecher
DPO: ACTION FVT	_	PHOLOGO CONTINUE CALE C
	COMPLETION DATE	02/07/91
DATA ASS	ESSMENT SUMMARY	
1. HOLDING TIMES	AA Hg	CYANIDE
2. CALIBRATIONS	- $ -$	
3. BLANKS		<u> </u>
4. ICS — C		-
5. ICS		ł
6. DUPLICATE ANALYSIS		•
7. MAIRIX SPIKE	71	
8. MSA		·
9. SERIAL DILUTION O	-	
		į.
()		
O = Data has no problems/or qualified M = Data qualified due to rein	due to minor problems.	,
M = Data qualified due to major probl Z = Data unacceptable.	ens.	
X = Problems, but do not affect data.		
ACTION ITEMS: Z'-The Pb %R Was >	> 200	
100 TD 7017 W65 2	200.	
AREAS OF CONCERN:		
NOTABLE PERFORMANCE:		
TAN ON MUCE:		
	· ·	
		

APP	<u> </u>	A.5			S:	<u> </u>	RY OF	INOF	RGANI	cs c	UAL	LTY C	UNIR	OL D	ALA						
LAZ	OR.ICR	Y: !/	21834	lab	O CAS	E NO	o	4067	1_	s of	ו אס	. 7/8	38 s	aypl:	E TYP	E/SD	ေ <u>၂</u>	OIL /	MG	ie oz	· ·
SII	E/STUD	Y DES	CRIPTI	[_: 00	Nete	vla-	- Ma	chais	٠	_ S <i>Y</i> ;	PLE	NOS:	MGSA MGT	302-01 <u>P02-</u> 0	, Mate	101-01 43-40	1 7 MG	1702	-01 GTPC	, 4-01.	,
<u> U</u> r	- Mi &	9	anax	1526	、 ソ <u></u>								MG"	MCS.	− 01				<u> </u>		
FIE	LD DUP.	. #15	MGTPCZ	: -01 &	MGTPC	2-01 i	<u> 1</u>	AB DUI	P. #	' S : <u>MG</u>	Fie:	ld Bl	ank IGTPO3	<u>フ(か)</u> (3 を)	Z MTRIX	(SP)	I KE	· ME	במיתו במיתו	-015	• 5
SER!	IAL DI	LUTIC	N SAMP	LE N	0. M	5TPC	- 3-c:	. C (OMPLE	TIO	DA:	TE:/"	2107	191	REVIE	WER!	נאו פ	ITIAI	.s :	1/15	
	Detect	tion	ON SAMP I Field Blank	Ca	II	Ver.		III	Std	Cı	II	ratio	n l	P B	ICP	ICS	V H S	VI	VII	IX	<u> </u>
ara- eter	Limit UG/I	t s	Field Blank	-	ZR	tini	ued	Ver.	Z R		Blan	nks ntinu	ed	R L	7	R	t p	Dup	LCS	D11	e
	CRDL	IDL		Ini	t 1	2	3	Init	Fin	Ini	1	2	3	PN	Init	Fin	хk	di£	7 R	Z D	h
Al	200		NA	ļ																	
56	60			ļ																	
As	10			<u> </u>																	
Ba	200			<u> </u>																	
Be	5			<u> </u>																	
Cd	5													-							
Ca Ca	5000																				
Cr	10	6.0		K			_aı (se	1 dato	me mevet s	+ 5	C n	City C	eme nat	nts.	cd).		<u> </u>		<u> </u>		ICP
Co_	50													·							
Cu	25																				
Fe	100																<u></u>				
Pb	3	1.0		4				docum						->	NA	NA	215.9	2H 6	ata CC)	NA	GFAA
Mg	5000																	Sup	then	chaene	ation)
Mn	15																				
Hg	0.2																				
Ni		120		K			(S	data e su	: me	t a	C re	504) 501/6	men.	S.	: chec	<u> </u>					iÇΞ
ĸ	5000																				
Se	5																				
Ag	10																				
Na.	5000																				
Tl	10		1																		
▼	50			1.																	
Zn	20																				
C.N.	10		V						+												

APPENDIX A: QUALIFIED

LABORATORY RESULTS

1 INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO
-----	--------	----

	IN	ORGANIC AN	NALYSES DATA SI	HEET	ı	, 	
Lab Name: VER SA R_ L A	BORATOR	RIES_INC	Contract:	: MA	.CHAIS		B02-01
Lab Code: VERSAR	Case	No.: 4067_	SAS No.	: _		SDG No	o.: MGSB
Matrix (soil/water)	: SOIL_	·			Lal	b Sample :	ID: 3972
Level (low/med): LO	W				Date	Received	: 12/08/
% Solids:69.9							
C on cent.	ration	Units (ug,	/L or mg/kg dry	y we	eight)	: MG/KG	
CA	S No.	Analyte	Concentration	С	Q	M	
7429	-90-5	Aluminum		- -		NR	
•	-36-0	_		- -		NR	
7440	-38-2	Arsenic_		- -		NR	
	-39-3_			<u> </u>		NR	
1	-41-7_	Beryllium]_[_		NR	
		Cadmium_		_ -		NR	
	-70-2			<u> - -</u>		NR	
	-47-3 ₋	-	3.1	_ _		P	
· · · · · · · · · · · · · · · · · · ·	-48-4 -50-8	Cobalt]		NR	
	-89 - 6	Copper		 		NR	
1	-92 - 1	Lead	7.2	 	N*	NR F	
	-95 - 4	Magnesium		 	—" [~] —	NR	
7439	-96-5	Manganese		- -	·	NR	
7439	-97-6	Mercury		- -		NR	
7440	-02-0	Nickel -	13.3	[- -		P	
7440	-09-7	Potassium		- -		NR	
17782	-49-2	Selenium		- -		NR	
7440	-22-4	Silver				NR	
	-23-5_					NR	
	-28-0_			_ _		NR	
		Vanadium_		1_1_		NR	
7440	-66-6_	Zinc		 _ _		NR	
		Cyanide		- -		NR	
l	 	l	! 	-		l l	
Color Before: BROWN		Clari	ty Before:			Textur	e: COARS
Color After: COLOR	LESS	Clar	ity After: CLE	ar_		Artifact	s: YES
Comments: _THE_PERCENT_SOLI	DS_LAB	_SAMPLE_ID	_NUMBER_IS_397	17;_	ARTIF	ACTSRO	CKS;

INORGANIC ANALYSES DATA SHEET

EPA	c	3 3	4DT	7.7	MO
LPA	0	AL	121	ıL	NU.

ab Name: VERS	AR LABORATO	RIES INC.	Contract:	. MZ	ACHAIS		MGT	P01	-01
	_				•				
ab Code: VERS	AR Case	: NO.: 406/	_ SAS No.:	·			SDG N	o.:	MGSB
atrix (soil/w	ater): SOII	ı			La	b Sa	ample	ID:	3971
evel (low/med): LOW				Date	Red	ceived	: 1	2/08/
Solids:84	•5								
Co	ncentration	Units (ug	/L or mg/kg dry	/ We	eight) ———	: M	G/KG		
	CAS No.	Analyte	Concentration	С	Q	M			
	7429-90-5	Aluminum		 - -		NR	İ		
	7440-36-0	Antimony		- -		NR	1		
	7440-38-2	Arsenic				NR	Ī		
	7440-39-3			- -		NR			
		Beryllium				NR	İ		
	7440-43-9-					NR			
	7440-70-2			_ .		NR	į		
	7440-47-3	_ Chromium_	3.7	_ .		P_			
	7440-48-4	Cobalt		_ .		NR	•		
	7440-50-8	Copper		1_1.		NR			
	7439-89-6			_ .		NR	1		
	7439-92-1		-56.9	图.	N*	. F_			
	-	Magnesium		_ .		NR	•		
		Manganese		[_].		NR			
	7439-97-6			_ .		NR	1		
	7440-02-0	- '	11.0	-		P_	. 🖡		
		Potassium	<u> </u>	1_1.		NR	•		
	1 .	Selenium_		-1.		NR	•		
	7440-22-4	- :	\	 - .		NR	•		
	7440-23-5			 	······································	NR			
	7440-28-0 7440-62-2			-1		NR			
	7440-62-2			- -		NR			
	/440-00-0	Cyanide		├ — ·		NR	•		
		- Cyanitue		- -		- NR	1		
		_	.1	1—1.		- 1	.1		
olor Before:	BROWN	Clari	ty Before:				Textur	e:	FINE
Color After:	YELLOW	Clar	ity After: CLE	AR_		Ar	tifact	:s:	YES_
	·								
omments:									
_THE_PERCENT	r_solids_la	B_SAMPLE_ID	_NUMBER_IS_397	09;	_ARTI	ACT	SRC	OCKS	s;
									

1 INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO
-----	--------	----

ab Name: VERSA ab Code: VERSA atrix (soil/wa	_	RIES_INC	Contract	•		MGTP02	-01
ab Code: VERS	_		CONCLACE	MACH	LAIS	i	01
	AR Case	No.: 4067				SDG No ·	MGSB
atrix (soil/wa					 -	55G 115	MGSD
	ater): SOIL_	<u> </u>			Lab S	ample ID:	3971
evel (low/med)	· TOW			_	+_ ¬		
sver (row) wed)): LOW			L	ate ke	ceived: 1	.2/08/
Solids: 81.	. 6						
_							
Cor	ncentration	Units (ug,	L or mg/kg dry	y weig	nt): M	G/KG	
	i 					1	
	CAS No.	Analyte	Concentration	c	M		
! :			_		.		
i		Aluminum_			NR	1	
	7440-36-0				NR		
	7440-38-2_	Arsenic			NR		
	7440-39-3			_	NR	•	
	7440-41-7			_	NR	•	
	7440-43-9-	Cadmium_		_ -	NR	•	
,	7440-70-2	Calcium_			NR		
	74 4 0-47-3_ 74 4 0-48-4_	Chromium_ Cobalt	5.0	1-1	P		
	7440-50-8	Copper		- 	NR NR	•	
	7439-89-6	Iron		- 	NR NR	•	
	7439-92-1		14.4	三 一	* F	†	
	7439-95-4			1-1-	- NR	· †	
	7439-96-5	Manganese		-	NR	•	
	74 3 9-97-6			-	NR	•	
	7440-02-0		13.2		P	Ī	
	7440-09-7_				NR		
	7782-49-2_	Selenium_			NR		
	7440-22-4	Silver		_	NR		
	7440-23-5				NR		
	7440-28-0 74 4 0-62-2	Thallium_ Vanadium		-	NR	•	
	7440-66-6	Zinc		-	NR	•	
	/440-00-0_	Cyanide		├ ─├──	NR		
				-	N.K.	†	
	' 	· ———	· ————	· - ·	—-·—	. ‡	
olor Before: 1	BROWN	Clari	ty Before:			Texture:	FINE
Color After: '	YEL L OW	Clar	ity After: CLE	AR		tifacts:	-
			-	~			
omments:							
_THE_PERCENT	_solids_lab	_sample_id	NUMBER_IS_397	10;_AF	RTIFACT	SROCKS	3;_
			_ _				

FORM I - IN

EPA	SAMPL:	E NO.
-----	--------	-------

INORGANIC ANALYSES DATA SHEET	EPA SAMPLE NO.
Lab Name: VERSAR_LABORATORIES_INC Contract: MACHAIS	MGTP02-01 DP
Lab Code: VERSAR Case No.: 4067_ SAS No.:	SDG No : MGSB02
Lab Code. VERSAR Case No.: 4007 DAD No.:	000
Matrix (soil/water): SOIL Lab Sa	ample ID: 39720_
Level (low/med): LOW Date Rec	ceived: 12/08/90
% Solids:81.6	
	- 1
Concentration Units (ug/L or mg/kg dry weight): MC	G/KG
CAS No. Analyte Concentration C Q M	
7429-90-5 Aluminum NR	
7440-36-0 Antimony NR	
7440-38-2 Arsenic NR	
7440-39-3 Barium NR	
7440-41-7 Beryllium NR	
7440-43-9- Cadmium NR	
7440-70-2 Calcium NR	
7440-47-3 Chromium 4.8 P	1
7440-48-4 Cobalt NR	į
7440-50-8 Copper NR	Ī
7439-89-6 Iron NR	
7439-92-1 Lead 14-2 R N* F	Ī
7439-95-4 Magnesium NR	<u>.</u>
7439-96-5 Manganese NR	1
7439-97-6 Mercury NR	
7440-02-0 Nickel 13.3 P	
7440-09-7 Potassium NR	
7782-49-2 Selenium NR	
7440-22-4 Silver NR	1
7440-23-5 Sodium NR	1
7440-28-0 Thallium NR	4
7440-62-2 Vanadium NR	1
7440-66-6 Zinc NR	1
Cyanide NR	•
	.1
Color Before: BROWN Clarity Before:	Texture: FINE
Color After: YELLOW Clarity After: CLEAR_ Ar	tifacts: YES
Comments:THE_PERCENT_SOLIDS_LAB_SAMPLE_ID_NUMBER_IS_39711;_ARTIFACT	srocks;

FORM I - IN

	IN	ORGANIC AN	1 ALYSES D <mark>ATA S</mark> H	EET	EPA SAMPI	LE NO.
Lab Name: VERSA	r laborator	IES INC.	Contract:	MACHAIS	MGTP03	-01
ab Code: VERSA	R Case	No.: 4067_	_ SAS No.:		SDG No.:	MGSB02
fatrix (soil/wa	ter): SOIL_			La	b Sample ID:	39721_
Level (low/med)	: LOW			Date	Received: 1	2/ 08/9 0
Solids:58.	3					
Cor	acontration	Units (va)	L or mg/kg dry	veight)	: MG/KG	
			2 42 33/114 -22	,	 1	
	CAS No.	Analyte	Concentration	c Q	M	
	7429- 90-5	Aluminum	, 	-	NR	
•	7440-36-0	Antimony		-	NR	
	7440-38-2	Arsenic			NR	
	7440-39-3	Barium	•	-	NR	
		Beryllium		[-	NR	
	7440-43-9-	Cadmium		-	NR	
	7440-70-2			-	NR	
	7440-47-3	Chromium	6.5		P	
	7440-48-4			-	~ NR	
	7440-50-8				NR	
	7439-89-6				NR	
	7439-92-1		20.9	Z SN*	F	
	7439-95-4] NR	
	7439-96-5				NR	
	74 3 9-97-6	Mercury			[NR]	
	7440-02-0	Nickel	14.0		[P_]	
	7440-09-7	Potassium			NR	
	7782-49-2				NR NR	
	7440-22-4	Silver			NR	
	7440-23-5			. _	NR	
	7440-28-0				NR	
	7440-62-2_			. _	NR	
	7440-66-6			. _	NR	
		Cyanide		-	NR	
		.		. _	_ l l	
Color Before:	BLACK	Clari	ty Before:		Texture:	MEDIUM
Color After:	YELLOW	Clar	ity After: CLE	CAR_	Artifacts:	YES
Comments: _THE_PERCENT	_solids_lab	_SAMPLE_ID	NUMBER_IS_397	'12;_ARTI	FACTSSTIC	xs;
					·	

7/88

EDY	SAMPLE	$N \cap$

ab Name: VERS	AR_LABORATOR	IES_INC	_ Contract:	MACI	HAIS	MGTP04	-01
ab Code: VERS	AR Case	No.: 4067_	_ SAS No.:	<u> </u>		SDG No.:	MGSB
atrix (soil/wa	ater): SOIL				Lab S	ample ID:	3972
	_			,	Data Ba	ceived: 1	2/00/
evel (low/med)): LOW			·	Date Re	celved. 1	.2/00/
Solids:67	• 0	•					
Co	ncentration	Units (ug	'L or mg/kg dry	v wei	ght): M	ig/kg	
				1 1		-, -,	
	CAS No.	Analyte	Concentration	c	Q	f	
	7429-90-5	Aluminum		-	NE	2	
	7440-36-0	Antimony		-	NI NI	1	
	7440-38-2	Arsenic		-	NI	L	
	7440-39-3	Barium —			NI	ર	
	7440-41-7	Beryllium			NI	ર∣	
	 7440-43-9-	Cadmium			NI		
	7440-70-2_	Calcium_		1_	NI NI	4	
	7440-47-3	Chromium_	8.2	_ _	P		
	7440-48-4	Cobalt			NI	4	
	7440-50-8	Copper		-	N	<u>.</u>	
	7439-89-6 7439-92-1	iron		1-1-	NI NI	1	
	7439-92-1_	Lead	-9-9	<u> ^ </u>	N*F	i	
	7439-95-4	Manganasa		1-1-	N	4	
	7439-98-5	Marganese		1-1	NI	4	
	7440-02-0		23.0	-	P	1	
	7440-09-7			- -	N		
	7782-49-2				NI NI	1	
	7440-22-4		·	- -	N:		
	7440-23-5				N:		
	7440-28-0	Thallium		- -	N:	R	
	7440-62-2	Vanadium		- -	N:	R İ	
	7440-66-6	Zinc			N	R İ	
		Cyanide			N.	R	
			1	.!_!_	}	<u>l</u> 	
Color Before:	BROWN	Clari	ty Before:			Texture:	FINE
Color After:	YELLOW	Clar	ity After: CLE	AR_	A	rtifacts:	
Comments:	N CATTRE TAR	מז שומשעם	NIMBED TE 207	15.			
THE PERCENT	L ⁻ PATTD2 TYYR	_ว <i>พ</i> นรกต_าก	_NUMBER_IS_397	10 i _			

FORM I - IN

7/88

1 INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO
	DETITION	110.

	II	ORGANIC AN	NALYSES DATA SH	HEET		. ————	
Lab Name: VER	S A R_LABORATOR	RIES_INC	Contract:	MAC	HAIS_	MGTPOS	5 - 01
Lab Code: VER	S A R Case	No.: 4067	SAS No.:	·		SDG No.	: MGSBO
Matrix (soil/	water): SOIL				Lab	Sample ID	39725
Level (low/me	d): LOW				Date	Received:	12/08/9
% Solids:6	4.1						
·	oncentration	Units (ug,	/L or mg/kg dry	y wei	.ght):	MG/KG	
	CAS No.	Analyte	Concentration	С	Q	М	
	7429-90-5	Aluminum		- -		NR	
	7440-36-0					NR	
	7440-38-2					NR	
	7440-39-3			_ _		NR	
	7440-41-7	_		<u> </u>		NR	
	7440-43-9-			!-		NR	
	7440-70-2_ 74 40 -47-3		5.5	! — ! —		NR	
	7440-48-4		3.5	│		P NR	
	7440-50-8			 		NR	
	7439-89-6			1- -		NR	
	7439-92-1		43.7	131-	N*	F	
	7439-95-4			1-1-	· · ·	NR	•
	7439-96-5			√ - -		NR	
	7439-97-6			- -		NR	
	7440-02-0	Nickel	17.3			P	
	7440-09-7	Potassium				NR	
	7782-49-2	Selenium_		1_1_		NR	
	7440-22-4_	Silver		1_1_		NR	
	7440-23-5_			1-1-		NR	
	7440-28-0	_		[-] -		NR	
	7440-62-2_ 7440-66-6	_		- -		NR	
	/440-00-0_	Cyanide		1-1-		NR	
		Cyanite		1-1-		NR	
	·	l	· ————	· ·		l —_ l	
Color Before:	BROWN	Clari	ty Before:			Texture:	COARSE
Color After:	YELLOW	Clar	ity After: CLE	AR_		Artifacts:	YES
Comments: _THE_PERCEN	IT_SOLIDS_LAB	_sample_id	_NUMBER_IS_397	16;_	ARTIF	ACTSROCK	s;

FORM I - IN

SIANDARD OPERATING PROCEDURE Title: Evaluation of Metals Data for the Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)	Date: Number	4 of Feb. 19 Feb. 19 Feb. 10	990
A.1.1 Contract Compliance Screening Report (CCS) - Present? ACTION: If no, contact RSCC.	YES []	70	NA *
* DCCUMENT NOT PROVIDED BY CONTRACTOR? A.1.2 Record of Communication (from RSCC) - Present? ACTION: If no, request from RSCC.	[]		<u>/</u> *
A.1.3 Trip Report - Present and complete? ACTION: If no, contact RSCC for trip report.	[]		<u>√</u> #
A.1.4 Sample Traffic Report - Present or on file? Legible? Legible? ACTION: If no, request from Regional Sample Control Center (RSCC).	[]	 	<u>_</u> *
A.1.5 Cover Page - Present? Is cover page properly filled in and signed by the lab manager or the manager's designee? ACTION: If no, prepare Telephone Record Log, and contact laboratory.			<u>-</u>
Do numbers of samples correspond to numbers on Record of Communication? **RSCC NOT PROVIDED BY CONTRACTOR Do sample numbers on cover page agree with sample numbers on:	[]		V*
(a) Traffic Report Sheet? **TRAFFIC REPORT AND PRODUCED BY CONTRACTOR. (b) Form I's? **ACTION: If no for any of the above, contact RSCC for Clarification.	[<u>]</u>]		<u>√</u> *

Page Title: Evaluation of Metals for the Contract 6 of 35 Laboratory Program Date: Feb. 1990 Appendix A.1: Data Assessment - Contract Number: Compliance (Total Review - Inorganics) Hv-2 Revision: 10 YES Other Metals analysis (6 months). . . exceeded? N/APrepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist. ACTION: If yes, reject (red-line) values less than Instrument Detection Limit (III) and flag as estimated (J) the values above III even though sample(s) was preserved properly. A.1.8 Ray Data A.1.8.1 Digestion Log* for flame AA/ICP (Form XIII) present? Digestion Log for furnace AA Form XIII present? Distillation Log for mercury Form XIII present? Distillation Log for cyanides Form XIII present? Are pH values (pH<2 for all metals, pH>12 for cyanide) *Weights, dilutions and volumes used to obtain values. Percent solids calculation present for soils/sediments? Are preparation dates present on Digestion Log? A.1.8.2 Measurement read out record present? ICP

Flame AA

Mercury

Cyanides

Furnace AA

Title:	Evaluation of Metals Data for the Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)	Date: Feb. 1990 Number: HW-2 Revision: 10			
		YES	NO N/A		
	ACTION: Flag associated data as estimated if standards are not within ±10% of true values (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.				
A.1.9.1	3 Is correlation *coefficient less than 0.995 for:				
	Mercury Analysis?		[_] _	/	
	(Net applicable to Titameline Hither) Atomic Absorption Analysis?				
<u>ACTI</u> (N: If yes, flag the associated data as estimated.		,		
A.1.9.2	Form II A (Initial and Continuing Calibration Verification	ı)-			
A.1.9.2.	l Present and complete for every metal and cyanide?				
	Present and complete for AA and ICP when both are used for same analyte?	[]		/	
	ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.				
A.1.9.2.	Circle all values on data summary sheet that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?	,			
	Metals 90-110%	1 1			
	Hg - 80-120%	[]	\	,	
	Cyanides 85-115%	1			

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^{*} The reviewer will calculate correlation coefficient.

STANDARD OPERATING PROCESSIBLE

	STANDARD OF DRAITING PROCEDURE	Page]	.0 of	35
!	Evaluation of Metals Data for the Contract Laboratory Program Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)	Date: Number: Revisio	Feb. 19 HW-1	90
		YES	ND	
A.1.9.3.	2 Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?	1/1		
	ACTION: If no, write in Contract Problem/Non-Complian Section of the "Data Assessment Narrative".	ce		
A.1.9.3.3	3 Circle all values on summary sheet that are outside acceptance windows.	•		
	Are CRA and CRI standards within control limits: Metals 80 - 120%R?	[]		
	Is mid-range standard within control limits: Cyanide 80 - 120%R?	Fortuna []	7 fage)	h.~
	ACTION: Flag as estimated all data within the affected ranges if the recovery of the standard is between 50-79%; flag only positive data if the recovery is between 121-150%; reject (red line) all data if the recovery is less than 50%; reject only positive data if the recovery is greater than 150%.	•		
A.1.9.4	Form III (Initial and Continuing Calibration Blanks)			
A.1.9.4.1	Present and complete?	[
	For both AA and ICP when both are used for same analyte	? []		
,	Was an initial calibration blank analyzed?	$[\underline{1}]$		
	Was a continuing calibration blank analyzed after every 10 samples or every 2 hours (whichever is more frequent)?			

ACTION: If no, prepare Telephone Record Log, contact laboratory and write in the contract-problems/non-compliance section of the Data Assessment Narrative.

2B CRDL STANDARD FOR AA AND ICP

Lab	Name:	VERSAR_	_LABSIN	ic		Contr	act:	9101211-91	_,_		_
Lab	Code:	VERSAR	Case	No.:	4123	SAS	No.:		SDG	No.:	MGGW01
AA	CRDL S	tanda rd	Source:	INOR.	VENT						
ICP	CRDL	Standar	d Source:	INOR	_VENT.						

Concentration Units: ug/L

	CRDL St	andard fo	r AA	CRDL Standard for ICP Initial Final						
Analyte	True	Found	%R	True	Found	%R	Found	*R		
Aluminum					:					
Antimony										
Arsenic										
Barium										
Beryllium						\ _				
Cadmium										
Calcium			—— <u>-</u>							
Chromium_				20.0	14.68	73.4	17.02	85.		
Cobalt				ł l		 -				
Copper	-									
Lead	3.0	2.72	90.7							
Magnesium				l ———						
Manganese										
Mercury										
Nickel		 (80.0	89.87	112.3	79.16	99.		
Potassium						-				
Selenium										
Silver										
Sodium										
Thallium_										
Vanadium_							······································			
Zinc			i]						

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)

Date: Feb. 1990 Number: HW-2 Revision: 10

actificate	Tf ame and a decided	YES	NO	N/A
MULLUY:	If yes, reject (red-line) all associated data			
	greater than CRDL concentration but less than to	רייכ		

times the prep. blank value found in the raw data.

A.1.9.5.3 Do concentrations of prep. blank fall below two times IDL when IDL is greater than CRDL?

ACTION: If no, reject (red-line) all positive data that has a concentration less than 10 times the prep. blank value in the raw data.

A.1.9.5.4 Is concentration of prep. blank below the negative CRDL? _____

ACTION: If yes, reject (red-line) all associated data that has a concentration less than 10xCRDL.

A.1.9.6 Form IV (1CP Interference Check Sample)

A.1.9.6.1 Present and complete?

(NOTE: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)

Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?

ACTION: If no, flag as estimated (J) all samples for which AL, Ca, Fe, or Mg is higher than in ICS.

A.1.8.6.2 Circle all values on Data Summary Sheet that are more than + 20% of true or established mean value. Are all Interference Check Sample results inside of control limits (+ 20%)?

If no, is concentration of Al, Ca, Fe, or Mg lower than in ICS?

ACTION: If no, flag as estimated (J) those positive results for which ICS recovery is between 121-150%; flag all sample results as estimated if ICS recovery falls within 50-79%; reject (red-line) those sample results for which ICS recovery is less than 50%; if ICS recovery is above 150%, reject positive results only (not flagged with a "U").

5A SPIKE SAMPLE RECOVERY EPA SAMPLE NO.

ab Name: VERS	AR LAB	s. INC.			Contract:	91	01211-		GGW05-0)1 S	
•					SAS No.:				G No.:	MGG	W01
atrix (soil/w	a t er):	WATER_					Level	(low	/med):	LOW	' <u>-</u> -
Solids for S	Sa m pl e:	0.0									
Co	on c en t i	ration U	nits (ug	3/1	or mg/kg dry	we	ight):	UG/L	<u>-</u>		<u> </u>
i i		Spiked S Result	ample (SSR)	С	Sample Result (SR)	С	Spik Added	e (SA)	%R	Q	М
luminum				- -		_ -		Ì		_ -	NR
Antimony				_ .		-					NR NR
arium				_ :			+			_ _	NR NR
Beryllium				_		— - _ -				_ -	NR NR
talcium75-3	125	220	.0100_	_	37.8200_		200	0.00_	91.1		P
Cobalt				_		- -					NR NR
ron	125		.9500_ .1100	-	_136880.2700_ 75.7400	- -			_326.4 106.8		P F_
Magnesium				-		- -				_ -	NR NR
Manganese			1.4800	_	119.5800		5.0	0.00	89.0	_ -	NR P
Potassium	125	564		_	119.5800_					_ -	NR
Selenium Silver				-						_ -	NR NR
Sodium				_		-					- NR NR
Vanadium				_						_ -	NR NR
Zinc Cyanide			724 (<u> </u>						- -	NR
Comments:	No	act Fe ch	Linghille Collins	- 1		.1_1			1	_	_
		1) 6	HU 5	70	<u>, · </u>						_

				IING PROCE	XRE	Page :	14 of 3	35
Title:	Contract L	of Metals; aboratory P. .1: Data A (Total Rev.	rogram SSESSment	- ~~~	:	Date: Number: Revisio		
						YES	M	- <u>1:</u>
	Are rest flagged	ults outside with "N" or	e the cant Form I's	rol limits and form	(75-125%) VA?	[]		
	ATTICN:	If no, wri	ite in th e e section	Contract of "Data A	- Problem/Non - ssessment Narra	tive".		
A.1.9.7.	4 <u> </u>							
	Are any	spike recov		•				
			(a)	less than	30%?		[_/_]	<u></u>
			(b)	between 30	74%?		11/1	
			(c)	between 1	26-150%?		11/	
			(d)	greater th	uan 150%?		<u>[]</u>	
	ACTION:	arieous data 126-150%, s arieous data greater tha	etween 30- ta as est; flag as es ta not fla an 150%, r	-74%, flag imated (J); stimated (J agged with reject (red	ussociated aqueonall associated if between if all associated a "U"; if -line) all agged with a "U"	eđ		
A.1.9.7.5	Soil/Sedi Are a ny s	spike recove (a) less t	_			[]	<u></u>
		(.	b) betwee	n 10-74%?			[]	
·		(c) between	n 126-200%	,		[]	<u>√</u>
				r than 2009			[]	
	beti if l data	ween 10-74% between 126- a was not fi	, flag all -200%, fla lagged wit	l associate ag as estim in a "U"; i	sociated data; d data as estinated all associ f greater than gged with a "U"	rated; iated		

6 DUPLICATES EPA SAMPLE NO.

MGGW05-01FD

I b Name: VERSAR_LABS._INC._____ Contract: 9101211-9

Tab Code: VERSAR Case No.: 4123 SAS No.: SDG No.: MGGW01

Matrix (soil/water): WATER____

Level (low/med): LOW____

Solids for Sample: ___0.0

% Solids for Duplicate: 0.0

Analyte	Control Limit	Sample (S)	С	Duplicate (D)	С	RPD	Q	М
Aluminum_								NR
Antimony_			_		_		1_	NR
Arsenic			<u> _ </u>		_		1_	NR
Barium			<u> _</u>		_		1_	NF
Beryllium					_		_ _	NF
Cadmium			_		_			NF
Calcium			-		-		-	NF
Chromium_		6.0000	ਹ	6.0000	ਹ	<u> </u>	-	P NI
Cobalt			_		_		-	
Copper			B	124 222	-	132.5	\ _	NI
Iron		86.2000	U	424.8000_		[-132.3-]	₽**	P F
Lead		2.0000	101	2.0000	0		1-	NI
Magnesium			-		-		 -	NI
Manganese			-		-		-	NI
Mercury		12.0000	<u> </u>	12.0000	ਹ		-	P
Nickel		12.0000_	101	12.0000_	"		-	NI
Potassium			 -		-		-	N
Selenium_			·} -		-		+-	N
SilverSodium			·		-		+-	N
Thallium			· -		-		1-	N
Vanadium_					-		 -	N.
Zinc			-		-		+-	N.
Cyanide			1-1		-		1-	N.
cyanitue					-		1-	1

STANDARD OPERATING PROCEDURE Page 16 01 35 Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Number: HN-2 Appendix A.1: Data Assessment - Contract Revision: 10 Compliance (Total Review - Inorganics) YES 2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria. A.1.9.8.4 Is any value for sample duplicate pair less than CROL* and other value greater than or equal to 10 x *CRDL? ACTION: If yes, flag the associated data as estimated (J). A.1.9.8.5 <u>Aque**qu**s</u> Circle all values on Data Summary Sheet that are: RPD > 50%, or Difference > ± CRDL* Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL? Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL? ACTION: If yes, flag the associated data as estimated. A.1.9.8.6 Soil/Sediment Circle all values on Data Summary Sheet that are: RPD > 100%, or Difference > 2 x CRDL* Is any RPD (where sample and duplicate are both

> 100%?

> 2x*CRDL?

* Substitute IDL for CRDL when IDL > CRDL.

greater than or equal to 5 times *CRDL):

Is any **difference between sample and duplicate

(where sample and/or duplicate is less than 5x*CRIX.):

^{**} Use absolute values of sample and duplicate to calculate the difference.

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics)

Date: Feb. 1990 Number: H.7-2 Revision: 10

YES MNA

A.1.9.9.4 <u>Soil/Sediment</u>

Circle all values on Form VI for field duplicates that are:

Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both greater than 5 times *CRDL):

>100%?

Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x *CRDL):

>2x *CRDL?

ACTION: If yes, flag the associated data as estimated.

Form VII (Laboratory Control Sample) (Note: ICS - not required for aqueous Hg and cyanide analyses.)

A.1.9.10.1 Was one LCS prepared and analyzed for:

every 20 water samples?

every 20' solid samples?

both AA and ICP when both are used for same analyte?

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory for submittal of results of LCS. Flag as estimated (J) all

data for which LCS was not analyzed.

NOTE: If only one LCS was analyzed for more than 20

samples, then first 20 samples close to LCS do not have to be flagged as estimated.

^{*} Substitute IDL for CRDL when IDL > CRDL.

^{**}Use absolute values of sample and duplicate to calculate the difference.

Title: Evaluation of Metals Data for the

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7	Contract I Appendix A	of Metals Data for the aboratory Program .l: Data Assessment - Contract (Total Review - Inorganics)		Date: Number: Revision)
3 1 0 11	5			YES	<u>w</u>	_ <u>N/A</u>
A.1.9.11	Porm I	K (ICP Serial Dilution) -				
	NOTE:	Serial dilution analysis is refor initial concentrations equal greater than 10 x IIIL.	quired only al to or	•		
A.1.9.11.	1 Wa ş Se	rial Dilution analysis performed eac	ch 20 samples? ·	[1		
		eacl	n matrix type?			
		each concentration range (i.e	e. low, med.)?	[<u></u>]		
	ACTION:	If no for any of the above, is data greater than or equal to estimated (J) for which Serial was not performed, and summar on the DPO report.	0 10xIDLs as al Dilution Analys	i s Y	,	
A.1.9.11.2	2 Was fie	ld blank(s) used for Serial Dil	ution Analysis?		[1]	
	<u>ACTION</u> :	If yes, flag all associated das estimated (J).	lata ≥ 10 x IDL			
	NOTE:	Serial dilution analysis shou on a field blank when it is t sample in SDG.	ld be performed he only aqueous			
A.1.9.11.3	on Form	olts outside control limit flag I's and Form IX when initial c is equal to 50 times IDL or gr	Oncentration on	[]		
	<u> 20110</u> 1:	If no, write in the contract-p. compliance section of the "Data Narrative".	roblen/non- a Assessment			
A.1.9.11.4	control	all values on Data Summary Sheet limit for initial concentration X IDLs only. Are any % different	ns equal to or gre	ater	<u>[√</u>]	

≥ 100%?

Page 22 01 35

Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Number: hv!-2 Appendix A.1: Data Assessment - Contract Revision: 10 Compliance (Total Review - Inorganics) YES W N/AForm VIII (Method of Standard Addition Results) A.1.9.13 A.1.9.13.1 Present? If no, is any Form I result coded with "S" or a "+"? ACTION: If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII. A.1.9.13.2 Is coefficient of correlation for MSA less than 0.990 for any sample? ACTION: If yes, reject (red-line) affected data. A.1.9.13.3 Was *MSA required for any sample but not performed? Is coefficient of correlation for MSA less than 0.995? Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical rum? ACTION: If yes for any of the above, flag all the associated data as estimated (J). A.1.9.13.4 Was proper quantitation procedure followed correctly as outlined in the SOW on page E-16 through E-17? ACTION: If no, note exception under contract problem/ non-compliance of data assessment narrative. or prepare a separate list. Dissolved/Total or Inorganic/Total Analytes -A.1.9.14

A.1.9.14.1 Were any analyses performed for dissolved as well as total analytes on the same sample(s).

Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)?

^{*} MSA is not required on LCS and prep. blank.

Title: Evaluation of Metals Data for the Date: Feb. 1990 Contract Laboratory Program Number: H.:-2 Appendix A.1: Data Assessment - Contract Revision: 10 Compliance (Total Review - Inorganics) YES \mathcal{M} $N\Delta$ A.1.9.15.2 Do any computation/transcription errors exceed 10% of reported values on Forms I-IX for: (NOTE: Check all forms against raw data.) (a) all analytes analyzed by ICP? (b) all analytes analyzed by GFAA? (c) all analytes analyzed by AA Flame? (d) Mercury? (e) Cyanide? ACTION: If yes, prepare Telephone Log, contact laboratory for corrected data and correct errors with red pencil and initial. A.1.9.16 Form I (Field Blank) - Circle all field blank values on Data Summary Sheet that are greater than CRDL, 2 x IDL when IDL > CRDL. Do concentrations of field blank(s) fall below CRDL (or 2 x IDL when IDL > CRDL) for all parameters of associated aqueous and soil samples?

If no, was field blank value already rejected due to

ACTION: If no, reject (except field blank results)

all associated positive sample data less than or equal to five times the field blank

other OC criteria?

value.

STANDARD OPERATING PROCEDURE

Page 24 or 35

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.1: Data Assessment - Contract Compliance (Total Review - Inorganics) Date: Feb. 1990 Number: HW-2 Revision: 10

A.1.9.17.3 Form XI (Linear Ranges)

Was any sample result higher than high linear range of ICP.

Was any sample result higher than the highest calibration standard for non-ICP parameters?

If yes for any of the above, was the sample diluted to obtain the result on Form I?

ACTION: If no, flag the result reported on Form I as estimated(J).

A.1.9.18 Percent Solids of Sediments

Is soil content in sediment(s) less than 50%?

ACTION: If yes, qualify as estimated all data not previously rejected or flagged due

to other OC criteria.

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Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.2: Data Assessment Narrative

Date: Feb. 1990 Number: HW-2 Revision: 10

CUNTRUH Ease#	4117, 4123, 4129	Site Motoro	la-Machois	Matrix:	Soil
SDG#	1163W01	Lab . Vorga	rlabs		Water
Contra	ctor Hylicianch	Reviewer Karen	<i>Smickin</i>		Other
	l)			
				•	
A.2.1	The case description a for rejection or quali	nd exceptions, if fication as estim	any, are noted sted value(s) J.	below with	n reason(s)
	Editell water	Son Weit will	Malines	Jan 1	Loronicon iron
	lead and nece	hel Samol	11 desara	ted "	FIALL
	Littied ami	Vis). How	wild che	Olivetra) della
	Marks de	sexiste De	ezks wie	0.2 mls	196)
	with this on	, , , , , , , , , , , , , , , , , , , ,	Miller	Kitte	ed jumbles
	were also and	alimed for	1 harda	ess!	The I
	data were in	Mixted ac	rudia.	tak	enon II
	Cata Vacidor	tin protoc	sel. IPO	Strice no	Sull land
	mondents for	chromun	i are que	A history	O. (T) and
	(UT) respective		the CRIV	Stan	Aud!
	MADERIO) rice	Auren was	lace (< 75%). Parities
	insulta En	ind are	auditica) 04 0	Hurtel)
	(5) . Note to	nonionalla	ait lab	holic	TPA
	(>20%).				
					

Page 29 of 35

Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.2: Data Assessment Narrative

Date: Feb. 1990 Number: HW-2 Revision: 10

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Page 31 of 35

Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.3: Contract Non-Compliance

(S:D Report)

Date: Feb. 1990 Number: HW-2 Revision: 10

COVERACT NON-COMPLIANCE
(SMO REPORT)

Regional Review of Uncontrolled Hazardous Waste Site Contract Laboratory Data Package

orthographic ranoratory para package	
CINTA 4/123 H	
0-32-ND. 4/23 h	1/2
The hardcopied (laboratory name) 10500 George George	
Inorganic data package received at Region II has been reviewed and the quality assurance	arx
Performance date summarized. The data reviewed inclinded.	
SID Sample No.:	
The state of the s	
Conc. & Matrix:	
Contract No. WA87-K025, K026, K027(SOW787) requires that specific analytical work be done an	M
- was associated reports be provided by the contractor to the beginne fracture and can	M ne
general criteria used to determine the performance were based on an examination of:	11 PC
- Data Completeness - Dimilicate Analysis Posults	
- Matrix Spike Results - Blank Analysis Results	
- Calibration Standards Results - MSA Results	
Items of non-compliance with the above contract are described below.	
The state of the s	
Comments:	
•	_
	_
(TAS) For KMS 2/4/91	
Reviewer's Initial Date	

Page 35 01 35

Title: Evaluation of Metals Data for the

Contract Laboratory Program

Appendix A.7: CLP Data Assessment Checklist

Inorganic Analysis

Date: Feb. 1990 Number: HW-2 Revision: 10

CONTROL 4/17	VAL DATA ASSESSMENT	Region L
CASE NO. 4/23 4/29	<u> </u>	<u> </u>
LABORATORY VISA LABORATIONS	NO. OF SAMPLES	= 11/104/10D
	MAIRIX 18/100	teus
SDG# 4661201	REVIEWER (IF NOT	ESDIMIK Class
SON# 7/88		13
DPO: ACTION FVI	REVIEWER'S NAME_	MILK NOCKU
	COMPLETION DATE	02/07/91
1. HOLDING TIMES 2. CALIBRATIONS 3. BLANKS 4. ICS 5. LCS 6. DUPLICATE ANALYSIS 7. MAIRIX SPIKE 8. MSA 9. SERIAL DILUTION 10. SAMPLE VERIFICATION 11. OTHER OC 12. OVERALL ASSESSMENT O = Data has no problems/or qualified du M = Duta qualified due to major problems Z = Data unacceptable. X = Problems, but do not affect data.	•	CYANIDE
ACTION ITEMS: 0'- CROL STÓ ANALYSIS OZ_ Lab.dup. RPD.for Fe IN	70R for Cr was 2	75.
AREAS OF CONCERN:		
-		
NOTABLE PERFORMANCE:		

APPENDIX A: QUALIFIED LABORATORY RESULTS

1 INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

00023

Lab Name: VERSAR LABS. INC.	Contract: 9101211-9	MGGW01-01
Lab Code: VERSAR Case No.: 4123_		SDG No.: MGGW01
Matrix (soil/water): WATER	Lab S	ample ID: 40535_
Level (low/med): LOW	Date Re	ceived: 12/ 15/9 0
% Solids:0.0		
Concentration Units (ug/	L or mg/kg dry weight): U	G/L_
CAS No Analyte	Concentration C	

. —					 -
CAS No.	Analyte	Concentration	С	Q	M
7429-90-5	Aluminum		-	i ———	NR
7440-36-0	Antimony	 -	-		NR
7440-38-2	Arsenic		-		NR
7440-39-3	Barium		-		NR
7440-41-7	Beryllium		i –	ļ ———	NR
7440-43-9		[-		NR
7440-70-2	Calcium		_		NR
7440-47-3	Chromium	54.4	Ī	1)	P
7440-48-4	Cobalt		7		NR
7440-50-8	Copper		_		NR
7439-89-6	Iron	53700	[- /	**	Р
7439-92-1	Lead	69.0	¬		F-
7439-95-4	Magnesium		-		NR
7439-96-5	Manganese		<u> </u> –		NR
7439-97-6	Mercury		[-		NR
7440-02-0	Nickel	41.3	_		P
7440-09-7	Potassium		[-		NR
7782-49-2	Selenium		-		NR
7440-22-4	Silver		[-		NR
7440-23-5	Sodium		-	·	NR
7440-28-0	Thallium		[-		NR
7440-62-2	Vanadium		[-		NR
7440-66-6	Zinc		[-		NR
_	Cyanide	·	1-	· 	NR
	· · · · · · · · · · · · · · · · · · ·		-		
·	, I 	· I ———————————————————————————————————	- ٠	· + 	· —

Color Before:	BROWN	Clarity Before:	OPAQUE	Texture:
Color After:		Clarity After:	•	Artifacts:
Comments: HARDNESS =	546_MG_EQUIVA	LENTS_CACO3/L		
		FORM I - IN		7/8

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE	ИО	
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Lab Name: VERSAR LABS. INC	Contract:	9101211-9	MGGW01-01F	
Tab Code: VERSAR Case No.: 4123	SAS No.:		SDG No.: MGGW01	
Matrix (soil/water): WATER		Lab S	ample ID: 40539_	_
evel (low/med): LOW		Date Re	ceived: 12/15/90	}
% Solids:0.0				

CAS No.	Analyte	Concentration	С	Q	M
7 42 9 -90-5	Aluminum_		-		NR
7440- 36-0	Antimony_		_		NR
7440-38-2	Arsenic_				NR
7440-39-3	Barium —]_		NR
7440-41-7	Beryllium		_		NR
7440-43-9-	Cadmium_				NR
7 440-70-2	Calcium		_		NR
7440-47-3	Chromium	6.0	F	THIS	P_
7440-48-4	Cobalt				NR
7440-50-8	Copper		-	23	NR
7439- 89-6	Iron	23.3	B	7 j*	P
743 9 -92-1	Lead	2.0	Ü		F
7439-95-4	Magnesium		1		ΝR
7439-96-5	Manganese		-		NR
7439- 97-6	Mercury		-		NR
7440-02-0	Nickel	12.0	Ū		P
7440-09-7	Potassium				NR
7782-49-2	Selenium		-		NR
7440-22-4	Silver		-		NR
7440-23-5	Sodium		- -	·	NR
7440-28-0	Thallium		- -	\ 	NR
7440-28 0_	Vanadium		-		NR
7440-62-2	Zinc		- -	1	NR
/ 440-00-0	Cyanide	·	- -	-	NR
	Cyaniue_	· 	- -	- 	.

	·	1	·-	· · ·
Color Before:	COLORLESS	Clarity Before: C	CLEAR_	Texture:
Color After:	COLORLESS	Clarity After: C	CLEAR_	Artifacts:
Comments:				

1 INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	ИО
-----	--------	----

MGGW03D-01

,		WEDSAR LABS. INC.	Contract:	9101211-9		
N de	lame:	VERSAR_LABSINC			SDG No.:	MGGW01
		VERSAR Case No.: 4123_	_ SAS No.:		DDG MOTE	

Code: VERSAR Case No. 1222

Lab Sample ID: 40533

Lab Sample ID: 40533

Date Received: 12/15/90
Level (low/med): LOW______

solids: ___0.0

CAS No.	Analyte	Concentration	С	Q	M
7429-90-5 7440-36-0 7440-38-2 7440-39-3 7440-41-7 7440-43-9- 7440-47-3 7440-48-4 7440-50-8 7439-92-1 7439-95-4 7439-95-4 7439-95-6 7440-02-0 7440-02-0 7440-22-4 7440-23-5 7440-62-2 7440-66-6	Calcium_Chromium_Cobalt_Copper_Iron_Lead_Magnesium_ManganeseMercury_Nickel_Potassium_Silver_Sodium_Thallium_Vanadium_Thallium_Tha	150000 124			NR NR NR NR NR NR NR NR NR NR NR NR NR N

Color Before: E	5KOWN	Clarity Before: Clarity After:		Texture:	
Comments: HARDNESS_=_9	13_MG_EQUIVALEN	TS_CACO3/L			
		FORM I - IN	1	00025	7/88

1 INORGANIC ANALYSES DATA SHEET

EPA SAMPLE N	Ο.
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_	
MGGW03D-01F	

e: VERSAR_LABSINC	Contract: 9		
e: VERSAR Case No.: 4123	SAS No.:		SDG No.: MGGW01
(soil/water): WATER			ample ID: 40537
(low/med): LOW		Date Re	ceived: 12/15/90
is:0.0			-

CAS No.	Analyte	Concentration	c	Q 	M
7429-90-5 7440-36-0 7440-38-2 7440-39-3 7440-41-7 7440-43-9- 7440-47-3 7440-48-4 7440-50-8 7439-89-6	Aluminum Antimony Arsenic Barium Beryllium Cadmium Calcium Chromium Cobalt Copper Iron Lead Magnesium Manganes Mercury Nickel Potassium Selenium Silver Sodium Thallium Vanadium	7.3 41. 2.6 m	3 7		RRRRRR IRR - IRRR IRRRRRRRRRRRRRRRRRRRR
	Cyanide				t

	7440-00 0_	Cyanide			
~ Before:	COLORLESS	Clarity Before: CLI	EAR_	Texture:	
	COLORLESS	Clarity After: CL	EAR_	Artifacts:	
ments:					
		FORM I - IN	ı	00026	7/88

INORGANIC ANALYSES DATA SHEET

202	SAMPLE	110
PPA	SAMPI.E	N(1)

Lab Name: VERSAR_LABSINC	Contract: 9101211-9 MGGW05-01
Lab Code: VERSAR Case No.: 4123	SAS No.: SDG No.: MGGW01
Matrix (soil/water): WATER	Lab Sample ID: 40395_
Level (low/med): LOW	Date Received: 12/15/90

% Solids: ___0.0

CAS No.	Analyte	Concentration	С	Q	М
7429-90-5 7440-36-0 7440-38-2 7440-39-3 7440-41-7 7440-43-9- 7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-95-4	Aluminum_ Antimony_ Arsenic_ Barium_ Beryllium Cadmium_ Calcium Chromium_ Cobalt_ Copper Iron_ Lead_ Magnesium	37.8 137000 75.7		2 3)	NR NR NR NR NR NR NR NR NR NR NR NR NR N
7439-96-5_ 7439-97-6_ 7440-02-0_ 7440-09-7_ 7782-49-2_ 7440-22-4_ 7440-23-5_ 7440-62-2_ 7440-66-6_	Manganese Mercury Nickel Potassium Selenium Silver Sodium Thallium Vanadium Zinc Cyanide	120			NR P NR NR NR NR NR NR NR

Color Before: BRO	OWN Clarity	Before: OPA	AQUE Texture:	
Color After: YE	LLOW Clarity	After: CL	EAR_ Artifacts:	<u></u>
Comments: HARDNESS_=_643	_MG_EQUIVALENTS_CACO3/	L		

INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO.
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MGGW05-01F

Lab Name:	VERSAR_LAB	sINC	Contract:	9101211-9		}
ab Code:		Case No.: 4123	SAS No.:		SDG No.:	MGGW01

Matrix (soil/water): WATER____

Lab Sample ID: 40396_

Level (low/med): LOW____

Date Received: 12/15/90

Solids: ___0.0

					16
CAS No.	Analyte	Concentration	C	Q	M
			-		NR
742 9- 90-5	Aluminum_		-		NR
7440-36-0_	Antimony_		-	·	NR
7440-38-2_	Arsenic		-		NR
7440-39-3_	Barium		-		NR
7440-41-7_	Beryllium		-) 	NR
7440-43-9-	Cadmium		-		NR
7440-70-2_	Calcium	6.0	1	111	P
7440-47-3	Chromium_	\	اعمر		NR
7440-48-4	Cobalt		-		- NR
7440-50-8	Copper		. _	7 ×	- P
7439-89-6	Iron	86.2	استا	- L	- F-
7439-92-1	Lead	2.0	U	¥_₩	_ 1 1
7439-95-4	Magnesium		_	.	NR
7439-96-5	Manganese		_ _	.	NR
7439-97-6	Mercury		_ _	.	_ NR
7440-02-0	.	12.0	ט ע	J	_ P_
7440-09-7	1	1	_	_	_ NR
7782-49-2			_ [_		_ NR
7440-22-4	Silver		- -		_ NR
	Sodium		- -	-	NR
7440-23-5	_		- -	-	NR
7440-28-0	Vanadium		- -	-	NR
7440-62-2_	- 1		- -	_	NR
7440-66-6	.	_	- -	-	NR
	Cyanide_	-	- -	-	-
	_	_	<u> </u>	_	— ' ——

Comments:		
gaments:		
Color After: COLORLESS	Clarity After: CLEAR_	Artifacts:
Color Before: COLORLESS	Clarity Before: CLEAR_	
	The Defence OF TAR	Texture:

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TNORGANIC	ANALYSES	DATA	SHEET	

FPA	SAMPLE	NO.
	DETAIL THE	110

INONOMIC TAME	, 20 3(121)		MGGW06-01	
Lab Name: VERSAR_LABSINC	Contract:	9101211-9		}
I b Code: VERSAR Case No.: 4123	SAS No.:		SDG No.: MGGWO	1
Matrix (soil/water): WATER		Lab S	Sample ID: 40345	_
Level (low/med): LOW		Date Re	eceived: 12/15/9	0
* • • • • • • • • • • • • • • • • • • •				

Solids: ___0.0

CAS No.	Analyte	Concentration	С	Q	M
7 42 9- 90-5	Aluminum		-		NR
7440-36-0	Antimony		_		NR
7440-38-2	Arsenic		-		NR
7440-38-2	Barium		-		NR
7440-39-3	Beryllium	·	1-	ļi	NR
7440-43-9-	-		-		NR
1	Calcium		-		NR
7440-70-2	. 	51.2	-		P
7440-47-3_	Chromium_		1+	4	NR
7440-48-4_	Cobalt		-	Ţ- <u>-</u> -	NR
7440-50-8_	Copper	85400	-	-	P
7439- 89-6_	Iron	1	1 -	(F-
7439-92-1_	Lead	54.9	1-	Y	NR
7439-95-4_	Magnesium		· —	·	NR
7439- 96 - 5_	Manganese		. _	.	1 1
7439- 97-6_	Mercury		. _	.\	NR
7440-02-0_	Nickel	83.9	ˈ_	.	P_
7440-09-7	Potassium		. _		NR
7782-49-2	Selenium		. _	. I	NR
7440-22-4	Silver		. _	_	NR
7440-23-5	Sodium			_	NR
7440-28-0			_ _		NR
7440-62-2	·		- -	-	NR
7440-66-6	Zinc		- -	-	NR
' ' ' ' ' -	Cyanide		- -		NR
\ <u></u>	- -1	-	- -		1
l	. I 	. i	- , -	- '	'

Color Before:	BROWN	Clarity Before:	OPAQUE	Texture:	
Color After:	YELLOW	Clarity After:	CLEAR_	Artifacts:	
Comments: HARDNESS_=_	682_MG_EQUIVAL	ENTS_CACO3/L			

1 INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

Date	
Date Date Veight)	SDG No.: MGGWG ab Sample ID: 40339 Received: 12/15/9 : UG/L M NR NR NR NR NR NR NR NR NR
La Date	Ab Sample ID: 40339 Received: 12/15/9 I UG/L NR NR NR NR NR NR NR NR NR N
weight)	M NR NR NR NR NR NR NR NR NR NR NR NR NR
veight)	M M NR NR NR NR NR NR NR NR NR NR NR NR NR
veight)	M M NR NR NR NR NR NR NR NR NR NR NR NR NR
c Q	M NR NR NR NR NR NR NR NR NR N
	NR NR NR NR NR NR NR NR NR
JO (VO)	NR NR NR NR NR NR NR NR NR
No (VI)	NR NR NR NR NR NR NR NR NR
W VD	NR NR NR NR NR P NR
NO VO	NR NR NR NR P NR
p (V)	NR NR NR P NR
E UI	NR NR P NR
	NR P NR
B VI	P NR
	NR
	- ' '
-	INRI
A 3	P
X 1/*	- F-
—	NR
	- NR
	- NR
<u>u</u>	
~	- NR
-	NR
	NR
-	NR
-	NR
-	NR
	NR
-	- NR
IR_	Texture:
AR_	Artifacts:
	AR_

			1 ALYSES DATA SE	irro	EPA SAMPLE NO.
	INC	ORGANIC AND	TIBES DATA DI		MGGW07-01
Name: VERSA	R_LABSINC	•	Contract	9101211-	-9
			_ SAS No.		
rix (soil/wa				La	b Sample ID: 40344
el (low/med)				Date	Received: 12/15/9
olids:0.					
Con	centration	Units (ug/	L or mg/kg dr	y weight)	: UG/L_
1					M
	CAS No.	Analyte (Concentration	C Q	11
ŀ	7429-90-5	Aluminum		- -	NR
-	7440-36-0				NR
ļ	7440-38-2	Arsenic			NR
	7440-39-3	Barium		_ _	NR
	7440-41-7	Beryllium		_ _	NR
	7440-43-9-	Cadmium		_ _	NR
	7440-70-2_	Calcium_		-	NR
	7440-47-3	Chromium_	31.	3	P_
	7440-48-4	Cobalt		_ _	NR
	7440-50-8				NR NR
	7439-89-6		10600		P_
	7439-92-1		82.	9	
	7439-95-4	Magnesium			NR
	7439-96-5	Manganese		_ _	NR
	7 43 9 -97-6	Mercury			NR
	7440-02-0	Nickel	90.	2 -	P NR
	7440-09-7	Potassium			$-\left \begin{array}{c}NR\\NR\end{array}\right $
	7782-49-2	Selenium_	.		- NR
	7440-22-4	Silver			- NR
	7440-23-5	Sodium		_ -	- NR
	7440-28-0	Thallium			- NR
	7440-62-2			 -	- NR
	7440-66-6	Zinc	_	- -	- NR
		_ Cyanide	-		
	I	_	it. Before 0	DAOUE	Texture:
olor Before:	BROWN		ity Before: O		
Color After:	YELLOW	Cla	rity After: C	LEAR_	Artifacts:
omments:			CO3/L		

INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO.
-----	--------	-----

MGGW07-01	F

		_	MGGWU/-UII	
ab Name: VERSAR_LABSINC	Contract:	9101211-9		t
Code: VERSAR Case No.: 4123	SAS No.:		SDG No.: MGG	W01
erix (soil/water): WATER		Lab S	ample ID: 403	38_
ovel (low/med): LOW		Date Re	ceived: 12/1	5/90

§ Solids: ___0.0

7429-90-5 7440-36-0 7440-38-2 7440-39-3 7440-41-7 7440-43-9- Cadmium Calcium Chromium Cobalt Copper 7439-95-4 7439-95-4 7439-95-4 7439-95-6 7440-02-0 7440-09-7 Potassium NR NR NR NR NR NR NR NR NR NR NR NR NR	CAS No.	Analyte	Concentration	С	Q	М
7440-22-4 Silver Ni 7440-23-5 Sodium Ni 7440-28-0 Thallium Ni 7440-62-2 Vanadium Ni 7440-66-6 Zinc	7429-90-5 7440-36-0 7440-38-2 7440-39-3 7440-41-7 7440-47-3 7440-47-3 7440-48-4 7440-50-8 7439-95-4 7439-95-4 7439-95-4 7439-95-4 7439-97-6 7440-02-0 7440-23-5 7440-28-0 7440-62-2	Aluminum_ Antimony_ Arsenic_ Barium_ Beryllium Cadmium_ Calcium_ Chromium_ Cobalt_ Copper_ Iron_ Lead Magnesium Manganese Mercury_ Nickel_ Potassium Selenium_ Silver_ Sodium_ Thallium Vanadium	27.2		(F)	NR NR NR NR NR NR NR NR NR NR NR NR

comments:		
Color After: COLORLESS	Clarity After: CLEAR_	Artifacts:
color Before: COLORLESS	Clarity Before: CLEAR_	Texture:

	1		
INORGANIC	ANALYSES	DATA	SHEET

	EPA	SAMPLE	NO.
--	-----	--------	-----

MGGW08-01	

ab	Name:	VERSAR_L	ABSINC		Contract:	9101211-9	1		-,1
Ъ	Code:	VERSAR	Case No.: 4	123	SAS No.:		SDG No	.: MGGWO	1

Contract: 9101211-9

atrix (soil/water): WATER____

Lab Sample ID: 40532_

evel (low/med): LOW_____

Date Received: 12/15/90

Solids: ___0.0

CAS No.	Analyte	Concentration	С	Q	M .
7429-90-5 7440-36-0 7440-38-2 7440-39-3 7440-41-7 7440-43-9- 7440-47-3 7440-48-4 7440-50-8 7439-95-4 7439-95-4 7439-96-5 7439-97-6 7440-02-0 7440-09-7 7782-49-2	Aluminum Antimony Arsenic Barium Beryllium Cadmium Calcium Chromium Cobalt Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Selenium	61700		3	M NR NR NR NR NR NR NR NR NR NR NR NR NR
7440-22-4 7440-23-5 7440-28-0 7440-62-2 7440-66-6	Sodium				NR NR NR NR NR

Color Before: BROWN	Clarity Before:	OPAQUE	Texture:	
Color After: YELLOW	Clarity After:	CLEAR_	Artifacts:	
Comments: HARDNESS_=_569_MG_EQUIVALEN	TS_CACO3/L			

INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO
	SAUTE LIE	1111

Lab Name: VERS	AR_LABSINC	·	Contract:	910121	1-9	MGGW08	-01F
Lab Code: VERS	AR Case	No.: 4123	SAS No.:	:	,	SDG No.:	MGGW01
Matrix (soil/wa						ample ID:	
Level (low/med): LOW			Dat	e Rec	ceived: 1	- 2/ 15/9 0
% Solids:0	• 0					_	-,,
Co	n centration	Units (ug,	/L or mg/kg dry	y weight	:): U	3/L_	
	CAS No.	Analyte	Concentration	c Q	М		
	74 29- 90 - 5	Aluminum			- NR		
	7440-36-0	Antimony_			- NR		
	_	Arsenic			NR		
	7440-39-3	Barium		_	NR		
	74 4 0-41-7 7440-43-9-	Beryllium	}	_ -	_ NR		
	7440-43-9-			-	NR		
	7440-47-3		6.0		NR NR		
	7440-48-4	Cobalt		14 11	P NR		
	7440-50-8	Copper		-	$- \frac{NR}{NR} $		
	7439-89-6	Iron	68.5	B (1)	•		
	74 3 9-92-1	Lead	2.0		- P F		
	7439-95-4	Magnesium			NR		
	7439-96-5	Manganese		-	- NR		
	7439-97-6	Mercury		-	NR		
	7440-02-0	Nickel	12.0	<u>u</u>	P		
	7440-09-7	Potassium			NR		
	7782-49-2	Selenium_			NR		
	7440-22-4	Silver			_ NR		
	7440-23-5			l _	NR	4	
	74 4 0-28-0 74 4 0-62-2				NR	ļ	
	7440-62-2			-	- NR		
	/440-66-6_	Cyanide		 	- NR		
		Cyaniue		-	- NR		
Color Before:	COLORLESS	Clarii	y Before: CLE	· ·	— + —— ·	rexture:	
				_			
Color After:	COLORLESS	Clar	ity After: CLE	AIR_	Art	tifacts:	
Comments:							
							

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE N

MGGW09-01	

Lab	Name:	VERSAR_LAB	SINC	Contract:	9101211-9		_}
ab	Code:	VERSA R	Case No.: 4123	SAS No.:		SDG No.: MGGW	1

Matrix (soil/water): WATER____

Lab Sample ID: 40534_

Level (low/med): LOW____

Date Received: 12/15/90

Solids: ___0.0

CAS No.	Analyte	Concentration	С	Q	М
7429- 90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440- 39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9-			-	l	NR
7440-70-2	Calcium				NR
7440-47-3	Chromium	6.0	Ū	UI	P_
7440-48-4	Cobalt		. [_		NR
7440-50-8	Copper				NR
7439-89-6	Iron	36.7		(13)	P_
7439-92-1	Lead	2.5	B		F_
7439-95-4	Magnesium		. _	.	NR
7439-96-5	Manganese		._		NR
7439-97-6	Mercury		. _		NR
7440-02-0		12.0	ו (. P_
7440-09-7	Potassium		. _	_	NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium		_ _		NR
7440-28-0			_ _		NR
7440-62-2	-		_ _		NR
7440-66-6	Zinc				NR
' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	Cyanide		_ -		NR
	- -		_ -		_ i

Color Before: COLORLESS	Clarity Before: CLEAR_	Texture:
Color After: COLORLESS	Clarity After: CLEAR_	Artifacts:
Comments: HARDNESS_=_0.78_MG_EQUIVA	LENTS_CAC03/L	

1 INORGANIC ANALYSES DATA SHEET

EPA	SAMPLE	NO
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					1
ab Name: VERS	AR_LABSING	3	Contract:	9101211	MGGW09-01F
ab Code: VERS	AR Case	No.: 4123	SAS No.:		SDG No.: MGGW
					223 11311 113311
atrix (soil/w	ater): WATE	R		La	b Sample ID: 4053
evel (low/med): LOW			Date	Received: 12/15/
Solids:0	. 0				
Co	ncentration	Units /va	/L or mg/kg dry	r indiabel	. 176 / 1
1	1 ———	onics (ug)	of mg/kg dry	/ weight)	: UG/L_
	CAS No.	Analyte	Concentration	c Q	м
	7 42 9 -90-5	Aluminum		-	NR
	7440-36-0	Antimony			NR
	7440-38-2	Arsenic -		-	NR
	7440-39-3				NR
	7440-41-7	Bervllium			NR
	7440-43-9-	Cadmium			NR
	7440-70-2	Calcium			NR
	7440-47-3	Chromium	6.0	8/17	P
	7440-48-4	Cobalt			NR
	7440-50-8	Copper			NR
	7439-89-6	Iron	26.4	B	
	7 43 9 -92-1	Lead	2.0		P F
	7439-95-4	Magnesium			NR
	7 43 9 -96-5	Manganese		-	NR
	7 43 9- 97-6	Mercury		-	NR
	7440-02-0	Nickel	12.0	<u> </u>	P
	7440-09-7	Potassium			NR
	7 78 2 -49-2	Selenium		_	NR
	7440-22-4	Silver			NR
	7440-23-5	Sodium			NR
	7440-28-0	Thallium			ไทท
	7440-62-2	Vanadium -			NR
	7440-66-6	Zinc			NR
		Cyanide			NR
olor Before:	COLORLESS	Clari	ty Before: CLE	AR_	Texture:
Color After:	COLORLESS	Clar	ity After: CLE	AR_	Artifacts:
					
omments:					
omments:					

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			1176	}	,
-	CONTROL		पार्कि।		*
CKAGE COMPLETENESS AND DELIVERABLES	CASE NUMBER:	4117;	(VOA)	1410	OI (BNAS
	IAB: MD Spe	etral Ser (BNA)	<u> </u>	Inc (VOAS)
	SITE: Motor	· j/e.		•	· · · · · · · · · · · · · · · · · · ·
O Data Completeness and Deliverables			YES	NO	N/A
1.1 Have any missing deliverables been to the data package.	en received and a	ided		X	
ACTION: Call lab for explanation missing deliverables. If note the effect on review the "Contract Problems/No of reviewer narrative.	f lab cannot provi v of the package v	ide them, inder			
1.2 Was SMO CCS checklist included wi	ith package?		$(\underline{\times})$		
0 Cover Letter/Case Narrative					
2.1 Is the Narrative or Cover Letter	present?		(X)		
2.2 Are Case Number and/or SAS number Narrative or Cover Letter?	contained in the	e	K		
O <u>Data Validation Checklist</u>					
The following checklist is divided in is filled out if the data package cor Part B for any BNA analyses and Part	ntains any VOA and	alyses,			
Does this package contain:	i .				
VOA data?			$\underline{\times}$		
BVA data?			×		
Pesticide/PCB data?				\times	
ACTION: Complete corresponding parts	of checklist.				

* 4117, 4123, 4129 data also included , 25 well as

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YES NO N/A

If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. The reviewer may determine that non-detect data are unusable ("R").

	data are unusable ("R").	on-detec	t	
.0 <u>Surrogate R</u>	ecovery (Form II)			
3.1 Are the for eac	VOA Surrogate Recovery Summaries (Form II) present h of the following matrices:			
a. Low	Water	\boxtimes		
b. Med	Water	[]		7
c. Low	Soil	[]		$\stackrel{-}{\times}$
d. Med	soil	[]		X
3.2 Are all Recovery	the VOA samples listed on the appropriate Surrogate Summaries for each of the following matrices:			
a. Low	Water	[X]		
b. Med	Water	[]		X
c. Low	Soil Soil	[]		$\frac{\times}{\times}$
đ. Med	Soil Soil	[]		\times
ACTION:	Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative.			
3.3 Were out	liers marked correctly with an asterisk?			$\underline{\times}$
ACTION:	Circle all outliers in red.			
3.4 Was one of specific	or more VOA surrogate recovery outside of contract ations for any sample or method blank?		\angle i	
If yes, v	were samples reanalyzed?	[]		X
Were meti	hod blanks reanalyzed?	[]		X
ACTION:	If surrogate recoveries are > 10% but all do not meet SOW specifications:			,

- 1. Flag all positive results as estimated ("J").
- 2. Flag all non-detects as estimated detection limits ("W").

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	If any surrogate has a recovery of <10%:	YES	Ю	N/A
	 Flag all positive results as estimated ("J"). Flag all non-detects as unusable ("R"). 			
	Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas.			
3.5 Are ther data and	re any transcription/calculation errors between raw Form II?		ι <u>Χ</u>	
ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
0 <u>Matrix Spike</u>	s (Form III)			
4.1 Is the M present?	atrix Spike Duplicate/Recovery Form (Form III)	<u> </u>		
4.2 Were mat for each	rix spikes analyzed at the required frequency of the following matrices:	r.		
a. Low	Wa ter	(X)		
b. Med	Water •			×
c. Low	so il			X
d. Med	so il	[]		X
ACTION:	If any matrix spike data are missing, take the action specified in 3.2 above.			
4.3 How many	VOA spike recoveries are outside QC limits?			
	Water Soils			
		5.00	ć D	n ili kur
	RPD's for matrix spike and matrix spike e recoveries are outside QC limits?	safferi	ege)	midation
	<u>Water</u> <u>Soils</u>			
_	6 out of 5 // out of 5	,		
ACTION:	If MS and MSD both have less than 10% recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for the MS/MSD analysis. Use professional judgement in applying this criterion to other samples in the package.			

3A WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lt. Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Li Code: MSS

Case No.: VR4117 SAS No.:

SDG No.:

Ma rix Spike - EPA Sample No.: MGGW05-01

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene Trichloroethene Benzene Toluene Chlorobenzene	250 250 250 250 250 250	0 715 0 0	226 1060 253 245 233	90 (138 *) 101 98 93	61-145 71-120 76-127 76-125 75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LI RPD	MITS REC.
1,1-Dichloroethene richloroethene Benzene Toluene Chlorobenzene	250 250 250 250 250 250	224 1110 249 256 239	90 (158 * 100 102 96	0 -14 1 -4 -3	14 14 11 13 13	61-145 71-120 76-127 76-125 75-130

- # Jolumn to be used to flag recovery and RPD values with an asterisk
- * Talues outside of QC limits

RED: 0 out of 5 outside limits

Sr ke Recovery: 2 out of 10 outside limits

CC MENTS: MGGW05-01 121490 CTR 4117, X5 DILUTION 35(5)/240/10, EM 1250V

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	YES	NO	N/A
.0 Blanks (Form IV)			
5.1 Is the Method Blank Summary (Form IV) present?			
5.2 Frequency of Analysis: for the analysis of VOA TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent?	ι×ί		
5.3 Has a VOA instrument blank been analyzed at least once every twelve hours for each GC/MS system used?	\times		
ACTION: If any method blank data are missing, call lab for explanation / resubmittal. If not available, reject all associated positive data ("R").			
5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.			
Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs?		***************************************	
ACTION: Use professional judgement to determine the effect on the data.			
.0 <u>Contamination</u>			
NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are <u>not</u> used to qualify data. Do not confuse them with the other QC blanks discussed below.			
6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for VOAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor.		ι <u>X</u> ı	
6.2 Do any field/trip/rinse blanks have positive VOA results (TCL and/or TIC)?			
ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)			
NOTE: Only field/rinse blanks taken the same day as the samples are used to qualify data. Trip blanks are used to qualify only those samples with which they were shipped. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate, spectral, tuning or calibration QC problems.			

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YES NO N/A

מ	AITE :	TIME	INSTRUMENT	SAMPLE NUMBERS			
						N	A
ACTION:	If lab o generate interval	ed outside	vide missing data an acceptable tw	, reject ("R") a elve hour calibr	ill data ration		
	e ion abur ent used?	ndance crit	ceria been met for	reach	ι <u>Χ</u> ι		
ACTION:			th do not meet ion separate sheet).				
ACTION:	associat However, (See 198	ed sample if expand 8 Function may accep	ion is in error, data as unusable led ion criteria a al Guidelines), t at data with appro	("R"). are met the data		,	
mass lis	ts and Fo	nscription orm Vs? (C und, check	/ calculation entheck at least two more.)	rors between values but		\boxtimes	
been rep	or t ed? (ate number Check at 1 ore values	of significant feast two values, .)	figures (two) but if errors	(X)		
ACTION:	resubmit	errors ex tal, make nder "Conc	ist, call lab for necessary correct lusions".	explanation / lions and note			
7.7 Are the acceptab		f the mass	calibration comp	cound	(X)		
ACTION:	whether	associated	udgement to deter data should be d, or rejected.	mine			
O Target Compo	und List	(TCL) Analy	ytes				
present v	wi th requi		ta Sheets (Form I r information on wing:				
a. Sample	es and/or	fractions	as appropriate		(X)		
b. Matri	x spikes a	and matrix	spike duplicates		$\mathbb{Z}_{\mathbf{j}}$		
c. Blanks	5						

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			,			
8.2	mass sp data sy	VOA Reconstructed Ion Chromatograms, the ectra for the identified compounds, and the stem printouts (Quant Reports) included in ple package for each of the following?	YES	NO	N/A	
	a. Samp	les and/or fractions as appropriate	$ \angle $			
	b. Matr (Mass	ix spikes and matrix spike duplicates spectra not required)				
	c. Blan	CS :	(X)			
	ACTION:	If any data are missing, take action specified in 3.2 above.		.4	4	
8.3	Are the	response factors shown in the Quant Report?	[]	\times	` 	
8.4	Is chron respect	matographic performance acceptable with felication	rid presenti Xi	ans		
	_	Baseline stability	\bowtie			
		Resolution	K			
		Peak shape				
		Full-scale graph (attenuation)	(X)			
		Other:	[]			
	ACTION:	Use professional judgement to determine the acceptability of the data.				
8.5	Are the identifi	lab-generated standard mass spectra of the ed VOA compounds present for each sample?	\swarrow			
	ACTION:	If any mass spectra are missing, take action specified in 3.2 above. If Lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".				
8.6	Is the R units of	RT of each reported compound within 0.06 RRT the standard RRT in the continuing calibration?	[]	X		
8.7	relative	ions present in the standard mass spectrum at a intensity greater than 10% also present in the ass spectrum?	ι <u>X</u> ı			
	Do sample within 2	e and standard relative ion intensities agree 0%?	تكا			
	ACTION:	Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected, flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (at the calculated detection limit).				

	YES	<i>1</i> /0	N/A
.0 Tentatively Identified Compounds (TIC)			
9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "J" qualifier?	$ \angle $		
9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:			
a. Samples and/or fractions as appropriate	(X)		
b. Blanks	\swarrow		
ACTION: If any TIC data are missing, take action specified in 3.2 above.			
ACTION: Add "J" qualifier if missing and "N" qualifier to all <u>identified</u> TIC compounds on Form I, Part B.			
9.3 Are any TCL compounds (from any fraction) listed as TTC compounds (example: 1,2-dimethylbenzene is xylene—a VOA TCL—and should not be reported as a TTC)?		[<u>X</u>]	
ACTION: Flag with "R" any TCL compound listed as a TIC.			
9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?	ı <u>Kı</u>		
9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?	(<u>X</u>)		
ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.			
0.0 Compound Quantitation and Reported Detection Limits			
10.1 Are there any transcription / calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?		K1	
10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture?			

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		YES	NO	N/A
ACTION:	If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
ACTION:	When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibrationance in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.			
.0 Standards Dat	a (GC/MS)			
system p	Reconstructed Ion Chromatograms, and data printouts (Quant. Reports) present for initial inuing calibration?	(X)		
ACTION:	If any calibration standard data are missing, take action specified in 3.2 above.			
.0 GC/MS Initial	Calibration (Form VI)			
	Initial Calibration Forms (Form VI) present lete for the volatile fraction?			
ACTION:	If any calibration standard forms are missing, take action specified in 3.2 above.			
	onse factors stable for volatiles over the ation range of the calibration (RSD <30%)?			
ACTION:	Circle all outliers in red.			
ACTION:	When RSD >30%, non-detects may be qualified using professional judgement. Flag all positive results "J". When RSD >90%, flag all non-detects as unusable ("R"). (Region II policy.)			
12.3 Do any c	ompounds have an average RRF < 0.05?			
ACTION:	Circle all outliers in red.			
ACTION:	If any volatile compound has an average RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag nondetects for that compound as unusable ("R").			

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Date: March 1990 Revision 7 YES NO N/A 12.4 Are there any transcription / calculation errors in the reporting of average response factors (RRF) or RSD? (Check at least two values but if errors are found, check more.) ACTION: Circle errors in red. If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions". 13.0 GC/MS Continuing Calibration (Form VII) 13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the volatile fraction? 13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument? ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis. ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation / resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R"). 13.3 Do any continuing calibration standard compounds have a RRF < 0.05? ACTION: Circle all outliers in red. ACTION: If any volatile compound has a RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R"). 13.4 Do any compounds have a % difference between initial and continuing calibration RRF > 25%? ACTION: Circle all outliers in red and qualify associated sample data as outlined in the table below:

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Instrument ID: MSB

Calibration date: 12/19/90 Time: 1136

Lab File ID: 1219V2B1 Init. Calib. Date(s): 12/15/90 12/15/90

Matrix:(soil/water) WATER Level:(low/med) Column:(pack/cap) CAP

Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

 			
COMPOUND	RRF	RRF50	%D =====
Chloroethane Methylene Chloride Acetone Carbon Disulfide 1,1-Dichloroethene 1,2-Dichloroethene (total) Chloroform 1,2-Dichloroethane 2-Butanone 1,1-Trichloroethane Carbon Tetrachloride Vinyl Acetate Bromodichloromethane 1,2-Dichloropropane cis-1,3-Dichloropropene Trichloroethene Dibromochloromethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane Benzene trans-1,3-Dichloropropene Bromoform 4-Methyl-2-Pentanone 2-Hexanone Tetrachloroethene 1,1,2,2-Tetrachloroethane Toluene Chlorobenzene Ethylbenzene Styrene Xylene (total) ====================================	1.509 0.084 0.572 0.570 0.483	1.477 1.364 0.573 1.328 3.0735 1.8767 2.389 0.05567 0.05583 0.05567 0.0583 0.0567 0.0583 0.0567 0.0583 0.0567 0.0583 0.0567 0.0583	7.2 8.1 7.7 16.9 24.1 19.9 24.1 10.7 10.
Toluene-d8	0.98	4 0.76	7 8.0

FORM VII VOA

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Affects Samples

MGGW06-01 m66w07-01 MGGW08-01 mGGW09-01 MGG W030 -01 099

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Instrument ID: MSB

Calibration date: 12/20/90 Time: 1545

Lab File ID: 1220V2B1 Init. Calib. Date(s): 12/15/90 12/15/90

Matrix:(soil/water) WATER Level:(low/med) Column:(pack/cap) CAP

Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND	R	RF	RRF50	% D	
	==	====		=====	
Chloromethane		.775			
	1	.369	1.471		
BromomethaneVinyl Chloride		486		† -2.8 *	t
Chloroethane		.561		-2.3	
Methylene Chloride	נו	.430	1.598		
Acetone		284	0.302		
Carbon Disulfide	1 3	.696			
1,1-Dichloroethene	∔ j	1.176	1.244		ŧ
1,1-Dichloroethane	# 2	2.471	2.018		ļ
1,2-Dichloroethene (total)_	Ϊ:	1.440			ţ
Chloroform_	* :	2.760		L .	*
1,2-Dichloroethane		1.509	•	,	Ì
2-Butanone		0.084	1 .	1	
1,1,1-Trichloroethane		0.572	?		
Carbon Tetrachloride	. 1	0.570			
Vinyl Acetate		0.483			
Bromodichloromethane		0.871			
1 2-Dichloropropane		0.463		-	*
cis-1,3-Dichloropropene	_ Ł	0.693			
Trichloroethene	_	0.467	1		
Dibromochloromethane	I	0.807		1 .	
1,1,2-Trichloroethane	_	0.455		_	1
Benzene	_	0.899	1		1
trans-1,3-Dichloropropene_		0.490			
Bromoform		0.548			7
4-Methyl-2-Pentanone	- - 1	0.574		$\frac{25.3}{25.3}$	
2-Hexanone	_	0.272	i .		•
Tetrachloroethene	_	0.46			1
1,1,2,2-Tetrachloroethane_	"	0.96			# *
Toluene	*	0.02		- 1	1
Chlorobenzene	_#	0.99			#
Ethylbenzene	- *	0.41			î
Styrene	_	0.82			1
xvlene (total)	_1	0.47		3 /.3 =======	_
=======================================	===	=====			1
Toluene-d8	_		0 0.88		1
Bromofluorobenzene	_	0.83			1
1,2-Dichloroethane-d4	-	1.20	3 1.10	3 3.3	-
	_1-		_	_	1

Affects Samples

FORM VII VOA

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MGGWOI-O/ Trip Blank

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- B	% DIFFEREN	NCE	YES	NO N/A
25-5	50—90	>90		
'J' positi results, n	ve 'J' position results,	ive 'J' positive		
for non de		ts non detects		
13.5 Are there a	ny transcription /	calculation errors	in the	
(%D) betwee	n in itial and conti	factors (RRF) or dif inuing RRFs? (Check s are found, check mo	at	<u> </u>
ACTION: Ci	rcle errors in red.	•		
re		call lab for explana y necessary correction onclusions".		
.0 <u>Internal Standar</u>	ds (Form VIII)			
sample and l for each con	ernal standard area blank within the up ntinuing calibration	as (Form VIII) of ever oper and lower limits on?	ery	· ————————————————————————————————————
ACTION: Li	st a ll the outliers	s below.		
Sample #	Internal Std	Area Lower Limit	Upper Limit	:
				
			-	- NIA
				_ ′
	(Attach addition	nal sheets if necessa	ry.)	
la det I f ext	wer limit, flag wit tects (U values) qu extremely low area	lard area count is out in "J" all positive reported with this are reported pt drop off, flag all "R").	esults and non- internal standar , or if performa	d. nœ
14.2 Are the rete 30 seconds (ention times of the of the associated c	e internal standards alibration standard?	within [X]	
d a t		nt should be used to times differ by mor		

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YES

15.	0	<u>Field</u>	Dupl	ica	tes

15.1 Were any field duplicates submitted for VCA analysis?

Ю

N/A

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer

narrative. However, if large differences exist, identification of field duplicates should be

confirmed by contacting the sampler.

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i		PART B:	BNA ANALYS	<u>rs</u>	YES	NO	N/A
.0 Traffic Repor	ts and Iaborat	ory Narrat	ive			*	_
ACTION:	raffic Report : # Not pr If no, contact or illegible co	ovided by lab for r	contract	0/		X	
1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data?						X	
ACTION:	Use professions effect on the o	l judgemen Juality of	nt to evaluate the data.	ate the			
1	If any sample a than 50% water, estimated (J).	nalyzed as all data	s a soil cor should be f	ntains more Nagged as			
0 <u>Holding Times</u>							
2.1 Have any E collection	EVA holding time to date of ex	es, determ traction,	uined from d been exceed	late of led?			
must be ex collection	or BVA analysis ctracted within . Extracts mu me date of extra	seven day st be anal	s of the da	telef			-
	Table of 1	Holding Ti	me Violatio	n <u>s</u>			
	Sample Dat Matrix Sam	te pl ed	(See Traff Date Lab Received	ic Report) Date Extracted	Date Analyzed		
 .							/ 4
						\mathcal{N}'	1 A
						·	
					·		
€	f holding times stimated ("J") "W"), and docu	and samble	: ouantitati	on limite ac	octimated.		

were exceeded.

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YES NO N/A If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. The reviewer may determine that non-detect data are unusable ("R"). Surrogate Recovery (Form II) 3.1 Are the BNA Surrogate Recovery Summaries (Form II) present for each of the following matrices: a. Low Water b. Med Water c. Low Soil d. Med Soil 3.2 Are all the BVA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices: a. Low Water b. Med Water c. Low Soil d. Med Soil ACTION: Call lab for explanation / resubmittals. missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative. 3.3 Were outliers marked correctly with an asterisk? ACTION: Circle all outliers in red. 3.4 Were two or more base-neutral OR acid surrogate recoveries out of specification for any sample or method blank? If yes, were samples reanalyzed? Were method blanks reanalyzed? If all ENA surrogate recoveries are > 10% but two within the base-neutral or acid fraction do not meet SCW specifications, for the affected fraction

only (i.e. base-neutral OR acid compounds):

limits ("W").

Flag all positive results as estimated ("J").
 Flag all non-detects as estimated detection

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	If any base-neutral or acid surrogate has a recovery of <10%:	YES	NO	N/A
	 Flag all positive results for that fraction (i.e. all acid or base-neutral compounds) "J". Flag all non-detects for that fraction "R". 			
	Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas.			
3.5 Are ther data are	re any transcription/calculation errors between raw I Form II?		\propto	
ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
.0 Matrix Spike	s (Form III)			
4.1 Is the Market Present?	Matrix Spike Duplicate/Recovery Form (Form III)	(<u>X</u>)		
4.2 Were mat for each	rix spikes analyzed at the required frequency of the following matrices:			
a. Low	Water	(X)		
b. Med	Wa t er			×
c. Iow	Soil	[X]	_ 	
d. Med	Soil	[]		$\overline{\times}$
ACTION:	If any matrix spike data are missing, take the action specified in 3.2 above.			
4.3 How many	ENA spike recoveries are outside QC limits?			
	Water Soils			
, 	O out of 22 O out of 22			
4.4 How many duplicate	RPD's for matrix spike and matrix spike recoveries are outside QC limits?			
	<u>Water</u> <u>Soils</u>			
· —	0 out of 11 out of 11			
action:	If MS and MSD both have less than 10% recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for MS/MSD analysis. Use professional judgement in applying this criterion to other samples.			

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	YES	NO	N/A
0 Blanks (Form IV)	112	140	11/ 8
5.1 Is the Method Blank Summary (Form IV) present?	(X)		
5.2 Frequency of Analysis: for the analysis of BNA TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent?	ι <u>X</u>		
5.3 Has a BVA instrument blank been analyzed for each GS/MS system used.			
ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If not available, reject all associated positive data ("R").			
5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.			
Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs?	X		
ACTION: Use professional judgement to determine the effect on the data.			
0 <u>Contamination</u>	•		
NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.			
6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for BNAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution			
Factor.		[X]	
6.2 Do any field/rinse blanks have positive RVA results (TCL and/or TIC)?			X
ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)			
NOTE: Only field/rinse blanks taken the same day as the samples are used to qualify data. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate, spectral, tuning or calibration QC problems.			

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YES NO N/A ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. Sample conc > CRQL Sample conc < CRQL & Sample conc > CRQL but < 10x blank is < 10x blank value value & >10x blank value Flag sample result Reject sample result No qualification Common Phthalate with a 'U'; cross and report CRQL; is needed Esters out 'B' flag cross out 'B' flag Sample conc > $CRQL^{\dagger}$ Sample conc < $CRQL \& \dagger$ Sample conc > CRQLbut < 5x blank is < 5x blank value | value & > 5 blank value Other Flag sample result Reject sample result No qualification Contaminants with a 'U'; cross and report CRQL; is needed out 'B' flag cross out 'B' flag For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable). 6.3 Are there field/rinse/equipment blanks associated with every sample? ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks. 7.0 GC/MS Tuning and Mass Calibration (Form V) 7.1 Are the GC/MS Tuning and Mass Calibration Forms (Form V) present for Decafluorotriphenylphosphine (DFTPP)? 7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the DFTPP provided for each twelve hour shift? 7.3 Has a tuning performance compound been analyzed for every twelve hours of sample analysis per instrument? ACTION: If any tuning data are missing, take action specified in 3.2 above.

ACTION: List date, time, instrument ID, and sample

data are available.

analyses for which no associated GC/MS tuning

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YES NO N/A

	D 4	TIM	E INSTRUMENT	SAMPLE NUME	ers		
						14/	A
					· · · · · · · · · · · · · · · · · · ·	1 1	,
	ACTION:	If lab cana generated c interval.	not provide missing outside an acceptabl	data, reject ("R") e twelve hour calib	all data ration		
7.4		e i on abundar ent used?	nce criteria been me	et for each	X		· .
	ACTION:		ata which do not mee attach a separate sh				
	ACTION:	associated However, in (See 1988)	calibration is in er sample data as unus f expanded ion crite functional Guideline ay accept data with	able ("R"). ria are met es), the data			
7.5	mass lis	ts and Form	cription / calculati Vs? (Check at leas check more.)			ıΣ	
7.6	been rep		e number of signific eck at least two val e values.)		ι <u>X</u>		
	ACTION:	resubmittal	rrors exist, call la , make necessary co er "Conclusi ons".	b for explanation / rrections and note			
7.7	Are the acceptable		he mass calibration	compound	(X)		
	ACTION:	whether ass	sional judgement to sociated data should qualified, or reject	be			•
Tar	get Compo	und List (To	L) Analytes				
8.1	present v	with require	ysis Data Sheets (F d header informatio e following:				
	a. Sample	es a nd/or fr	actions as appropri	ate	(X)		
	b. Matri	x spikes and	matrix spike dupli	cates	(X)		
	c. Blanks	5			[\(\times\)]		

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}		•			
mass sp data sy	ENA Reconstructed Ion Chromatograms, the ectra for the identified compounds, and the stem printouts (Quant Reports) included in ple package for each of the following?	YES	NO	N/A	
a. Samp	les and/or fractions as appropriate	(\succeq)			
	ix spikes and matrix spike duplicates spectra not required)	\swarrow			
c. Blan	ks ;	\swarrow			
ACTION:	If any data are missing, take action specified in 3.2 above.			*	
8.3 Are the	response factors shown in the Quant Report?		\times		
	matographic performance acceptable with	of princed	Vas.	ad	
respect	Baseline stability	\bowtie			
	Resolution	(X)			
•	Peak shape	ιχί			
	Full-scale graph (attenuation)	\bowtie			
1	Other:			X	
ACTION:	Use professional judgement to determine the acceptability of the data.				
8.5 Are the identif	lab-generated standard mass spectra of the ied BNA compounds present for each sample?	$(\underline{\times})$			
ACTION:	If any mass spectra are missing, take action specified in 3.2 above. If Iab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".				
	RRT of each reported compound within 0.06 RRT f the standard RRT in the continuing calibration?	ι <u>X</u>			
relativ	ions present in the standard mass spectrum at a intensity greater than 10% also present in the mass spectrum?	ıΣ			
8.8 Do sampi within :	le and standard relative ion intensities agree 20%?	$(\underline{\times})$			
ACTION:	Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected, flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (at				

the calculated detection limit).

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				ŧ			
				YES	Ю	N/A	-
.0	Ten	tatively	Identified Compounds (TIC)				
	9.1	Part B)	Tentatively Identified Compound Forms (Form I, present; and do listed TICs include scan number ntion time, estimated concentration and "J" er?		_	X	
	9.2	compound	mass spectra for the tentatively identified is and associated "best match" spectra included sample package for each of the following:	·			
		a. Sampl	les and/or fractions as appropriate			X	
		b. Blank	ss · · · · · · · · · · · · · · · · · ·	[]		X	
		ACTION:	If any TIC data are missing, take action specified in 3.2 above.				
		ACTION:	Add "J" qualifier if missing and "N" qualifier to all identified TIC compounds on Form I, Part B.				
	9.3	TIC comp	TCL compounds (from any fraction) listed as counds (example: 1,2-dimethylbenzene is xylene———————————————————————————————————			X	
		ACTION:	Flag with "R" any TCL compound listed as a TIC.				
	9.4	relative	ions present in the reference mass spectrum with a intensity greater than 10% also present in the ass spectrum?	[]	Problems (Pa	\angle	
	9.5		nd "best match" standard relative ion intensities thin 20%?	[]		\times	
		ACTION:	Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.				
).0	Con	rpound Qu	antitation and Reported Detection Limits				
	10.	Form I Verify ion, a	ere any transcription / calculation errors in results? Check at least two positive values. that the correct internal standard, quantitation and RRF were used to calculate Form I result. my errors found?	—			
	10.		e CRQIs adjusted to reflect sample dilutions or soils, sample moisture?	$r \times_1$			

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·					
			YES	NO	N/A
}	ACTION:	If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".	,		
	ACTION:	When a sample is analyzed at more than one dilution, the lowest CRQIs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibratic range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.	in .		
.0 Stand	dards Dat	a (GC/MS)			
11.1	system p	Reconstructed Ion Chromatograms, and data printouts (Quant. Reports) present for initial inuing calibration?	(X)		
i	ACTION:	If any calibration standard data are missing, take action specified in 3.2 above.			
.0 <u>GC/MS</u>	<u>Initial</u>	Calibration (Form VI)			
12.1	Are the and comp	Initial Calibration Forms (Form VI) present lete for the ENA fraction?	(X)		
	ACTION:	If any calibration standard forms are missing, take action specified in 3.2 above.			
12.2	Are respo	onse factors stable for RVAs over the ation range of the calibration (RSD <30%)?	ιXi		
; t	ACTION:	Circle all outliers in red.			
	action:	When RSD >30%, non-detects may be qualified using professional judgement. Flag all positive results "J". When RSD >90%, flag all non-detects as unusable ("R"). (Region II policy.)			
12.3 1	Do any ∞	ampounds have a RRF < 0.05?		(X)	
. ,	ACTION:	Circle all outliers in red.			
2		If any ENA compound has an average RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").			

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	1000	110		
12.4 Are there any transcription / calculation errors in the reporting of average response factors (RRF) or &RSD? (Check at least two values but if errors are	YES	NO	N/A	
found, check more.)		(X)		
ACTION: Circle errors in red.		•		
ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".				
.0 GC/MS Continuing Calibration (Form VII)				
13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the BNA fraction?	(X)			
13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?				
ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.				
	Λ	; A		
ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation / resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").				
13.3 Do any continuing calibration standard compounds have a RRF < 0.05?		ι <u>X</u> ı		
ACTION: Circle all outliers in red.				
ACTION: If any EVA compound has a RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").				
13.4 Do any compounds have a % difference between initial and continuing calibration RRF > 25%?		(X)		
ACTION: Circle all outliers in red and qualify associated sample data as outlined in the table below:	l	••		

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	7			· · · · · · · · · · · · · · · · · · ·			YES	NO	N/A
1				* DIFFERENCE					5,755
		:	2 5~ 50	50-90	>90	•			
		1J' po		'J' positive	'J' positive	-			
		results	s, no action n detects	results, 'W'		-			
_		101 16	- Letters	non detects	non detects				
	13.5	Are the	re anv transc	ription / cal	culation errors	in the	·		
		reportn	ng of average	e response fac	tors (RRF) or di	fference			
		(∛D) bet	ween initial	and continui	ng RRFs? (Check e found, check m	cat		\times	
		ACTION:	Circle erro	ors in red.					
		ACTION:	If errors a	re large, cal	l lab for explar	mation /			
•			note errors	., make any ne s under "Concli	essary correctiusions".	ons and			
14.0	Inte	rnal Star	dards (Form	VIII)					
1	14.1	Are the	internal sta	ndard areas (1	Form VIII) of ev	rerv			
-		sample a	ın d blank wit	hin the upper	and lower limit	ຮ໋			
			-	calibration?	•				
		ACTION:	List all th	e outliers bel	low.				
		Sample #	Interna	l Std Area	lower Limi	t Upp	er Limit		
=			-						
			_						
								_	1/4
1								- /0	77
								-	
1		 	-					_	
-			(Attac	h additional s	heets if necess.	ary.)			
		ACTION:	If the inter	mal standard	area count is o	utside th	e upper o	or	
			detects (U '	values) quanti	" all positive protection that the state of	internal	standard	ì.	
			If extremely	y low area cou	nts are reported	d, or if	performar)CE	
			detects as i	musable ("R")	rop off, flag al	11 dSSOC18	aced non-	•	
1	14.2	Are the :	retention tir	mes of the int	ernal standards	within	/		
		30 second	ds of the ass	sociated calib	ration standard?	?	[X]		
1		ACTION:	Professional data if the	l judgement sh retention tim	ould be used to es differ by mor	qualify re than			

30 seconds.

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YES 8 N/A

5.0 Field Duplicates

15.1 Were any field duplicates submitted for BNA analysis?

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer

narrative. However, if large differences exist, identification of field duplicates should be

confirmed by contacting the sampler.

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1		PART C: PESTICIDE/PCB ANALYSES	YES	NO	N/A	
.0 Trafi	fic Repo	rts and Laboratory Narrative				
1.1 2	Are the '	Traffic Report Forms present for all samples?			X	
,	ACTION:	If no, contact lab for replacement of missing or illegible copies.				
I a	problems analytic	raffic Reports or Lab Narrative indicate any with sample receipt, condition of samples, all problems or special notations affecting ity of the data?		[]	X	
,	ACTION:	Use professional judgement to evaluate the effect on the quality of the data.				
,	ACTION:	If any sample analyzed as a soil contains more than 50% water, all data should be flagged as estimated (J).				
.0 <u>Holdi</u>	ing Time	<u> </u>				
2.1 H	Have any Sollection	PEST/PCB holding times, determined from date of on to date of extraction, been exceeded?		[]	X	
π • c	must be e	for PEST/PCB analysis, both soils and waters, extracted within seven days of the date of on. Extracts must be analyzed within 40 the date of extraction.				
0 Surro	ogate Rec	covery (Form II)				
		PEST/PCB Surrogate Recovery Summaries (Form II) for each of the following matrices:				
a	a. Low V	Va t er			X	
b	o. Med V	later			X	
C	. Low S	∞il			\times	
d	d. Med S	‰il			\boldsymbol{X}	
S		the PEST/PCB samples listed on the appropriate Recovery Summaries for each of the following				
a	. Low W	ater	[]		X	
þ	. Med W	ater	[]		X	
С	. Low S	oil .	[]		X	
d	l. Med S	oil ([]		$\frac{\times}{}$	

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		•		
		YES	МО	N/A
ACTION:	Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative.			
3.3 Were out	tliers marked correctly with an asterisk?			X
ACITON:	Circle all outliers in red.	•		
3.4 Was surn specific	rogate (DBC) recovery outside of the contract cation for any sample or blank?		[]	<u>X</u>
ACTION:	No qualification is done if surrogates are diluted detection. If recovery is below contract limit zero), flag all results for that sample "J". If zero, flag positive results "J" and non-detects recovery for the blank is zero, flag non-detects associated samples "R". If recovery is above con limit, flag all positive results for that sample in the reviewers professional judgement the high is due to co-eluting interference (check the assoblank - if recovery is high there also, flag the data).	(but above recovery; "R". If for all ntract "J", unless recovery sciated		
3.5 Are ther data and	re any transcription/calculation errors between raw Form II?	√	[]	X
ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".	,		
.0 Matrix Spike	s (Form III)			·
4.1 Is the M present?	atrix Spike Duplicate/Recovery Form (Form III)	[]		<u>X</u>
4.2 Were mat for each	rix spikes analyzed at the required frequency of the following matrices:			
a. Low	Water			X
b. Med	Water			X
c. Low :	Soil			$\underline{\times}$
d. Med	Soil	[]		\times
ACITION:	If any matrix spike data are missing, take the action specified in 3.2 above.			
4.3 How many	PEST/PCB spike recoveries are outside QC limits?			
	Water Soils			
<u> </u>	out of 12 out of 12			

Revision 7

YES NO N/A 4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits? Water Soils out of 6 out of 6 ACTION: If MS and MSD both have less than zero recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for MS/MSD analysis. Use professional judgement in applying this criterion to other samples. Blanks (Form IV) 5.1 Is the Method Blank Summary (Form IV) present? 5.2 Frequency of Analysis: for the analysis of Pesticide TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil. medium soil), whichever is more frequent? 5.3 Chromatography: review the blank raw data chromatograms, quant reports or data system printouts. Is the chromatographic performance (baseline stability) for each instrument acceptable for PEST/PCBs? ACTION: Use professional judgement to determine the effect on the data. 5.0 Contamination "Water blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify data. Do not confuse them with the other QC blanks discussed below. 6.1 Do any method/instrument/reagent blanks have positive results for PEST/PCBs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor. 6.2 Do any field/rinse blanks have positive PEST/PCB results? ACTION: Prepare a list of the samples associated with each of the contaminated blanks.

(Attach a separate sheet.)

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							XES.	NO	N/A
1	NOT	E: Or as ma ir su su pr							
	ACT	ION:		æ to contamir	ration. I	pelow to qualify Use the largest S.			
	-	-	le c onc > CRQL < 5 x blank	Sample conc is < 5x blar		Sample conc > & > 5x blank 1	- 1		
1	- 	with	sample result a "U"; cross 'B" flag	Reject sampl and report (cross out "F	RQL;	No qualification is needed	ion		
	1-						i		
		there	e field/rinse/e	equipment blar	iks associ	lated with every	r []		X
_	ACT	ION:	For low level	samples, note	in data	assessment that	.		
I						squipment blank.			
-						inking water tap			
_			do not have as	sociated field	d blanks.	•			
740	Calibrat	tion_a	and GC Performa	noe			•		
	Pri≀ (∞r	ntouts nfirma	following Gas C for both Prim tion standards sitive results	ery and Confi	mation lifthers	- 1			
8	a.	Evalu	ation Standard	Mix A			[]		X
I	b.	Evalu	at io n St andard	Mix B			[]		\times
_	c.	Evalu	ation Standard	i Mix C			[]		X
	đ.	Indiv	vid u al St andard	l Mix A					X
Ħ	e.	Indiv	rid ua l Standard	Mix B			[]		\times
	f.	Multi	component Pes	ticides Toxap	hene & Ch	lordane			\times
	g.	Arccl	ors 1016/1260				[]		X
	h.	Arocl	ors 1221, 123 2	, 1242, 1248,	and 1254		[]		\times
I	ACTI	ION:	If no, take ac	tion specifie	d in 3.2	above	_		

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	∞ lum	orm VIII Pest-1 present and complete for each GC mn (primary and confirmation) and each 72 hour ence of analyses?	YES	N O	N/A	
	ACITO	N: If no, take action specified in 3.2 above.				
•	7.3 Are t data	there any transcription/calculation errors between raw and Form VIII?			X	
	ACTIC	N: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "conclusions".	·			
1	7.4 Has t	the total breakdown on quantitation or confirmation on exceeded 20% for DDT?		[]	$\underline{\times}$	
		- for Endrin?			\times	
	peak	Endrin aldehyde <u>and</u> 4,4'-DDD co-elute and there is a at their retention time, has the combined DDT and End down exceeded 20%?	trin 	[]	X	
!	b	f DDT breakdown is greater than 20% on quantitation of eginning with the samples following the last in contr	olumn <u>ol</u> standa	rd:		
	2	 Flag all positive DOT results "J". If DOT was not detected but DOD and/or DOE are posiflag the DOT non-detect "R". Flag positive DOD and DOE results "JN". If DOT breakdown is > 20% on confirmation column and is identified on quantitation column but not on concolumn, use professional judgement to determine when should be reported on Form I (if reported, flag results). 	d DOI firmation ther DOI			
	b. I: ti	f Endrin breakdown is > 20% on quantitation column, b he samples following the last in control standard:	eginning v	with		
	3.4.	Flag all positive Endrin results "J". If Endrin was not detected, but Endrin Aldehyde and, Ketone are positive, flag the Endrin non-detect "R". Flag Endrin Ketone positive results "JN". If Endrin breakdown is > 20% on confirmation column Endrin is identified on quantitation column but not confirmation column, use professional judgement to determine whether Endrin should be reported on Form (if reported, flag result "N").	<u>and</u> on	n		
	c. If	f the combined breakdown is used (it can only be used f the conditions in 7.4 above are met) and is > 20 % or	a ,			

quantitation column beginning with the last <u>in control</u> standard, take the actions specified in 7.4 a and b above. If the combined breakdown is >20% on confirmation column and Endrin or DDT is identified on quantitation column but not on confirmation column, use professional judgement to determine whether Endrin or DDT should be reported on

Form I (if reported, flag result "N").

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<u> </u>				<u> </u>			
	7 5	To the 1	incomity, check DCD of all form calibration factors	YES	NO	N/A	
	7.5		inearity check RSD of all four calibration factors the quantitation column?			X	
]			If no, flag positive hits for all pesticide and PCB analytes "J" for all associated samples. Do not flag toxaphene or DUT if they are quantified from a 3-poin calibration curve.				
	7.6	(quantit	% difference between the EVAL A and each analysis ration and confirmation) DBC retention time within as (2% for packed column, 0.3% for capillary [I.D. m], 1% for megabore [0.32 < I.D. < 2 mm]) ?	· []		X	
		ACTION:	DBC retention time cannot be evaluated if DBC is not detected. If it is present and has a retention time out of QC limits, then use professional judgement to determine the reliability of the analysis and flag results "R", if appropriate.				
1	7.7		proper analytical sequence followed for each period of analyses (page PEST D-36 in 8/87 SOW).	[]		X	
		ACTION:	If no, use professional judgement to determine the severity of the effect on the data and accept or reject it accordingly. Generally, the effect is negligible unless the sequence was grossly altered or the calibration was also out of limits.				
0	Pes	ticide/PC	B Standards Summary				
! [8.1		IX present and complete for each GC column and equence of analyses?	[]		X	
		ACTION:	If no, take action specified in 3.2 above.				
	8.2		re any transcription/calculation errors between and Form IX?			X	
		ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".				
	8.3		etention time for packed columns > 12 min OV-1 and OV-101 columns)?	[]		X	
		ACTION:	If no, check that there is adequate resolution between individual components. If not, flag results for compounds that interfere with each other (co-elute) "R".				
•	8.4		tandard retention times fall within the windows hed for the first IND A and IND B analyses?	[]		\times	

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		<u></u> '			
ACTION	Beginning with the samples following the last in control standard, check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and, DBC is visible non-detects are valid. If peaks are present and cannot be identified through "pattern recognition" or a consistent shift in standard retention times, flag all affected compound results "R".	YES	NO	N/A	
factors 20% (fo beginni	continuing calibration standard calibration within 15% (for quantitation column) or confirmation column) of the initial (at mg of 72 hr sequence) calibration factors? If no, flag all associated positive results "J". Use professional judgement to determine			<u> </u>	
9.0 <u>Pesticide/F</u>	whether or not to flag non-detects. CB Identification				
pestici	X complete for every sample in which a de or PCB was detected?	[]		\times	
ACTION:	If no, take action specified in 3.2 above.				
	re any transcription errors between raw d Form X?	1		X	
ACTION:	If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".				
c alcula	ention times of sample compounds within the ted retention time windows for both quantitation firmation analyses?	[]		X	
Was GC/1 compount	S confirmation provided when required (when concentration is > 10 ug/ml in final extract)?	[]		X	
ACTION:	Reject ("R") all positive results (meeting quantitation column criteria, but missing confirmation by a second column or GC/MS (if appropriate). Also, reject ("R") all positive results not meeting retention time window criteria unless associated standard compounds are similarly biased (i.e. base on RRT to DBC).				
the mult	promatograms for false negatives, especially for ciple peak components toxaphene and PCB's. Were my false negatives?	[,		×	
ACTION:	If appropriate PCB standards were not analyzed, or if the lab performed no confirmation analysis, flag the appropriate data with an "R".				

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YES

2.0 Field Duplicates

12.1 Were any field duplicates submitted for PEST/PCB analysis?

<u>xo</u>

N/A

ACTION: Compare the reported results for field duplicates

and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate

results must be addressed in the reviewer narrative. However, if large differences exist,

identification of field duplicates should be

confirmed by contacting the sampler.

APPENDIX A: QUALIFIED

LABORATORY RESULTS

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 90121908

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: 121908

Level: (low/med) Date Received: 12/17/90

% Moisture: not dec. Date Analyzed: 12/20/90

Column: (pack/cap) CAP Dilution Factor: 1.0

	ONCENTRATION UNITS: ug/L or ug/Kg) UG/L	Q
74-87-3	10 10 10 10 5 10 5 10 5 5 5 5 6 10 5 10 6 10 5 5 5 10 10 5 6 10 5 5 5 10 10 5 6 10 10 5 6 10 10 5 6 10 10 5 6 10 10 5 6 10 10 5 5 5 5 5 5 5 5 5 5 5	מממממממממממממממממממממממממממממ

EPA SAMPLE NO.

MGGW01-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121907

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121907

CONCENTRATION UNITS:

Level: (low/med)

Date Received: 12/17/90

% Moisture: not dec.

Date Analyzed: 12/20/90

Column: (pack/cap) CAP

Dilution Factor: 1.0

0

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG	
74-87-3	Chloromethane		10 ບ
74-83-6	Bromomethane		10 0
	Vinyl Chloride		10 U
75-00-3	Methylene Chlo		10 U
1	4 1		5 U
67-64-1	Acetone Carbon Disulfi		10 U
75-15-0	Carbon Disulfi	de	5 U
/5-35-4	1,1-Dichloroet	nene	5 U
75-35-3	1,1-Dichloroet	hane	5 ไบ
540-59-0	1,2-Dichloroet	hene (total)	5 U
67-66-3	Chloroform		5 U
	1,2-Dichloroet	hane	5
78 -9 3 -3	2-Butanone		10 U
71-55-6	1,1,1-Trichlor	oethane	5 [Ŭ
56-23-5	Carbon Tetrach	loride	5 ไป
108-05-4	Vinyl Acetate		10 U
75 -2 7- 4	Bromodichlorom	ethane	5 ไป
78 -8 7 -5	1,2-Dichloropr	opane	5 [†] U
10061-02-6	cis-1,3-Dichlo	ropropene	5 U
79-01-6	Trichloroethen	e	5 Ü
124-48-1	Dibromochlorom	ethane	5 U
79-00-5	1,1,2-Trichlor	oethane	5 U 5 U
71-43-2			ร์ บั
	trans-1,3-Dich	loropropene	ร์ บั
			5 U
108-10-1	Bromoform 4-Methyl-2-Pen	tanone	10 0
503-78-6		canone	10 U
127-10-4	2-Hexanone Tetrachloroeth	one	5 U
70-24-5	lettachtoroeth	blesses base	
100-00-2	1,1,2,2-Tetrac	mroroethane	5 U
108-88-3	Toluene_ Chlorobenzene_		5 U
108-90-7	Cnlorobenzene_		5 U
100-41-4	Ethylbenzene		5 U
100-42-5	Styrene Xylene (total)		5 U
13 3- 02-7	Xylene (total)		5

EPA SAMPLE NO.

MGGW03D-01

SDG No.:

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Case No.: VR4117 SAS No.:

Lab Code: MSS

Lab Sample ID: 90121905 Matrix: (soil/water) WATER

Lab File ID: 121905 Sample wt/vol: 5.0 (g/mL) ML

Date Received: 12/17/90 Level: (low/med)

Date Analyzed: 12/19/90 % Moisture: not dec.

Dilution Factor: 1.0 Column: (pack/cap) CAP

CONCENTRATION UNITS: 0 COMPOUND (ug/L or ug/Kg) UG/L CAS NO. 10 U 74-87-3-----Chloromethane 10 TI 74-83-9-----Bromomethane U 10 75-01-4-----Vinyl Chloride__ ŢŢ 10 75-00-3-----Chloroethane U 75-09-2----Methylene Chloride 67-64-1-----Acetone 13 75-15-0-----Carbon Disulfide TT 5 U 75-35-4----1,1-Dichloroethene 5 IJ 75-35-3----1,1-Dichloroethane 540-59-0----1,2-Dichloroethene (total) 5 IJ 5 U 67-66-3-----Chloroform 5 U 107-06-2----1,2-Dichloroethane 10 U 78-93-3----2-Butanone 160 71-55-6----1,1,1-Trichloroethane___ Ū 56-23-5-----Carbon Tetrachloride___ 10 ΙU 108-05-4-----Vinyl Acetate П 75-27-4-----Bromodichloromethane 5 İυ 78-87-5-----1,2-Dichloropropane_ 5 ĪŪ 10061-02-6----cis-1,3-Dichloropropene_ 7 79-01-6----Trichloroethene İυ 5 124-48-1-----Dibromochloromethane 5 U 79-00-5----1,1,2-Trichloroethane_ 5 ľU 71-43-2----Benzene 10061-02-6----trans-1,3-Dichloropropene_ 5 U 5 U 75-25-2-----Bromoform İυ 108-10-1----4-Methyl-2-Pentanone 10 591-78-6----2-Hexanone 10 U U 5 127-18-4-----Tetrachloroethene U 5 79-34-5----1,1,2,2-Tetrachloroethane__ 5 U 108-88-3----Toluene 5 U 108-90-7-----Chlorobenzene 5 U 100-41-4----Ethylbenzene 10**0**-42-5-----Styrene 5 U 13**3**-02-7-----Xylene (total) U

EPA SAMPLE NO.

MGGW05-01

Lab File ID: 121903DD

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Sample wt/vol: 5.0 (g/mL) ML

Lab Code: MSS Case No.: VR4117 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 90121903

Level: (low/med) Date Received: 12/17/90

% Moisture: not dec. Date Analyzed: 12/19/90

Column: (pack/cap) CAP Dilution Factor: 5.0

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) UG/L (

CAS NO.	COMPOUND	(ug/L	or ug/l	Kg)	UG/L		Q
							I
	Chloromethane_					50	U
74-83-9	Bromomethane					50 [U
75-01-4	Vinyl Chloride					50 Ì	U
75 80 0	0 h 2 mm 4 h mm -					50	U
75-09-2	Chioroethane	ride				25	U
67 -64-1	Acetone					50	U
75-15-0	Carbon Disulfi	.de				25	U
75-35-4	1.1-Dichloroet	hene	-			25	Ū
75-35-3	1,1-Dichloroet	hane				25]	ับ
540-59-0	1,1-Dichloroet	hene (tota	1)			25	ับ
67-66-3	Chloroform		<u> </u>			25	U
107-06-2	Chloroform 1,2-Dichloroet	hane	,			25	U
78 -9 3- 3	2-Butanone					50	U
71 -5 5 -6	2-Butanone 1,1,1-Trichlor	oethane			1	20	
56-23-5	Carbon Tetrach	loride	t			25	U
108-05-4	Vinyl Acetate					50	U
75-27-4	Vinyl Acetate Bromodichlorom 1,2-Dichloropr cis-1,3-Dichloropr	ethane				25	U
78-87-5	1,2-Dichloropr	opane				25	U
10061-02-6	cis-1,3-Dichlo	ropropene				25	U
79 -0 1-6	Trichloroether	ie			7	20	ゴ
124-48-1	Dibromochlorom	ethane	1			25	Ū
79-00-5	1,1,2-Trichlor	oethane				25	U
71-43-2	Benzene		1			25	บ
10061-02-6	trans-1,3-Dick	loropropen	e			25	U
75-25-2	Bromoform					25	ַ
108-10-1	4 -Methyl- $\overline{2}$ -Per	tanone				50	ับ
591-78-6	2-Hexanone					50	U
127-18-4	2-Hexanone Tetrachloroeth	ene				25	U
79-34-5	1,1,2,2-Tetrac	hloroethan	e			25	U
108-88-3	Toluene					25	บ
108-90-7	Chlorobenzene		- 1			25	ប
100-41-4	Ethylbenzene_					25	บ
100-42-5	Styrene					25	U
133-02-7	Xylene (total)					25	Ü
	-						

EPA SAMPLE NO.

MGGW06-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 90121902

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121902

Level: (low/med)

Date Received: 12/15/90

% Moisture: not dec.

Date Analyzed: 12/19/90

Column: (pack/cap) CAP Dilution Factor: 1.0

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) UG/L

74-87-3	10 10 10 5 10 5 5 5 5	מטטטטטטטטטטטטטטטטטטטטטטטטטטטטטטטטטטטטטט
108-05-4Vinyl Acetate 75-27-4Bromodichloromethane 78-87-51,2-Dichloropropane	1 5 1	ט ט
10061-02-6cis-1,3-Dichloropropene	5	U
79-01-6Trichloroethene		U
124-48-1Dibromochloromethane	_	U U
79-00-51,1,2-Trichloroethane	5 5	Ŭ
71-43-2Benzene 10061-02-6trans-1,3-Dichloropropene	5	Ŭ
75-25-2Bromoform	5	U
108-10-14-Methyl-2-Pentanone	10	U
591-78-62-Hexanone	10	U U
127-18-4Tetrachioroethene	5 5	Ū
79-34-51,1,2,2-Tetrachloroethane 108-88-3Toluene	5	U
108-88-3	⁻ † 5 †	ับ
100-41-4Ethylbenzene	5	Ŭ
100-42-5Styrene 133-02-7Xylene (total)	5	บ
133-02-7Xylene (total)	5	U

MGGW07-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 90121901

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: 121901

Level: (low/med) Date Received: 12/15/90

% Moisture: not dec. . Date Analyzed: 12/19/90

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO. COMPOUND CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/L Q

CAS NO.	COMPOUND (ug/L or ug/	/Kg) UG/L	
		10	ט
74-8 7 -3 	Chloromethane	10	Ū
74-8 3 -9	Bromomethane	10	Ū
75-0 1 -4	Vinyl Chloride	10	Ū
75-0 0- 3	ChloroethaneMethylene Chloride	5	Ū
75-0 9-2	Methylene Chloride	10	Ü
67-64-1	Acetone	5	Ü
75-1 5 -0	Carbon Disulfide	2	ן ט
75-3 5- 4	1,1-Dichloroethene	5 5	υ l
75 -35- 3 	1,1-Dichloroethane	5	ן מ
540 -5 9 -0	1,2-Dichloroethene (total)	5	บ
67-6 6 -3	1,1-Dichloroethene1,1-Dichloroethane1,2-Dichloroethene (total)Chloroform1,2-Dichloroethane	5	Ü
107-06-2	I, 2-DICHTOI GECHANE	1	n n
78-93-3	2-Butanone 1,1-Trichloroethane	. 10	
71 EE-6	1 1 1-Trichloroethane	13	77
- FC-33-5	carnon retrachiotive	1	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Vinyl Acetate	5	ū
70-07-5	1 7-bichloropropane	.)	ū
10061-02-6	cis-1.3-Dichloropropene) 5	[U
79-01-6	Trichloroethene	33	
124-48-1	Trichloroethene	5	ן טַ
70-00-5	1,1,2-Trichloroethane		U
40 0)	ן ט
10061-02-6-	trans-1,3-Dichloropropene	5	U
75 35-3	Bromoform	5	U
15-25-24	Bromoform 4-Methyl-2-Pentanone	10	ן ט
108-10-1	2-Hevanone	10	U
591-/8-6	Z-Hexanone Tetrachloroethene	5	U
12/-18-4	1,1,2,2-Tetrachloroethane	5	U
/9-34-5	T,1,2,2 150140111011011101	5 5 5 5 5	ן ט
108-88-3	Toluene Chlorobenzene	5	ן ט
108-90-7	Cittotoberizerie_		ט
100-41-4	Ethylbenzene	5	ן ט
100-42-5	Styrene	- 5	ט ו
133-02-7	Xylene (total)	-	† 1
		_	_ ' '

FORM I VOA

MGGW08-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.: SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121904

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121904

Level: (low/med)

Date Received: 12/17/90

% Moisture: not dec.

Date Analyzed: 12/19/90

Dilution Factor: 1.0

Column: (pack/cap) CAP

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane		10 U
74-83-9	Bromomethane		10 U
75-01-4	Vinyl Chloride_		10 U
	Chloroethane		10 U
75-09-2	Methylene Chlor	ide	5 Ü
			10 U
75 -1 5 -0	Carbon Disulfide	-	5 ไป
75-35-4	1,1-Dichloroethe	ene	5 [U
75 -3 5 -3	1,1-Dichloroetha	ane	5 U 5 U
54 0- 59 - 0	1,2-Dichloroethe	ene (total)	5 U
67 -66-3 -	Chloroform	į.	5 U
107-06-2	1,2-Dichloroetha	ane	5 U
			10 T
71-55-6	2-Butanone 1,1,1-Trichloroe	ethane	5 ับ
56-23-5	Carbon Tetrachle	oride	5 ไป
108-05-4	Vinyl Acetate		10 U
75-27-4	Bromodichloromet	thane	5 U
78 -8 7 -5	1,2-Dichloropro	pane	5 U
10061-02-6	cis-1.3-Dichlore	opropene	5 บิ
79-01-6	Trichloroethene		5 ับ
124-48-1	Trichloroethene Dibromochlorome	thane	
79 -0 0 -5	1,1,2-Trichloro	ethane	5 ไป
71-43-2	Benzene		5 U 5 U 5 U 5 U
10061-02-6-	trans-1,3-Dichle	propropene	5 บั
75 - 25 -2	Bromoform		5 บั
108-10-1	4-Methyl-2-Penta	none	10 Ü
	2-Hexanone		10 U
	Tetrachloroether		5 ปั
79-34-5	1,1,2,2-Tetrach	loroethane	5 บั
108-88-3	Toluene		5 บั
108-90-7	Chlorobenzene		5 Ü
100-41-4	Ethylbenzene		5 Ü
100-42-5	Styrene		5 Ü
133-02-7	Xylene (total)_		5 U

EPA SAMPLE NO.

MGGW09-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.: SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121906

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121906

Level: (low/med)

Date Received: 12/17/90

% Moisture: not dec.

Date Analyzed: 12/19/90

Column: (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or	ug/Kg) UG/L	Q
74-87-3	Chloromethane_			10 U
74-03-0	Bromomethane			10 [Ū
				10 0
75-00-3	Chloroethane Methylene Chlo			10 [7
75-00-3	Methylene Chlo	ride		5 U
/3-03-2 67-64-1	Acetone			10 U
75-15-0	carbon Disulfl	de		5 U
75-25-4	1.1-D1CD10E	liene -		5 U
_		nano	<u>.</u>	5 U 5 U
540-59-0	1,1-Dichloroet	hene (total)		5 U
				5 U
107-06-2	1,2-Dichloroet	hane		5 U
78-93-3	2-Butanone			10 1
71-55-6	1 1 1—Trichio	coethane		5 U
^ ^ ^		ITULTUS		5 U
100-05-4	Vinvl Acetate			10 U
75-77-4	Vinyl Acetate	nethane		5 U
79-27-4	1,2-Dichlorop	ropane		5 U
		aropropene		5 U
10061-02-6-	Trichloroethe	ne		5 T
/9-01-6	Trichloroethe	methane		5 U U U U U U U U U U U U U U U U U U U
124-48-1	1,1,2-Trichlo	roethane	,	5 U
	Panzana			5 T
71-43-2	trans-1,3-Dic	hloropropene		5 U
	D~c~c+c~m		r	5 U
75-25-2	4-Methyl-2-Pe	ntanone		10 1
108-10-1	2-Hovanone	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		10 U
591-78-6	2-Hexanone Tetrachloroet	hene		5 U
	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	colordelliane		5 U
79-34-5	1,1,2,2-18C1a	C11201 00 0110110		5 \U
108-88-3	Toluelle			5 T
108-90-7	TolueneChlorobenzene_			5 U
100-41-4	Ethylbenzene_			5 บ
100-42-5	Styrene_ Xylene (total	· · · · · · · · · · · · · · · · · · ·		5 U
133-02-7	xyrene (totar	·		•

ATTACHMENT 1 SOP NO. HW-6

DATA ASSESSMENT:

10. OTHER QC DATA OUT OF SPECIFICATION:

not applicable

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued on next page if necessary):

good

12. CONTRACT PROBLEMS NON-COMPLIANCE:

none

13. This package contains re-extraction, re-analysis or dilution. Upon reviewing the QA results, the following form I(s) are identified to be used.

Not applicable

ATTACHMENT 1 SOP NO. HW-6

DATA ASSESSMENT:

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued):

ADDUMNITY A A

APPENDIA A	••		(No. of Com	pounds/No. of	Fractions (Samples)		,
	and anut — Na	ta Ualida			e: <u> </u>		C	use #: 4117/ 4101
		A	<u> </u>			Lab Name:	MD. Spectral o	A) Foc. (VOA)
	Initials	JMZ 1	nЗ			Number of	Samples:	8
HeAlemen. R	INITIATE.	A	nalytes Rejec	cted Due to Exc	eeding Rev	lew Criter	ia:	
•						<u>.</u>		
				lab Contamination	False -ve.	ı	m A.3 # Samples	Total # Rejected/ Total # in all Samples
	Surrogates	Holding Time	Calibration	Contamination	ID	Other	Total # Samples	2 /0
Acids (15)	0	0	0		0	0_	<u> </u>	100
PAHS 16	$\langle \rangle$	0	0	0	0	0	8	0/128

PAHS 16 B/N (50)	\wedge	0	\mathcal{O}	0	0	0	8	0/100
	^	\mathcal{O}		0	0	0	7	0/ 280
VOA (35)	6	\triangle		0	0	0	0	0/0
PEST (20)		(.)	6	()	0	Ô	0	00
PCB (7)	0	0	<u> </u>					

Analytes Estimated Due to Exceeding Review Criteria for:

	_					ms/msD		
Actide (15)	Δ	0		0	0	0	0	0/0
Acids (15) PANS 16 BYN (50)	0	0	0	0	0	0	8	0/198
VOA (35)	0	\circ	0	0	0	1	7	.1/280
	0	0	0	0	0	0	0	0/0
PEST (20)	0	0	0	0	6	6	Q	0/0
PCD (7)				-NA				

Region	TI
W.C. BIOD	

ORGANIC REGIONAL DATA ASSESSMENT

	NO. 4117 / 4101			19				
LABO	DRATORY Mo Spectral Services Inc. (vor Versur (BNA)	NO. OF S	AMPLES!	ers : 1 S	soi 1			
SOW:	. 110c Aco 1989	TO STREET TO		ESD) NO.				
	EPA method 8040 NYS 1989 malificat	REVIEWER'S NAME Jean Zimmerman						
DPO:	ACTIONFYI	COMPLE	TION DAT	$\mathbf{E} = \frac{\partial}{\partial r}$	/9/			
	DATA ASSES	SMENT SU	MMARY					
		VOA	BNA	PEST	OTHER			
1.	HOLDING TIMES	0	0	NA -				
: .	GC/MS TUNE/INSTR. PERFORM	0	0					
3.	CALIBRATIONS	$\frac{\times^{1}}{}$						
4.	BLANKS		0					
5 .	SURROGATES							
6.	MATRIX SPIKE/DUP	01	0	<u> </u>				
7.	other QC (TG, PB, WB)				******			
8.	INTERNAL STANDARDS							
9.	COMPOUND IDENTIFICATION	<u> </u>	0					
10.	SYSTEM PERFORMANCE	0	0					
11.	OVERALL ASSESSMENT	_ 0_	<u> </u>					
M	D = Data had no problems/or qualified due = Data qualified due to major problems. U = Data unacceptable. X = Problems, but do not affect data.	e to minor p	roblems.					
ACT	ION ITEMS:							
					·			
ARE	AS OF CONCERN: X - Lanting	calibra	tion Tel	15725;				
	- lo Rec trichlora ethene exceede							
	TO ACC THE MINE SHARE WEEKS	7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7	<u> </u>					
		·····						
NOT	ABLE PERFORMANCE		· · · · · · · · · · · · · · · · · · ·					
								
	-							

Versar Laboratories inc.

ANALYSIS REPORT General Inorganic Chemistry Section

DATE: 04-JAN-91

CODE / CONTROL #: HYDROSEA / 4117,4123,4129 CLIENT / SITE: HYDROSEARCH / MOTOROLA PROJECT / BATCH: 420.98.0 / 4,5,6

Lab#	Field #	TOTAL PHENOL (mg/L)	
0340 0341	MGGW06-01 MGGW07-01	< 0.010 < 0.010	
0394	MGGW05-01	< 0.010	
0524 0527	MGGW08-01 MGGW01-01	< 0.010 < 0.010	

Tumusm Laboratory Manager

PAGE: 1

Appendix E

Analytical Model Computer Output

DATA BASE:

Simulation period number= 1

Number of simulation periods for which contaminant concentration distribution is to be calculated 1

Simulation period duration in days= 1000.00 Number of grid columns= 12 Number of orid rows# 11 Grid spacing in ft= 100.00 X-coordinate of upper-left grid node in ft= 0.00 Y-coordinate of upper-left grid node in ft= 0.00 Aguifer actual porosity as a decimal= 0.400 Aguifer effective porosity as a decimal= 0.350 Simulation period number= 1 Aquifer thickness in ft= 90.00 Aguifer longitudinal dispersivity in ft= 30.00 Adulfer transverse dispersivity in ft= 10.00 Ø.56 Seepage velocity in ft/day= Number of point sources= 1 Simulation period number= 1 Point source number 1 X-coordinate of point source in ft= Y-coordinate of point source in ft= Slup point source solute inject. vol. in gal= 16500.00 Slup point source solute concentration in mg/l= 1100.000 Time after slug contaminant injection in days= 1000.00 Bulk density of dry aquifer skeleton in g/cu cm= Acuifer distribution coefficient in ml/g= .3 Number of monitor wells for which timeconcentration tables are desired= 4 Monitor well number= 1 I-coordinate of monitor well= 2 J-coordinate of monitor well= 5

Monitor well number= 2

I-coordinate of monitor well= 5

J-coordinate of monitor well= 5

Monitor well number= 3

I-coordinate of monitor well= 6

J-coordinate of monitor well= 5

Monitor well number= 4

I-coordinate of monitor well= 6

J-coordinate of monitor well= 7

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 1000.00

J-ROW		I — COLUMN										
	1	2	3 [/]	4	5	6	7	8				
1	ଉ.ଡଡ	ହ.ହାହ	ଉ. ଉପ	ସ. ଡାସ	ଉ. ଅର	0.00	Ø. ØØ	ଡ. ଅନ୍ତ				
2	Ø. Ø Ø	ଡ.ଡଡ	ଫ.ଫଡ	Ø. ØØ	ଡ.ଡଡ	0.00	ଡ.ଡଡ	ହା. ଉତ				
3	ଅ . ଅ ଅ	ଫ.ଡାଡା	0.00	ପ. ଅହ	0.00	0.00	ଡ.ଡଡ	0.00				
4	ଡ. ଡ ଡ	മെ.മുള	0.0E	Ø. Ø2	ପ. ପତ	ଡ. ଅପ	0.00	0.00				
5	ଉ. ଉ ଥ	Ø.50S	1.71	0.65	Ø.Ø30	0.00	01.00	ଡ.ଅଡ				
٤	ଷ. ହ ଷ	Ø. Ø2	Ø. Ø6	0.02	ව.ගින	୍ ହ. ହହ	ଡ.ଡଡ	0.00				
7	0. 0 0	ହ.ଉହ	ଡା.ଅଫ	ଉ.ଡାଉ	ଉ.ଡାଡ	ଡ.ଡାଡ	ତ.ଡଡ	ଉ.ଅଉ				
••	-, ·, -	· · · ·		الشاءت الحثا	**	- ,	7: 7:					

-= 1⊘	ଅ .ହ ଅ	ଅ.ଅଫ	Ø. ØØ	୍. ଓଠ ଅ. ଅପ	ZI. ZIZ		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.00 0.00
11	21 . (2 1/21	ହା. ହାହା ହା. ହାହା	0.00 0.00	ଏ. ଏଷ	0.00 0.00	ଡି. ଅଫ ଡି. ଡି ଡି	ଡ. ଡାଡ ଡ. ଡାଡ	ଅ.ଅପ ଅ.ଉପ
			0,00	0,00	0.00	v. 00	0.00	C. a. V. V.
J-ROW		,		I-COLU	MN			
	Э	10	11	12	13	14	15	16
1	ଫ . ହ ପ	ଅ.ଅପ	ପ. ଅପ	ଉ.ଅଡ				
2	ଉ.ହାସ	ଉ.ଉଡ	ଅ. ଅପ	ଉ.ଅପ				
3	ଡ.ଡାଡ	ଡ.ଡଡ	Ø. ØØ	0.00				
4	ଡ.ଡଡ	ଡ.ଡଡ	0.00	0.00				
5	ଡ ୁ ହ ାପ	ଅ.ଅପ	0.00	Ø. ØØ				
€.	ପ. ହପ	ଡ.ଡଡ	ଫ. ଉତ	ତା. ତାତ				
7	ଡ . ଡ ଡ	ଡ.ଡଡ	ଡ. ଉଡ	ଡ. ଅପ				
8	ସ.ହାସ	ଡ.ଡଡ	ଡ.ଡଡ	ଡ.ଡଡ				
9	ୟ. ହ ଥ	ଡ.ଡଡ	Ø. ØØ	ଡ. ଅପ				
1 🗷	ପ.ହାପ	ପ. ଅପ	ଉ.ଡାଡ	Ø. ØØ				
11	ଥା. ହାହ	ଡ.ଅଫ	ଡ.ଡଡ	ଅ.ଅପ				
MONTTO		OMPUTATI	ON GEETH	TC.				
111014110	NEEL C	Dine O (A) I	CH NESDE	.134				
TIME-C	ONCENTRA	TION TAB	LE	,				
MONITO	R WELL N	UMBER: 1						
TIME (D	AYS)	CONCE	NTRATION	(MG/L)				
1000.	ଉଉଷ		0. 50					

MONITOR WELL NUMBER: 2

TIME (DAYS) CONCENTRATION (MG/L)

1ଅସ୍ତ.ଅସ୍ଥ -

ଅ. ଉଞ

MONITOR WELL NUMBER: 3

TIME (DAYS) CONCENTRATION (MG/L)
1000.000 0.00

MONITOR WELL NUMBER: 4

TIME (DAYS) CONCENTRATION (MG/L)

1000.000

0.00

The second secon concentration distribution is to be calculated & Simulation period number= 1 Simulation period duration in days= 1000.00 Simulation period number= 2 Simulation period duration in days= 1365.00 Simulation period number= 3 Simulation period duration in days= 1730.00 Simulation period number= 4 Simulation period duration in days= 2095.00 Simulation period number= 5 Simulation period duration in days= 2461.00 Simulation period number= 6 Simulation period duration in days= 2826.00 Simulation period number= 7 Simulation period duration in days= 3191.00 Simulation period number= 8 DATA BASE: Number of simulation periods for which contaminant concentration distribution is to be calculated 8 Simulation period number= 1 Simulation period duration in days= 1000.00 Simulation period number= 2 Simulation ceriod duration in days= 1365.00 Simulation period number= 3 Simulation period duration in days= 1730.00 Bimulation period number= 4 Simulation period duration in days= 2095.00 Simulation period number= 5 Simulation period duration in days= 2461.00 Simulation period number= 6 Simulation period duration in days= 2826.00 Simulation period number= 7 Simulation period duration in days= 3191.00 Simulation period number= 8 Simulation period duration in days= 3556.00 Number of grid columns= 16 Number of grid rows= 11 Grid spacing in ft= 100.00 X-coordinate of upper-left grid node in ft= Y-coordinate of upper-left grid node in ftm Aguifer actual porosity as a decimal= 0.400 Adulfer effective porosity as a decimal= 0.350 Simulation period number= 1 Aquifer thickness in ft= 90.00 Aquifer longitudinal dispersivity in ft=100.00 Admifer transverse dispersivity in ft= 10.00 Seepage velocity in ft/day= Number of point sources= 1 Simulation period number= 2 Adulfer thickness in ft= 90.00

Adulfer longitudinal dispersivity in ft=100.00 Adulfer transverse dispersivity in ft= 10.00 Seepage velocity in ft/day= 0.56 Number of coint sources= 1 Simulation period number= 3 Adulfer thickness in ft= 90.00 Admifer longitudinal dispersivity in ft=100.00 Adulfer transverse dispersivity in ft= 10.00 Seepage velocity in ft/day= Q.56 Number of point sources= 1

Aquifer thickness in ft= 90.00

Simulation period number= 4

0.00

0.20

```
Accurian thansverse dispensivity in ft= lw.d0
Seepade velocity in ft/day=0.56
Number of point sources= 1
Simulation period number= 5
Adulfer thickness in ft= 90.00
Acuifer longitudinal dispersivity in ft=100.00
Acuifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/dav= 0.56
Number of point sources= 1
Simulation period number= 6 -
Aquifer thickness in ft= 90.00
Aguifer longitudinal dispersivity in ft=100.00
Adulfer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day=
Number of point sources= 1
Simulation period number= 7
Adulifer thickness in ft= 90.00
Aquifer longitudinal dispersivity in ft=100.00
Adulfer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day=
Number of point sources= 1
Simulation period number= 8
Aguifer thickness in ft= 90.00
Aquifer longitudinal dispersivity in ft=100.00
Adulfer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day=
Number of point sources= 1
Simulation period number= 1
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400. ଅଧ
Slug point source solute inject. vol. in gal= 16300.00
Slug point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 1000.70
Simulation period rumber= &
Paint source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft=
                                       400.00
Slub point source solute inject. vol. in gal= 16500.00
Slub point source solute concentration in Mg/l= 1100.ଉଡିଡ
Time after slug contaminant injection in days= 1365.00
Simulation beriod number= 3
Point source number 1
X-coordinate of point source in ft=
                                         2.22
                                       400.00
Y-coordinate of point source in ft=
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l≕ 1100.ଅପର୍
Time after slug contaminant injection in days= 1730.00
Simulation period number= 4
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft=
                                       400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 2095.00
Simulation period number= 5
Paint source number 1
 X-coordinate of point source in ft=
 Y-coordinate of point source in ft=-400.00
Slug point source solute inject. vol. in gal= 18500.00
Slug point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 2461.00
Simulation period number= 6
 Point source number 1
 X-coordinate of point source in ft=
```

<u> 9143 ಜರಾಗರ ಕರಣಗರತ್ ಅರ್ಧಕರತ ರಗ್ರಹದರು. ೪೦೩, ರಗ ರತ್ನಕ ರವಿಷ್ಣಿವೆ.ವಿವೆ</u> Slug point source solute concentration in mo/l= 11ଥିଲି ଅନିଥ Time after slub contaminant injection in days= 2826.00 Simulation period number= 7 Paint source number 1 X-coordinate of coint source in ft= Y-coordinate of coint source in ft= Slub boint source solute inject. vol. in dal= 18500.00 Slug point source solute concentration in mg/1=1100.000Time after slup contaminant injection in days= 3191.00 Simulation period number= 8 Point source number 1 X-coordinate of point source in ft= Y-coordinate of point source in ft= 400.00 Slug point source solute inject. vol. in gal= 16500.00 Slug point source solute concentration in mg/l= 1100.000 Time after slug contaminant injection in days= 3556.00 Bulk density of dry aquifer skeleton in g/cu cm= 8.30 Adulfer distribution coefficient in ml/g= .3 Number of monitor wells for which timeconcentration tables are desired= 5 Monitor well number= 1 I-coordinate of monitor well= 2 J-coordinate of monitor well= 5 Monitor well number= 2 I-coordinate of monitor well= 5 J-coordinate of monitor well= 5 Monitor well number= 3 I-coordinate of monitor well= 6 J-coordinate of monitor well= 5 Monitor Well numbers 4 I-coordinate of monitor well= 6 J-coordinate of monitor well= 7 Monitor well number= 5 I-coordinate of monitor well= 12 J-coordinate of monitor well= 5

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 1200, 00

J-ROW	I-COLUMN										
	1	2	3	4	5	6	7	පි			
1	ව.වට	ଉ.ଉଉ	ව. ඔඩ	ଉ.ଉପ	Ø. Ø3	ର. ଉପ	න. ඔව	ଉ.ଅପ			
2	তা. তাতা	ව.වෙව	ଅ. ଅପ	ক. কৰ	ଡ.ଅପ	ଉ. ଉପ	ତୀ. ଉପ	ଅ.ଅଧ			
3	ହା. ଥାହା	0.ଉପ	তা. তাতা	বা. কাহা	ව.ගැන	ଉ.ଉଉ	0.00	ସ.ସହ			
4	ହା. ହାର	0. 02	Ø.Ø3	ଡ.ଡାଞ	Ø. Ø1	ଅ.ଅପ	71. 22	හි. වැඩ			
5	Ø.23	Ø.65	Ø. 34	0.70	Ø.27	0.05	Ø. Ø1	তা. কেঠা			
£	0.01	0. 02	Ø. Ø3	Ø.Ø3	Ø. Ø1	a. aa.	ଉ.ଉପ	ଅ.ଅସ			
7	ପ.ପପ	ଡ. ସେପ	Ø. ØØ	ଡ.ଡେଡ	ଡା. ଡାହା	ଡ.ଡଡ	ଡ.ଡଡ	ସ. ହାସ			
8	ව.වෙව	ହା. ଅପ	ଡା. ଡାଡା	ଡ. ଅପ	0. 00	Ø. ØØ	Ø. ØØ	ଡ.ଅଡ			
Э	ଡା.ଡାଡ	ୟ. ସସ	ଉ.ଅପ	ହା. ତାତ	0.00	Ø. ØØ	ଉ.ଡାଉ	Ø. 200			
10	ଆ. ଅପ	ଅ. ଅପ	ଫ. ଅଫ	Ø. ØØ	ଫ. ଫଡ	ଡ.ଡଡ	0.00	0.00			
11	ଉ.ଉଡ	ଫ.ଉফ	ଉ. ଉଉ	ଉ. ଉପ	ଉ.ଡାଡା	ଡ. ଉପ	ଡ.ଅପ	ଉ.ଉଡ			
J-ROW				I-COLU	MN						
	Э	10	11	12	13	14	15	16			
1	ପା. ସହ	0. ଅପ	Ø.ØØ	ව. වන	୭.୭୬	ଫ. ଅଷ	ଅ. ଅଷ	Ø. ØØ			
Ē	ସ. ସପ	Ø. ସହ	ଅ. ଅପ	ପ.ଅପ	ZI. ZIZI	ଉ.ଉପ	ଉ.ଉଉ	21.20			
3	ଅ.ଅସ	ଫି. ଅଥ	খা. ঐঠা	স. ঐঠ	থ. ঠাঠ	ଉ.ଅଉ	ହା. ଅପ	ଅ.ଅଅ			

5	ଅ.ଅଅ	فياء بالأر	جاء ياج	3.34	2. 3.2	S. 200	ಶ. ಸಮ	ني تي ۽ نڌ
8	ହ.ଡଡ	ଉ.ଉଡ	ଉ.ଅଅ	া. কাক	ବ.ଉହ	ଅ.ଅପ	ଡ. ତହ	ଅ.ଅଅ
7	ଅ.ଅହା	ହା. ହାହା	ଡ.ଡାଡ	0.00	ଏ.ହାହା	0.00	ହି. ହହ	ହ. ଅପ
8	Ø. ØØ	ଡା. ଉତା	ଡ. ଉପ	ଉ.ଉଉ	ଡ.ଡେ	ଉ.ଉଉ	Ø. ØØ	0.00
9	ଡ.ଡଡ	ହା. ଅପ	Ø. ØØ	ଅ.ଅପ	ଡ.ଡଡ	ଡ. ଉପ	Ø. 20	ହ. ଉପ
10	ଉ.ଉଡ	ଉ.ଅପ	ଫ. ଉପ	ଷ.ଷଦ	ଉ.ଉଉ	0.00	0.00	ව.පට
1 1	ଅ.ଅପ	ଡା. ଡାଡା	ଥା. ଉଉ	ଅ.ଅପ	Ø. ØØ	Ø. ØØ	0.20	0.00

SIMULATION PERIOD DURATION IN DAYS: 1365.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				I-COLU	MM			
	1	2	3	4	5	6	7	8
1	ଅ. ସଥ	ହ.ଉପ	ଅ.ଅଇ	ପ. ଅପ	থ. ∆থ	ହ. ଉଷ	ହ.ଥାୟ	ଉ. ଉଷ
Ξ	ପ.ପଠା	ହା. ହହ	0.00	ଉ.ଉଉ	ହା. ହାୟ	Ø. 00	Ø. 20	ଉ.ଉଉ
3	ଫ. ଫଡ	ଫ.ଡେଡ	ଅ.ଅଭ	ଅ.ଅପ	Ø. ØØ	ହା. ଅପ	ଡ. ଅପ	Ø. ØØ
4	0.01	0.03	0.05	0.0E	0.04	0.02	0.01	0.00
5	0.10	Ø. 31	Ø.59	ଡ.୫୫	0.49	Ø. E1	ଡ.ଅଟ	Ø. Ø1
6	121.021	ಡ.ಥಾತ	a. 25	a.ae	Ø. Ø 4	Ø. 02	៤.៤:	0.20
7	ହା. ହାହା	ଡ.ଡେଡ	ଡ.ଡେଡ	ଅ.ଅପ	ଫ.ଅହ	ସ.ସାପ	0.00	ହ.ଅପ
8	ଡ.ଡଡ଼	ହାରେ ଅବ	ହ. ଅନ	ଡା. ଡାହା	ଉ.ଉଭ	0.00	ව. වන	ଅ.ଅପ
9	ଅ.ଅପ	ତା. ହେତ	ଅ.ଅପ	ଅ.ଅହା	ଡ.ଅପ	ව.වඩ	ଡ.ଡଡ	ହା. ଅପ
10	ତ.ହାତୀ	ହା. ଅହା	ଉ.ଅଉ	2.00	ପ.ସପ	ହା. ତାହା	Ø. 82	0.20
1.1	ହ. ହାଥା	ଡ. ଅପ	ଡ.ଡାଡ	ଡ.ଡଡ	ଡ.ଡାଡ	0.20	ଅ.ଅପ	ଅ.ଅଅ
J-ROW				I-CGLU	MIN			
	Э	12	11	18	13	14	15	15
i	ହା. ହାଫ	ସ. ସସ	ଅ. ଅପ	ଉ.ଡାଡା	ଉ. ଉଦ	ଅ.ଅପ	ଡ.ଡଡ	ଉ.ଥାୟ
2	ଉ.ଡାଡା	ହା. ହାହା	ହା. ହାଡା	ଅ.ଅପ	ଅ.ଅପ	Ø. ØØ	2.20	Ø. ØØ
3	ହ. ସହ	ଡା.ଡାଡା	0.00	ଡ.ଡାଡ	ଅ.ଅଅ	ଉ.ଅଭ	ଉ.ଉପ	ଡ.ଅଡ
4	ଡ.ଡଡ	ଡ.ଡେଡ	ଉ.ଅଉ	ଡ. ଅପ	ଅ.ଅପ	0.00	ଉ.ଅଉ	ଡ. ଅଧ
5	ଉ.ଉଷ	ଡା. ଉତ	ଡ.ଡାଡ	ଡ.ଡଣ	ଡ.ଡହ	Ø. ØØ	0.00	ଉ.ଉପ
E	ଉ.ଉଡା	ତୀ. ହାତ	ଉ.ଅଉ	ହା. ହାହା	ଏ. ଏହ	ଡ.ଡଡ	ପ. ଅପ	Ø. ØØ
7	ତା. ତାତୀ	ହ. ହହ	ଡ.ଡଡ	ଉ.ଉଉ	ପ. ଅପ	0.00	Q1.1210	0.00
8	ୟା. ସହା	ପି.ସେପ	ଅ.ଅପ	ଡ.ଡାଡ	· Ø. ØØ	ହ. ହାହ	ହା. ଅପ	ଡ. ଓଡ
Э	ଷ.ସ	ତ.ଡେଡ	ଉ.ଅପ	ଉ.ଉଉ	ଅ.ଅଭ	ସ.ସାସ	ଉ.ଅହା	ଉ.ଅଉ
10	121. 211 2 1	ତା. ଅତ	ଅ.ଅପ	ପ. ଅପ	ଡ.ଅଉ	ව.පව	ଅ.ଅଧ	Ø. ØØ
11	ই. ইউ	হা. এটা	ଉ.ଅପ	ଅ.ଅସ	ଥା. ତାହା	0.00	ව. වඩ	ଅ.ଅସ

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 1730.00

J-ROW	I-COLUMN										
	1	2	3	4	5	6	7	9			
1	ଉ.ଉଡା	ଉ.ଅପ	ଉ.ଉଉ	ଅ.ଅଅ	ଅ.ଅପ	ଅ.ଉଷ	ସ. ସସ	ଉ.ଉଉ			
2	ହା. ହାହା	ହା. ହାହା	0.00	ହା. ହାହା	0.00	Ø. ØØ	ଅ.ଅଅ	0.20			
3	ଉ.ଉପ	ହା. ସହ	0.00	ହା.ହାହା	ଅ.ଅପ	Q. QQ	0.00	0.00			
4	Ø. Ø1	Ø. Ø2	0.05	Ø. ØS	ହା. ହାଞ	0.05	Ø. Ø3	0.01			
5	Ø. Ø5	Ø.16	Ø. 34	Ø. 51	Ø.53	Ø.37	Ø.17	0.06			
٤	ହ. ହା:	ଡ.ଡେଥ	0.05	ଡ.ଡାଞ	ଉ.ଡଞ	0.05	Ø. Ø3	Ø. Ø1			
7	ଡା.ଡାଡା	ହା. ହାହା	ହା. ହାହା	ଉ.ଉପ	ଡ. ଡଡ	0.00	ସ. ଉପ	0.00			
8	ହା. ହାହା	ହା ଏହା	ଅ.ଅପ	ଡ. ଅପ	ହି. ଅପ	Ø. 00	ହା: ଅପ	0.00			
9	ହା.ହାହା	ହା. ହାହା	ହା. ହାହା	ଅ.ଅପ	ସ. ଅପ	ସ.ସସ	ହା. ହାହ	0.20			
1 2	খা. খাঠা	ହା. ଅଫ	ଥା.ଅଡା	ଅ.ଅମ	건. 경제 -	ଅ.ଅପ	ವ.ವನ	ଉ.ଡେଡ			

J-ROW				I-COLUMN					
	Э	1 Ø	1 1	12	13	14	15	16	
1	ସ.ସଠ	ଡ. ଅପ	ଉ. ଉଉ	ଉ. ଉଷ	ଡ. ଡଡ	ଉ. ଅଷ	ଅ.ଅପ	Ø. ØØ	
2	ଉ.ଉଡା	ହା. ଅଂସ	ଉ.ଅପ	0.00	ଉ.ଉପ	ସ. ଉପ	Ø. Ø12	ରୀ. ଉତା	
${\mathfrak Z}$	ଉ.ଉଡ	ව.වට	ව. වෙව	ଡ.ଡଡ	ଡ.ଡଡ	ଅ.ଅଧ	ଉ. ଉପ	Ø. ØØ	
4	ଉ.ଉଷ	ଡ.ଡଡ	0.00	ସ. ସସ	ସ.ଉପ	ହ.ଅତ	ହ. ହାସ	ঐ. ঐঐ	
5	Ø. Ø1	ହା. ହାହା	Ø. ØØ	0.00	0.00	Z1. Z2	ପ.ଅପ	ଅ. ଅଷ	
£	ଉ.ଉଉ	ক.কেব	ହ. ଅପ	0.00	ଡ.ଅପ	ହ. ହହ	Ø. 0121	ଅ.ଅଡ	
7	ସ.ସହ	ହା. ହାହା	ଡ.ଡଡ	ଡ.ଡଡ	ଡ.ଡାଡ	ଅ.ଅପ	12. 20	(2) . (2) (2)	
а	ପ. ପଡା	ଡ.ସେଡ	ପ. ଅପ	ଉ. ଉପ	ଡ.ଡଥ	Ø. 20	ହ.ଡବ	ଉ.ଅପ	
9	ଅ.ଅଡା	ହା. ହାତ	0.00	ଅ. ଅପ	ଡ. ଏହ	ପ.ଅଷ	හ.වන	ଡି.ଅପ	
া প্ৰ	ଉ.ଉପ	ତା. ହାହ	ଉ.ଉପ	ସ. ପପ	ଉ.ଉଉ	ଉ.ଅପ	ସ. ସହ	ଉ.ଅଷ	
1.1	ପ.ପଠା	ଡ.ଡଡ	ଡ.ଡଡ	ଅ.ଅପ	0.00	া. থাঠা	ଡ. ଅପ	Ø. 20	

SIMULATION PERIOD DURATION IN DAYS: 2095.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				MN				
	1	2	3	4	5	6	7	8
1	ଉ.ଉଡା	ଡ.ଡେଡ	ଅ.ଅପ	ව. ඔව	0.00	ଅ. ଅପ	ଅ. ଓଷ	ଥ. ଅପ
2	ପ. ଅଔ	ଡା. ଉତ	Ø. ZØ	ପ. ଅପ	ଉ. ଉହ	ଅ.ଅସ	ව.පව	0.00
3	ପ. ପାଠା	ଡ଼ା. ଉଉ	න. නව	Ø. ØØ	ଡ.ଡଥ	ହ. ଅପ	ଡି.ଅପ	ଡ.ଡଡ
4	ପ.ପଠ	ହା. ହାଥ	Ø. 24	0.07	a. a9	a.a9	ව.විසි	ZC 93
f5 - 6	ଡ.ଡ2	ହା. ଅප	0.19	2.34	Ø. 44	Ø.4E	Z.29	Ø. 14
Ġ	ଉ. ଉ ଅ	ହ. ହଥ	②。②4	0.27	a.as	ଡା.ଡାକ	0.08	ଉ.ଡଞ
7	ଡ. ଡ ଡ	ହା. ହାହା	Ø. ØØ	ପ.ପଥ	0.00	ଅ.ଅପ	Ø. ØØ	ର. ପର
8	0.00	ସ.ସସ	ଡା. ଡାଧ	ଅ. ଉପ	ଉ.ଅପ	0.00	21.22	0.00
Э	ଉ.ଡଠ	ହା. ଅହା	ଉ. ଅପ	ව. වෙව	ଉ.ପହ	121. IZIŽ	21. 22	ଅ.ଅସ
10	ଉ. ଉଡ	ଡା.ଡାଡା	ଡା. ଡାଡ	ଡ. ଡଡ	ଅ. ଅଅ	ଉ.ଅଉ	ଅ.ଅପ	0.00
1 1	ଅ.ଅଅ	ହା. ହାହା	ଡ.ଡଡ	ଡ. ୪୭	ଡ. ଡଡ	ଉ.ଅଫ	Ø. ØØ	ଉ. ଅଧ
J-ROW				I-COLU	MN			
	Э	10	11	12	13	14	15	15
1	a. a@	ଉ.ଉଡ	0.00	ଡ.ଅପ	ଉ. ଉଉ	ଅ. ଅଅ	ଡ. ଅଅ	ଆ. ଅସ
2	Ø. 20 0	ସ. ସସ	ತ. ತಾಪ	ଡା. ଅପ	ଡ. ଅଧ	ପି.ଅପ	0.00	0.99
3	ଅ.ଅଫ	ଉ.ଉଠ	তা. তাত	ଉ.ଅପ	Ø. ØØ	ଡା. ଡାଡା	0.0C	0.ZØ
4	Ø. Ø1	ଅ.ଅଅ	ଅ.ଅଅ	ଅ. ଅଷ	ව. ඔට	ହ. ତତ	ව. වැඩ	J. 30
5	ଫ. ଉଟ	0.01	ଏ. ଅଅ	ଉ.ଉପ	ଉ.ଅପ	ව. ඔව	ଡା. ଡାଡା	0.00
5	∅.∅1	হা. হাহা	ব. তাতা	ଡ.ଡଥ	ସ. ସହ	ව.වන	Ø. ØØ	0.00
7	ହ. ହ ଞ	ଡ.ଡଡ	ଡ. ଡଡ	ଉ.ଅପ	ව. ඔව	ସ. ଉପ	ସ. ସପ	ଉ.ଉପ
8	ଅ.ଅ ଅ	ହା. ଅହା	ଅ. ସହ	ପ. ଅପ	ଡ.ଅଷ	ଫ. ଅପ	ව. වඩ	Ø. ØØ
Ŧ	ଡ. ଅ ଅ	ଷ. ଉଉ	0.20	ଉ.ଉପ	ହ. ତାଅ	ହା. ତଥ	ଫ. ଉପ	0.00
1/2	ଅ.ଅ ଡ	ଅ.ଉପ	Ø. ØØ	Ø. ØØ	ସ. ସସ	ව. වර	ଅ.ଅପ	Q. 20
11	മ. മമ	ଅ.ଅସ	ଉ.ଅପ	ଅ.ଅପ	ଉ.ଉଡ	ସ.ସଅ	ଅ. ଔଷ	2.20

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 2461.00

J-ROW	I-COLUMN									
	1	Ξ	3	4	5	5	7	8		
				ଅ.ଡାଡ ଅ.ଡାଡ						

		د ۲۰ مالت	4.23	ala と音	S. 148		* 4 (L	20 2 <u>2</u>
5	ଥା.ଔ1	0. 04	2.11	Ø. ÆÆ	ð.33	21, 33	2.34	a.a3
Ē	ହା. ହାହା	Ø. Ø1	ଅ.ଅଞ	0.26	Ø. Ø9	0.10	0.09	ଅ.ଅଥ
7	ହା. ହାହା	ହା . ।ଆହା	ହା. ହାହ	ହା. ଉପ	ଉ.ଉପ	Ø. 22	ୟ. ୟାଷ	া. তাতা
8	ଡା. ପଠା	ঠা. বেব	Z: 00	ଅ.ଅପ	ତ.ଅପ	0.23	ଅ.ଡାଡ	ହା. ତହ
9	াটা. টোঠো	🗷. ହୋତ	0.00	ଡ. ଡଡ	ଥା.ଥାୟ	ව.වන	া. তা	ଅ. ଝାପ
10	ହା. ଅପ	ହା. ହାହା	ସ. ଉପ	ଅ.ଅଅ	Ø. 20	ହି.ଅପ	건. 경인	ଅ.ଅଥ
11	ହ. ହହ	ଅ. ଅହା	ଉ.ଉପ	ଉ. ଉପ	ପ. ଉପ	2. C U	21.20	ଅ.ଓଡ
J-ROW				I-COLU	MM			
	3	1 ট	11	12	13	14	13	16
1	ଉ. ହହ	ଅ. ଅପ	ଅ.ଅପ	0.00	ହ. ଏହା	ଉ. ଉଉ	ଅ. ଅପ	0.30
2	ଡ.ଡାଡ	ହା. ହାହା	ଅ. ହହ	හි. ඔවු	21. 1212	ଅ.ଅଉ	ZI. ØZI	ହ.ଅନ
3 3	ଡା. ଉତ	🗷 . ଆଆ	ଆ. ଅପ	ଡ.ଡଡ	ପ. ପପ	ଅ.ଅପ	ଅ.ଅପ	ଅ.ଅପ
4	ខា.ឆាច	0. 01	0.00	Ø. ØØ	ପ. ଯଥ	ଅ.ଅପ	ଡ.ଡେଥ	ବ. ଉପ
	Ø.12	ଡ.ଡାଗ	∅. ₫1	ଅ.ଅଫ	ত. তাত	ව. ඔබ	છ.ઝએ	ହ. ଅଅ
- 6	ହା. ହାଞ	Ø. Ø1	হা. হাট	ଫ. ହାହା	0.00	ପ. ସପ	ପ. ଅପ	ଉ.ଅଉ
7	ଡା. ଉତ	🧖 . ଅଅ	ଅ.ଅପ	ଅ.ଅପ	ଅ. ଅପ	ଅ.ଅପ	ହା. ଅପ	ହା. ତହ
. 8	ୟ. ସମ	0. 00	ଡ.ଡେଡ	ହ. ଉପ	ଅ.ଅପ	ଡ.ଡଥ	ଡ. ଡଡ	ହ. ଅପ
9	ଡ.ଅପ	ତା. ସହ	Ø. ØØ	ଅ.ଅପ	ව. වාඩ	ව. ඔබ	ව. වට	ଅ.ଅଅ
1 🖾	ଡା. ଅପ	Ø. ଡଡ଼	ଡ.ଡଡ	ସ. ସସ	ଅ.ଅହ	ପ. ଅପ	ଉ. ଉଷ	ହ. ଅହ
11	ଡା. ଡାଡା	2). ZIZT	ଅ. ଅପ	ଫ. ଅପ	ଅ. ଅଅ	ଅ.ଅପ	ଡ. ଅଷ	ଅ. ଅଥ

SIMULATION PERIOD DURATION IN DAYS: 2825.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

∍ մ≳⊡യ		I-CCLUMN									
	1	2	3	4	5	5	7	8			
_ 1	ଫ. ହହ	ଅ.ଅଷ	ପ. ପଷ	ଡ.ଅପ	ଡ. ଅଷ	0.00	ଅ.ଅପ	ଡ. ଅପ			
2 3	ପ.ସଠ	🕢. ସେପ	Ø. ØØ	ଉ.ଅପ	ଉ.ଅପ	ଅ.ଅପ	ව. ඔව	ଉ.ଅଉ			
3	ଫ. ସଠ	Ø. ତାତ	ହା. ଅହା	ଉ.ଡାଡ	Ø. 12121	ଅ. ଅଭ	ଅ.ଅପ	ଅ.ଅପ			
4,	তা. তাতো	Ø.Ø1	Ø.Ø2	Ø. Ø4	Ø. Ø7	ଡ. 1ପ	0. 10	ത. മ9			
5	ପ.ପୀ	ଡ.ଡ≘	Ø. Ø6	Ø. 13	Ø.23	Ø. 31	Ø. 33	Ø. 28			
€	ହ. ହହ	0. 01	බ. ඔද	0.04	Ø. Ø7	0.10	0.10	Ø.09			
7	ଅ.ወଡ	ହା. ହାହା	ଡ.ଡଡ	ପ. ଅପ	ହ.ଅପ	ହ. ହହ	ଅ.ଅପ	ଅ.ଅପ			
_ 8	ହା. ହାହା	ହା. ହାହା	ଡ.ଡଡ	ଡ. ଅପ	ଉ.ଉଡ	ଡ. ସଅ	ହା. ଅପ	ৱ. কেৱ			
Э	টো. টোটো	ଥ େ ଅଫ	ଅ.ଅପ	ଫ. ଫଡ	0.00	ଡ. ଡଡ	ଅ.ଅପ	년. 20			
12	ଡା.ଡାଡା 🌣	0.ଉପ	ව. ඔව	ଉ.ଉପ	ପ. ପଅ	ସ. ଉପ	ର. ଅପ	ତୀ. ତାହା			
1.1	ଅ. ସଥ	ଉ.ଉହ	ଅ. ଅପ	ଉ.ଉଧ	ଅ. ଅପ	ଉ. ଅଧ	ଥ. ଅପ	ସ. ଅପ			
J-ROW				I-COLU	IMM						
	Ð	1 21	1 1	12	13	14	15	16			
1	ଉ.ଅସ	ଡ. ସସ	ଉ. ଅଷ	ଉ. ଉଉ	ଉ. ଉଉ	ଉ. ଉପ	ସ. ସହ	ଉ.ଅପ			
₽ 2	ହା. ହାହ	ହା. ହାହା	Ø. ØØ	ଡ. ଡଡ	ଡ.ଡଡ	ଅ.ଅପ	ହ. ଅପ	ଡ. ଅପ			
3	ହା. ସସ	ଡ.ଡଡ	ସ. ସହ	ව. වැඩ	ଡ.ଡଡ	ହା. ହାତ	ହା. ଅପ	ହ.ଅନ			
4	ଉ. ଉଚ	0. 03	Ø. Ø1	ଅ.ଅପ	ଫ. ଫଡ	ଅ. ଅଅ	ଅ.ଅପ	ଉ.ଅପ			
5	Ø.19	0. 10	Ø. Ø4	Ø. Ø1	ଉ. ଉଉ	তা. তাত	ଉ.ଡଡ	ଉ.ଅପ			
- &	ଉ.ଉଚ	অ. অভ	Ø. Ø1	ଅ.ଅପ	ଫ. ତହ	0.20	ଉ. ଉପ	থা. তাতা			
7	ଉ.ଉଉ	ୟ. ସହ	ଉ.ଡାଡ	ଉ. ଉପ	0.00	ହା. ଔୟ	ଡ.ଡଡ	ହା. ଅହା			
8	ଡ.ଡଡ	ଡ. ହେତ	ଡା. ଡାଡା	ව. වුට	ଡ.ଡଡ	Ø. ØØ	ଡା. ଅପ	ଉ. ଉପ			
9	୍ଷ. ଅପ	ଫି. ସେପ	0.00	ଉ.ଉଉ	ଉ.ଅପ	0.00	ଉ. ଉପ	ଡ.ଡଡ			
10	ଡା. ଡାଡା	তে. হোতা	ଅ.ଅଅ	ଉ.ଅପ	ව.වන	ହା. ହାହ	Ø. ØØ	ପା. ଅପ			
11	ଉ.ଉଉ	ଅ.ଉହ	ଉ.ଉଉ	ଅ.ଅପ	ଉ.ଅପ	ଅ. ଉପ	ଅ.ଅପ	তা. ঠাতা			

MODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 3191.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW		I-COLUMN								
	1	2	3	4	5	೯	7	3		
1	ହ. ହହ	ଉ.ଉପ	ପ. ଅପ	তা. তাই	ଉ.ଅପ	ପ. ଅପ	ଉ.ଉଉ	ସ. ଦମ		
2	ହା. ହାହା	ତ ହେଉ	ತಾ.ಲಾಹಾ	তা. হাফা	Ø. 2020	তা. তাখ	ଅ.ଅଅ	া. কাঠা		
3	ଡା. ଉତ	@. @@	ଉ.ଉହା	ଉ.ଉଉ	হা. হাহো	ଡ.ଡଡ	ତ.ଉଚ	ହୀ. ଔହା		
4	ଅ.ଅପ	হোঃ. হাতা	ଅ.ଅୀ	ক. ক্র	Ø. Ø5	ଫ. ଫ୍ଞ	হা. 12া	ଡା. 1ଥା		
5	ଉ.ଉଉ	Ø.Ø1	മ. മാട	Ø.Ø8	0.15	Ø.23	Ø.29	Ø.29		
S	ହା. ସହା	ଥା. ଉପ	ଅ.ଅୀ	Ø. Ø3	ଡ.ଡେଲ	ಥ.ಥಾಕ	호, 1회	ଅ. 1ଅ		
7	্া. হাত	থ.টো	ව. ඔව	এ. এএ	টা. ফাঠা	ව. ගැට	ପ.ସସ	ତା. ସହ		
8	ହା. ହାହା	ಥ.ರಾಹ	ହା. ହାହା	ହ. ହହ	ව. වැඩ	তা. তাহা	ତ. ଅପ	ହା. ହାହା		
- 9	ହା. ହାହା	ହା.ପତ	ହ.ଡବ	তা. তাত	ව.පීට	ଉ. ଉଉ	21. 2021	ପ. ଅପ		
10	ପ.ଅପ	ଥ. ସେପ	ପ. ଫଡା	ହା. ହହ	ଡା. ତାହା	ଉ.ଉପ	য়ে হাত	ଉ.ଅପ		
11	ହ. ହହ	ଅ.ଅପ	ଡ. ତତ	ହା. ଅହା	(Z) _ (Z)(Z)	ଉ.ଡାପ	া. তাহ	0.00		
J-ROW				I-COLU	MM			•		
	Э	10	1 1	12	13	14	15	16		
1	ହା. ଅହା	୬. ଅପ	ত. তত	ଡ. ଅପ	ව. වැඩ	ව. වෙව	ଡା. ଅପ	ଡ. ହେଉ		
2	ହା. ଉତ	ଡ. ଉତ	তা. তাতো	ୟ. ୟହା	ଡା. ଉତ	ଡ.ଡଡ	ଅ. ସହ	হা. হাহা		
3	ୟ.ଅସ	ଉ.ଅସ	0. ZW	ଡ.ଡଡ	তা. তাতা	ଅ.ଅପ	ଡା. ତାତ	ଥା. ଅପ		
4	ව.වෙස	Ø. Ø6	∅.ඕ∃	Ø. Ø1	ଉ.ଷ୍ଡ	ଉ.ଡାଉ	ଅ. ସହ	ଉ.ଟେଉ		
5	ZI. 24	0. 16	ଅ. ଅ9	0.04	Ø. Ø1	ෂ. ඔම	তা, তাতী	ପ. ତାପ		
' ∈	0.08	0. 06	മ.താട	0.01	থা. দাখো	ହ. ହାତ	ହ.ହାହା	ক. কাঠা		
7	ව.වෙව	ଡ.ଡାଡ	ଡ.ଡଡ	ଅ.ଅଅ	০. সাহা	ව. වැඩ	ହା. ହାହା	ହା. ହହ		
a	ତା. ଉତ	ଉ. ଏଉ	ତା. ହହ	ହ.ଅହ	ଅ.ଅଅ	ව. වඩ	া. ইছা	ୟ. ସହ		
Э	ଉ.ଅଅ	ଡ. ଅପ	ଅ.ଅନ	ଡ. ଡାଡ	ହା. ଅପ	ହ. ହେବ	হা. হাই	তে. ইঠ		
10	ଉ.ଉପ	ଉ.ଅଉ	ତ.ଡତ	াই. ইছো	ଓ.ସହା	Ø. ZØ	ව. ඔබ	ව.ටැඩ		
11	ৱ. এএ	ୟ. ସମ	ଡି. ଡିଡି	ଅ.ଅପ	ର, ସହି	থ. অথ	એ. ইংফ	ହ. ଅଧ		

SIMULATION PERIOD DURATION IN DAYS: 3556.00

AHLUES	UF CUIVI	HIMITIAHIA	CHANCE	H 1 7 1014 1114	₽/ ₽ / €3/ .			•
J-ROW				I-COLU	YIN			
0 11011	1 .	2	3	4	¹ 5	6	7	8
		A 20	ଅ.ଅପ	ව. වෙන	ව. ැව	ව. ඔව	ଅ.ଅସ	ଅ. ଅପ
1	তা. তাতা	ଥ ି, ଅଥି		ପ.ଯହା	ව. යුව බ. වැඩ	ଉ.ଡେଡ	হা. হাহো হ	ହା. ହାହା
2	ୟ. ଅଠ	ହା. ଅପ	ହା.ହାହା ସ			ଡ. ଉପ	7.21	21.211
3	ଅ.ଅଧ	ଡ .ଥାଥା	ପ. ଉଦ	হো. । হোগা কে কেক	ଡ. ହେବ		ଅ.ଅ∃	0.10
4	ଉ.ଉହ	0.ହାହା	Ø. Ø1	Ø.Ø2	ପ. ହ4	a.ae		
5	ହା. ହାହା	Ø. Ø1	Ø.Ø2	ଡା. ଡା5	Ø. 10	∅.16	0.23 3 33	Ø.25
6	হা. ইঠা	ୟ. ସସ	Ø. Ø1	ଡ.ଡଥ	Ø. Ø4	ଡ.ଅ∈	ଅ.ଅ9	Ø. 10
7	ହା. ଅପ	ଡ. ତତ	টো. ঠাঠা	ହା । । । । । । ।	ଥା. ହାହ	ଅ.ସଥ	থা. হা	0.01
8	তা. তাতা	য়ে. তাতা	ଅ.ଅନ	ପ.ପଦ	ପ.ଫାପ	থা. থাথ	ପ. ସଥ	ହା.ହାହା
9	ଡ.ଡାଡା	ହା. ଉପ	টো <u>টোফ</u> ো	ହା. ହହ	ଡ. ତାଡ	ଅ.ସଂପ	তা. তাতা	ଡି.ସିହି
10	ହା. ହାହା	🗷. ହାହା	ପ. ତାହ	ହା. ହାଅ	ହା. ହହ	াঠা. ঠাঠো	ଉ. ଉଉ	Ø. 200
11	ଉ.ଡଡ	ଫ. ଅପ	ଅ.ଅପ	ଅ.ଅପ	ପ. ସହ	ව. වෙව	া. ইংটা	ଅ.ଅପ
J-ROW				I-COLU	MN			
5 NOW	Э	1 Ø	11	12	13	14	15	16
1	ଉ.ଅସ	ଡ.ଡଡ	ଉ.ଡାଡ	ଉ.ଡାଡ	ହା. ହହା	ଉ.ପ୍ର	ଅ. ଅସ	ଉ.ଉପ
â	ଡ. ସେପ ଅ.ସେପ	ହା. ଅପ	ଅ.ଅଅ	ଅ.ଅଧ	ପ. ଅପ	ପ. ସପ	ଉ. ଉତ	তা. টাভী
3	Ø. Ø1	0.ଉଡ	12.20	হা. হাহা	ଉ.ଅପ	ବ.ଅନ	ଡ.ଡଡ	ଉ.ଉପ
<u>. </u>	0.10	ଉ.ସେଞ	0.05	Ø. Ø3	0.01	Q. Ø1	ତ. ତତ	ପ. ଅପ
5	0.25	a.20	Ø. 13	a. 27	ଉ.ଉଞ	0.01	ହା. ହାହ	ଉ. ଉପ
ے ق	0.10	0. 28	0.05	হা.হা3	21.21	Ø. Ø1	ව. වෙට	া. এই
5 7	Ø. 21	ହା. ଉପ ଫା. ଅଫା	ଅ.ଅଅ	ହା. ହୁପ	ଉ.ଉପ	Ø. ØØ	ଉ.ଅସ	ପ. ପର
	121 - 21 - 1			THE STREET			ল্ লেগ	্য সংস

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ය. ජන ව. විව ව. එව ව. එව ව. එව ව. එව
බ. බව ව. විව ව. එව ව. එව
බ. බව ව. විව ව. විව ව. විව
 140 ,
MONITOR WELL COMPUTATION RESULTS:
TIME-CONCENTRATION TABLE
MONITOR WELL NUMBER: 1
                 CONCENTRATION (MG/L)
TIME (DAYS)
 1000.000
                           Ø. 65
 1365.000
                           Ø. 31
                           Ø. 16
 1730.000
 2095.000
                           0.08
                           0.04
 2461.000
                           Ø. Ø2
 2826.000
 3191.000
                           Ø. 21
 3556.000
                           Ø. Ø1
MONITOR WELL NUMBER: 2
                  CONCENTRATION (MG/L)
TIME (DAYS)
1000.ପଠର
                           Ø. 27
                           Ø.49
 1365.000
                           Ø. 53
 1730.000
                           Ø. 44
2055.000
2461.000
                           Ø. 33
                           Ø.ES
 2826.000
                           Ø. 15
 3191.000
 3556.000
                           Ø. 10
MONITOR WELL NUMBER: 3
TIME (DAYS)
                 CONCENTRATION (MG/L)
                           Ø. Ø5
 1ଥାସତ.ଅପତ
 1365.000
                           Ø. 21
 1730.000
                           Ø. 37
2055.000
                           Ø. 42
                           Ø. 38
 2461.000
                           0.31
 2826.000
 3191.000
                           Ø.23
                           2.16
 3556.000
MONITOR WELL NUMBER: 4
TIME (DAYS)
                 CONCENTRATION (MG/L)
1ଉଉପ. ଉପଉ
                           ଅ.ଅପ
1365.000
                            Ø. ØØ
 1730.000
                           Ø. 20
 2095.000
                           Ø. 00
 2461.000
                           ଡ. ଅପ
 2826.000
                           0.00
```

0.00

0.00

MONITOR WELL NUMBER: 5

3191.000 3556.000

TIME (DAYS)	CONCENTRATION (MG/L)
1ଉଉଉ. ଉଉଡ	ତ. ହେଉ
1365.ወ00	ଫ.ହେଡ
1730.000	ଷ. ଅପ
වුන්ලිට්. නිනිනි	ଉ.ଡାଡ
모수된는, 경기장	ଅ.ଅଅ

```
0.24
 3191.000
                         Ø. 97
 3556.000
DATA BASE:
Number of simulation periods for which contaminant
concentration distribution is to be calculated 7
Bimulation period number= 1
Simulation period duration in days= 3922.00
Simulation period number= 2
Simulation period duration in days= 4287.00
Simulation period number= 3
Simulation period duration in days= 4652.00
Simulation period number= 4
Simulation period duration in days= 5017.00
Simulation period number= 5
Simulation period duration in days= 5383.00
Simulation period number= 8
Simulation period duration in days= 5748.00
Simulation period number= 7
Simulation period duration in days= 6113.00
Number of grid columns= 15
Number of orid rows= 11
Grid spacing in ft= 100.00
X-coordinate of upper-left grid node in ft=
Y-coordinate of upper-left grid node in ft=
                                                 2.00
Acuifer actual porosity as a decimal= 0.400
Adulfer effective porosity as a decimal- 0.350
Simulation period numbers 1
 Aduifer thickness in ft= 90.00
 Acuifer longitudinal dispersivity in ft=100.20
 Adulfer transverse dispensivity in ft= 10.20
Seepage velocity in ft/day= 0.56
 Number of point sources- 1
Simulation period number= 2
Aquifer thickness in ft= 90.00.
 Aquifer longitudinal dispersivity in ft=100.00
 Aquifer transverse dispersivity in ft= 10.00
 Seepage velocity in ft/day= 0.56
 Number of point sources= 1
 Simulation beriod number= 3
 Adulfer thickness in ft= 80.00
 Acuifer longitudinal dispensivity in ft=100.00
 Aquifer transverse dispersivity in ft= 10.00
 Seepage velocity in ft/day= 0.56
 Number of point sources= 1
 Simulation period numbers 4
 Adulfer thickness in ft= 90.00
 Aquifer longitudinal dispersivity in ft=100.00
 Adulfer transverse discersivity in ft= 10.00
 Seepage velocity in ft/days 0.56
 Number of point sources= 1
 Simulation period number= S
 Aquifer thickness in ft= 90.20
 Acuifer longitudinal dispersivity in ft=100.00
 Acuifer transverse dispersivity in ft= 10.00
 Sampage velocity in ft/day= 0.56
 Number of point sources= 1
 Simulation period number= 6
 Acuifer thickness in ft= 90.00
 Abulfer longitudinal dispensivity in ft=100.00
 Aquifer transverse discensivity in ft= 10.20
 Seepage velocity in fildays 0.36
 Number of saint scarces# 1
```

డా గాలకు ఉద్దర్శాలు <mark>దాజాన్</mark>కుడుకు కుండా చాలా చేస్తున్నారు. 7

```
Regifer longiousinal ciaparaivity in fivili. De
Adulfer transverse discersivity in for 10.20
Seepage velocity in ft/day = 0.56
Number of point sources= 1
Simulation period number= 1
Paint source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 11ଅଖ. ଅପିତ
Time after slug contaminant injection in cays= 3922.00
Simulation period number= 2
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slub point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 4287.00
Simulation period number= 3
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft=   4ଉଡ. ପଥ
Slug point source solute inject. vol. in gal= 16500.00
Slub point source solute concentration in mg/l= 1100.030
Time after slug contaminant injection in days= 4652.00
Simulation period number= 4
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of coint source in ft=-400.00
Slug point source solute inject. vol: in gal≃ 16500. ଡଟ
Slug point source solute concentration in mg/l= 1100.ඔම
Time after slug contaminant injection in days= 5017.00
Simulation period number= 5
Paint source number 1
X-coordinate of point source in ft=
                                       ୍ୟ. ସହ
Y-coordinate of point source in ft= 400.00
Slup point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 5383.00
Simulation period number= 6
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 5748.00
Simulation period number= 7
Point source number 1
X-coordinate of point source in ft=
                                       0.00
Y-coordinate of point source in ft=    4ଉଡ. ଉଡ
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 6113.00
Bulk density of dry aquifer skeleton in g/cu cm= 2.30
Adulter distribution coefficient in ml/g= .3
Number of monitor wells for which time-
concentration tables are desired= 5
Monitor well number= 1
I-coordinate of monitor well= 2
J-coordinate of monitor well= 5
Monitor well number= 2
I-coordinate of monitor well= 5
J-coordinate of monitor well= 5
Monitor well number= 3
```

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Monitor well numbers 4
I-coordinate of monitor wells 8
J-coordinate of monitor wells 7
Monitor well numbers 5
I-coordinate of monitor wells 18
J-coordinate of monitor wells 5

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 3922.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				I-COLU	MN				
	1	2	3	4	5	٤	7	8	
1	ହା. ହା ଡ	ଡ.ଡେଡ	ଡ. ଡଡ	ଡ. ଏହ	ଅ.ଅଷ	Ø. ØØ	ଅ. ଅଷ	ව. ඔබ	
2	0.0 0	ଉ.ଉଉ	ପ.ପଥ	ଅ.ଅଅ	ହା. ହାହା	ଅ.ଅପ	Ø. ØØ	ৱ. ভাৰ	
3	ଡ. ଡ ଡ	ହା. ହାହା	ଡ.ଡଡ	ଅ.ଅପ	Ø. ØØ	ହା. ହାହା	Ø. Ø1	0.01	
4	ଉ. ଉ ଡ	ଉ.ଉଉ	Ø. ØØ	0.01	Ø. Ø3	0.05	0. 0 7	0.09	
5	Ø. Ø Ø	ଡା. ତାତା	Ø.Ø1	ଫ. ଫ୍ର	Ø. Ø6	Ø. 11	0.17	0.E2	
6	ଉ. ଉ ପ	ଡ.ଡଡ	ପ. ଅପ	0.01	Ø. Ø3	0.05	0.07	ଡ. ଜ9	
7	Ø. Ø Ø	ହା.ହାହା	ପ.ଠାତ	ଡ.ଡଡ	ଅ.ଅପ	ଅ.ଅପ	Ø. Ø1	0.01	
읍	0.00	ହା. ଅପ	ହ. ହହ	ପ.ଯାହ	0.00	ହା. ହାତ	a. 00	Ø. ZiØ	
Э	Ø. Ø Ø	ପି.ପିତି	ପ. ଉପ	0.00	Ø. 120	Ø. ØØ	Ø. ØØ 1	Ø1. 121121	
10	Ø. 120	তা. তাতা	ପ. ଉପ	ଉ.ଉପ	ସ. ହାତ	ହା. ହାହ	ଅ.ଫାଉ	2.20	
1.1	Ø. Ø Ø	ୟ.ଥାସ	ଅ.ଅଷ	ଉ.ଅପ	୭.ଅଡ	ପ.ଅପ	ହା. ଅହ	ଡ. ଡଡ	
J-ROW				I -COLU	MN				
	9	1 🗷	11	18	13	14	15	15	
1	Ø. Ø Ø	ହା. ହାହ	ଉ. ଉଷ	ସ. ଉତ	ଉ.ଅତ	ଡ. ଉଉ	ଅ. ଉଡ	ଡ.ଅବ	
2	ୟ. ଅ ଡ	ଅ.ଅଭ	ଡ.ଡଡ	ଡ.ଡଡ	ଉ.ଉପ	ପ. ହାତ	മ. താമ	Ø. Ø2	
3	ଡ.ଡୀ	Ø. Ø1	Ø. Ø1	ଅ.ଅପ	0.00	Ø. ØØ	ପ. ତତ	ଡ.ଅନ	
4	Ø. 1 0	Ø. 10	ව. ඔපි	0.05	Ø. Ø3	Ø. Ø1	Ø. Ø1	0.00	
5	Ø.24	Ø.22	Ø. 17	Ø. 12	Ø. Ø6	Ø. Ø3	0.01	Ø.00	
6	Ø. 10	0.10	ଡ.ଡ8	0.05	Ø. Ø3	Ø. Ø1	0.01	ଅ. ଅଧ	
7	ଉ.ଡୀ	0.01	0.01	Ø. ØØ	ව. හැන	ଉ. ଉଉ	ପ. ପଠ	ଉ.ଉଉ	
. 8	ଅ.ଅ ଅ	ଉ.ଡାଡ	ଡ. ଓଡ	ଉ.ଉଷ	ଅ.ଅପ	0.00	ଉ.ଡୀଡ	0.00	
3	ଏ. ଅ ଡ	ହା. ହହ	ସ. ଅପ	ଡ. ୟସ	. 0.00	ଉ.ଡାଡ	ଉ.ଉଡ	ଅ.ଅପ	
10	ଅ.ଅ ଅ	ଡି. ଡିଡ	ହା. ଅପ	ଡ.ଡଡ	ଅ. ଅପ	ଉ.ଡାଡ	ଡ. ଡାଡ	ହା. ହାହ	
11	Ø. Ø Ø	ଉ.ଉଡ	ଉ. ଉପ	ବ. ଅଷ	a. a a	ଡ.ଡଡ	ଅ. ଉଉ	ଉ.ଅପ	

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 4287.00

J-ROW		I-COLUMN									
	1	2	3	4	5	٤	7	8			
1	ଅ. ଅ ଡ	ହା. ହାହା	Ø. ØØ	ଉ.ଉଉ	0.00	ଅ.ଅଅ	ଉ.ଉଉ	ହା. ଉତ			
2	ଅ.ଅ ଅ	ହା. ହାହା	Ø. ØØ	ହା. ଅନ	0.00	Ø. ØØ	ଉ. ଉପ	0.00			
3	0.0 0	ଡ.ଡଡ	ଡ.ଡଡ	ଡ. ଅପ	ଉ.ଅପ	0.00	Ø. Ø1	0.01			
4	ଡ.ଡ ଡ	ଡା. ଡାଡା	ଡ.ଡଡ	Ø. Ø1	0.02	Ø. Ø3	Ø. Ø6	ଉ. ଉଞ			
5	0.0 0	ହା. ହାହା	Ø. Ø1	0.02	Ø. Q4	a. 07	Z.12	0.17			
E	ଫ.ଅଫ	ଅ.ଅପ	ଫ.ଅପ	0.01	ව. ඵුළ	മ.മാദ	Ø. Ø6	Ø. Ø8			
7	ଉ. ପ ଡ	ଉ.ଉଉ	ଡା. ଡାଡ	ଡ଼ ଓଡ଼	ହା. ଉତ	ହା. ହାଡ	a. Ø1	0.01			
8	ହା. ହା ଡ ଼	ই. ইই	ଟା. ଡାଡ	ଡ.ଡାଡ	ଅ.ଅପ	ඵ.ඵාව	ପ. ଅପ	0.00			
9	ଅ.ହା ଡ	ଅ.ଅପ	ଡା. ହାହା	ଉ. ଉପ	ଉ.ଉଡ	21. 210	ପ. ହାଡ	ଉ.ଅଉ			
1 ই	0.0 0	ଡି.ଡେଡ	ଡ.ଡଡ	ଆ. ଏହା	ଡ.ଡଡ	ට. වැට	ଡ. ଡଡ	ଉ.ଅଉ			
1 1	ଥ. ଅ ପ	୍ ହା.ହାହ	ହ.ଅୟ	ଅ.ଉପ	ଉ.ଫଡ	0.00	ସ.ଉପ	2.20			

J-ROW				I-COLUMN					
	Э	1 ଡ	11	12	13	14	15	16	
1	ଡ଼. ଉପ	0. 00	ଡ.ଡଡ	ଅ. ଅପ	ঠা. ঠাটো	ଫ. ଫଡ	ଡ. ଡଡ	ଡ. ଡଡ	
2	ଉ.ସଉ	മ. മമ	তা. তাতা	0.00	তা. ঠাঠা	0.00	ଅ.ଅପ	ଅ.ଅପ	
3	Ø. Ø1	Ø.Ø1	Ø. Ø1	Ø.Ø1	ଡ. ଅହା	ଅ.ଅପ	0.00	0.00	
4	0.10	0.10	0. Ø9	Ø. Ø7	0.05	മ.മാട	0.01	0.01	
5	Ø.21	0.22	ହା. 🖃 ହା	Ø.15	0.10	Ø.Ø6	ଡ.ଅଞ	Ø.Ø1	
6	0.10	Ø. 10	Ø. Ø9	Ø. Ø7	0.05	Ø. Ø3	0.01	অ. তা	
7	Ø. Ø1	ଅ.ଅ1	Ø. Ø1	0.01	Ø. 20	ଅ.ଅପ	ଅ.ଅପ	ଡ.ଡଡ	
8	ସ.ସମ	ଡ. ସସ	ଡା. ଫଡା	ଉ.ଅଅ	ଉ.ଡାଡ	ମ. ହହ	0.00	ଅ.ଅଅ	
9	ହା. ହାହ	🗷. ହୋତା	ଡ.ଡଡ	ව.වැව	ወ. ଅପ	ଅ.ଅପ	ଉ.ସହ	ଡ. ଡଡ	
1 🛭	ପ. ସହ	ହ. ଉହ	Ø. 00	ব. কব	ପ. ଉପ	ପ.ଉପ	ପ.ଡାଡ	ව.වැඩ	
1 1	ולשולש בולש	മ. മമ	ହା. ଫ ଫ	ଡ. ସହ	ଡ.ଅପ	ଉ. ଉପ	ଉ.ଅପ	ହା. ଅପ	

SIMULATION PERIOD DURATION IN DAYS: 4652.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW		· I-COLUMN									
<u> </u>	1	2	3	4	5	6	7	8			
1	ହା. ଅହା	ଫା. ଉଉ	ଅ. ଅନ	21. 212	ଉ.ଅପ	ପ. ଅପ	ପ. ଅପ	ପ.ସପ			
Ē	ଉ.ଉଉ	ଉ.ଉପ	2.20	ව.පව	ଉ.ସଅ	ଉ.ଅସ	ଅ.ଅଅ	121. 121121			
- 3	ଉ.ଅସ	0.ସେପ	21. 2021	ව. ඔබ	ଡ.ଅପ	ପ. ସହ	ପ. ସଂପ	Ø. Ø1			
4	ହା. ଅଥ	Ø. ଉହ	0.00	0.00	0.01	Ø. Ø2	0.04	0.06			
5	ହା. ହେତ	ව.ඵර	ত. তাত	Ø. Ø1	ව. වැඩ	Ø. Ø5	ଉ.ଅଞ	∅.13			
€.	ସ. ହାହ	ଡ. ଅପ	০.এ০	Ø. ØØ	ଉ.ସୀ	Ø. ØZ	Ø. Ø4	ଅ.ଅକ			
7	ଅ. ଅପ	Ø. ସସ	ଅ.ଅଫ	ව. ඔබ	ପ. ଅଥା	ତ.ଉପ	া. াটা	∅.∅1			
8	ଡା. ଡାଡା	ହା. ଉଠା	ව. ඵච	ପ. ସପ	ଡା. ତତ	ପ. ଅପ	ଅ.ଅଅ				
Э	ଅ.ଅପ	ଅ.ହାଅ	ଡ. ଓଡ	ଡା. ତାତା	ଡ.ଡଡ	ଅ.ଅପ	ಶ.ಫಾ	0.00			
10	ଡା. ଡାଡା	0.ଉପ	ହା. ହାହା	0.00	0.00	ଡା. ଡାଡା	ହା. ହହ	0.00			
11	ଡ.ହାଡ	ଡ. ଡଡ	ঐ. ঐঐ	ଡ. ଅପ	ଡ.ଡଡ	ଡ.ଅଡ	ଡ. ଅଡ	ଫ. ଫଡ			
J-ROW				I-COLL	IMN						
	Э	10	11	12	13	14	15	16			
1	ଉ.ଉଉ	ପା. ସସ	Ø. ØØ	ପ. ଅପ	ଉ. ଉଉ	ව. වෙව	ව. වැට	0.00			
٤	ହା. ହାହା	ଉ. ଅପ	ଉ.ଅଉ	ව. වැඩ	ව. ඔව	ଉ. ଅପ	ପ. ପପ	ଅ.ଅପ			
3	Ø.Ø1	0. 01	0.01	Ø. Ø1	0.01	0.01	121. 121121	ଉ.ଅପ			
4.	ଡ.ଡେ୫	ଅ. 1ଅ	0.10	Ø. Ø9	Ø.Ø7	Ø. Ø4	ව. වැඩ	Ø. Ø1			
5	Ø. 17	0. 20	ව. 2ව	Ø.17	Ø.13	Ø. Ø9	0.05	Ø. Ø2			
٤	Ø. Ø8	0. 10	0.10	Ø. Ø9	Ø. Ø7	0.04	4. 182	0.01			
7	0.01	0.01	0.01	ক. তা	Ø. Ø1	0.01	ଡ.ଡେଡ	ପ.ଅପ			
. 8	ହ.ଡଡ	ହା. ହାହ	তা. তাতা	ଡ. ସହ	ଉ.ଉପ	ଡ.ଡଡ	ව. ඔව	ව. වච			
Э	হা. হাঠা	0.ପପ	ପ.ଠାଠ	0.00	ଡ.ଅଡ	ଡ.ଡଡ	ହ. ହହ	তা. তাতা			
10	ଅ.ଅପ	ଡ. ଉତ	হা. হাহা	তা. তাতা	ଡ. ଉପ	ଡ.ଫଡ	ଅ. ଅଅ	ହ. ହହ			
11	ଅ.ଅସ	ଉ. ଅଅ	ଡ.ଡଡ	ଷ. ଉପ	ଡ.ଡଡ	ପ. ଫଫ	ಡ.ಹಾರ	121. 2012			

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 5017.00

J-ROW	I-COLUMN									
	1	2	3	4	5	6	7	8		
1	ସ. ସହ	ଡ. ବ୍ର	ହା. ଉପ	তা. তাতা	ত. তাত	ଅ. ଫସ	ଡ. ଡଡ	ହା. ଅପ		
Ē	ଅ.ଅଅ	ଫ.ଡାହା	তা. তাতা	থা. থাথ	তা. এপ্ৰ	. ଡ.୍ଡାଡ	ଡା. ଅପ	ଡ.ଡେଏ		
Ξ	-,	- -,,	المائد المان	100 - 100	Control (Special)	্স কেন্স	লৈ. সাঁগা	তা. তাং		

日 2 7 8 9 1 Ø	ି. ି ସ. ଅପ ସ. ସସ ସ. ସସ ସ. ସସ	େ. ଧ <i>ା</i> ସ. ଅ ସ ସ. ସସ ସ. ସସ ସ. ଅ ସ	ି. ୬୦ ସ. ଉପ ସ. ଉପ ସ. ସସ ସ. ସପ	ର. ଓ: ପ. ସମ ସ. ସମ ସ. ସମ ସ. ସମ ସ. ସମ	ଡ. ୦: ୭. ଡ଼ା ୭. ଡ଼ା ୭. ଡ଼ା ୭. ଡ଼ା	ି. କିଞ୍ଚ ଫି. ଫିଟ ଫି. ଫିଡ ଫି. ଫିଡ ଫି. ଫିଡ	ା. ୦୫ ଡ. ଡଃଞ ଡ. ଡଃଞ ଡ. ଡଃଡ ଡ. ଡେଡ	ର. ଅଞ୍ଚ ଅ. ଅଞ୍ଚ ଅ. ଅଧ ଅ. ଅଷ ଅ. ଅଷ
11	ପ.ସପ ପ.ସହ	ଡ . ଡ ଡ ଡ. ଡଡ	ହା. ଅ ପ ଓା. ଅପ	ସ. ସଥ ସ. ସଥ	ଅ.ଅପ ଅ.ଅପ	ଡ. ଅଷ ଉ. ଅଷ	ଅ. ଅଅ ଅ. ଅଅ	ଅ. ଅପ ଅ. ଅପ
T-ROW	_	_		I-COLU	MN		- 1 .7 .7	
	9	1 ঐ	1 1	12	13	14	15	16
1	ଡ.ଫଡ	ଫ . ଡ ରୀ	ଅ. ଅଷ	Ø. ØØ	ଡ.ଡଡ	ଡ. ଡଡ	0.00	ଉ. ଅପ
	ଡ.ଡଡ	ଅ .ଅ ଅ	ହ. ଉଷ	ଉ.ଅସ	ଉ.ଉଉ	ଉ.ଡାଡ	ଅ.ଅଷ	ଅ.ଅଷ
_ 3	Ø. Ø1	ଡ.ଡା:	Ø. Ø1	Ø. Ø1	Ø. Ø1	Ø. Ø1	0.01	ଉ.ଡାଡ
4	Ø. Ø7	Ø. Ø 9	Ø. 10	a.a s	Ø. Ø8	0.0E	Ø. Ø4	0.02
5	Ø.13	Ø. 17	Ø. 19	0.18	0.1E	0.12	ଡ. ଅଞ	Ø. 24
ϵ	Ø.Ø7	Ø. Ø9	Ø. 10	Ø. Ø 9	ଉ.ଉଞ	0.0E	Q. Q4	ଉ.ଉଥ
7	ଥ.ଥା	Ø. Ø1	0.01	Ø. Ø1	Ø. Ø1	Ø. Ø1	21.21	0.00
8	ଡ.ଡଡ	ଡା. ଡାଡ	ଉ.ଡାଡ	0.00	ଉ.ଉଉ	ଉ.ଉଉ	0.00	0.20
9	ତି.ପହା	ସ. ହାସ	ଡ.ଡଡ	ଡ. ଉଉ	ପ. ତାହ	ହ. ହାୟ	ଅ.ଅପ	ଅ.ଅପ
10	ଅ.ଅପ	ତା. ହାହା	Ø. ØØ	0.00	ଉ.ଉପ	0.00	ଏ.ଡଡ	0.00
11	ଉ.ଥାଅ	ଡ . ଅ ଡ	ଡ. ଅପ	ଡ. ଅଷ	ଅ.ଅପ	ଅ.ଅଅ	0.00	ଅ. ଅପ

SIMULATION PERIOD DURATION IN DAYS: 5383.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				I-COLU	MM			
	1.	2	3	4	5	6	7	8
1	ଅ.ଅପ	ଡା. ଡିଡା	0.00	ଡ. ଅଡ	ଡ.ଡଡ	0.00	ඔ. ඔබ	ଉ. ଉପ
_ 2	ହା. ହହ	ଉ.ଉଉ	ଡ.ଡାଡ	া. কাতা	ଡ.ଡାଡ	ଉ.ଉପ	ସ. ଅପ	Z1. ØØ
3	ଉ.ଡାଡ	ଫ . ଡ ଡ	ଡ. ଡଡ	ଅ.ଅପ	Ø. ØØ	Ø. ØØ	Ø. ØØ	0.01
4	ହା. ହାହ	ହା. ଫାହା	ଉ. ଉପ	ଡ.ଡଡ	ଡ.ଡାଡ	0.01	0.0E	ଉ.ଉଞ
5	ଡ.ଡଡ	ଡା. ଡାଡା	ହ. ହହ	ହା.ଅପ	0.01	0.02	0.04	ଅ.ଅଧ
= 6	ତା. ତାହା	ହା. ଓ ହା	ଡ. ଉପ	ଡ.ଡାଡ	ଡା.ଡାଡା	0.01	0.02	0.03
7	ତା. ସହ	ଡ . ହ ତ	ଡ.ଡଡ	ହ. ହାହ	ଡ.ଡଡ	ଡ.ଡଡ	0.00	Ø. Ø1
8	ଡା. ଉତ	ଡା. ଡାଡା	ଉ. ଉପ	0.00	0.00	0.00	0.00	0.00
_ 9	ଡି. ଡିଡି	ଡ.ଡଡ	ଡ. ଅପ	ଡ. ଅପ	ପ. ଅପ	ପ. ପପ	ହା. ଅଷ	0.00
10	ଉ.ଉଉ	ଡ .ଡ ଡ	Ø. ØØ	ହା. ହାହ	0.00	ଷ. ଉପ	ଡ.ଡଡ	0.20
3 1 1	ଫ. ଅପ	ଅ . ଅ ସ	0.00	0.00	ଡ.ଅଷ	ଡ. ଅପ	0.00	ଡ. ଅପ
■ J-ROW				I -COLU	MN			
	Э	10	1.1	12	13	14	15	16
1	ହ. ହହ	0.00	0.00	0.00	ଉ.ଉପ	୍ଡ. ଡଡ	ଏ. ଏହ	ଉ.ଅପ
€ .	ଡା. ଓଡା	ହ . ହ ହ	ଅ.ଅପ	ଉ.ଅପ	ଅ.ଅପ	ଡ.ଡଡ	ହା. ହାଡ	ଉ.ଅପ
■ ਤ	0.01	0.01	0.01	0.01	0.01	Ø. Ø1	0.01	0.01
4	0.05	Ø. 07	Ø. Ø9	Ø. Ø9	Ø. Ø9	ଅ.ଅଞ	0.06	0.04
១១	0.10	Ø. 1 3	Ø. 16	0.18	Ø.17	Ø. 14	0.10	0.07
€	Ø. 05	₫ . 0 7	Ø. Ø9	Ø. Ø9	Ø. Ø9	Ø. Ø8	Ø. Ø6	Ø. Ø4
7	0.01	0.01	Ø. Ø1	0.01	0.01	0.01	Ø. Ø1	0.01
<u> </u>	ଡା. ଉଡା	ହା. ୟହ	ଉ.ଡଡ	ଡ. ତଡ	ଡ.ଅପ	୍ ହର	ପ. ପପ	ଡ. ଉଡ
9	ଡ.ଡଡ	ହ . ଡ ଡ	Ø. ØØ	0.00	ଅ. ଅପ	0.00	ଉ.ଉଉ	0.00
■ 10	ପି.ସସ	তা. ঠাঁতো	ව. ඵච	ଉ.ଅଭ	ଡ.ଡଡ	ହା. ହାହ	ଉ. ଉଷ	ଫ. ଫଡ
_ 11	ଡ.ଉଡ	ହା. ହାହ	ହ. ଅଭ	ଡ.ଡେଡ	ଡ.ଡଡ	ସ. ଉପ	ଅ.ଅଅ	ଅ.ଅଷ

NODAL COMPUTATION RESULTS:

BIMULATION PERIOD DURATION IN DAYS: 5748.00

J-ROW				I-COLU	MN			
	1	æ	3	4	5	Ē	7	8
1	ପ.ପର	0. ଏହ	ଉ. ଅପ	ଉ. ଉତ	ଅ. ଅପ	0.00	0.00	ଉ.ଉଉ
2	ହା. ହହ	ଫ. ହାଠ	ପ. ଫାହା	ଡ. ତତ	ଅ.ଅପ	ଉ.ଅଉ	ଡ.ଡଡ	0.00
3	ଉ.ଅପ	ହା. ହାହା	ପ. ସପ	0.00	0.00	ଅ.ଅଏ	0.00	Ø. 202
4	ହା. ହାହା	🗷. ଅପ	তা. তাতা	0.00	ଫ. ଉପ	Ø. Ø1	Ø. Ø1	VI. VE
5	0. U0	ଡ.ଡେଡ	ହା. ହାହା	0.00	ପ.ପତ	Ø1. Ø1	0.02	0.04
Ð	হা. হাই	ঠা. ঠাঠা	তা. তাতা	ଡ. ଅପ	ଡ.ଅପ	Ø.Ø1	Ø. Ø1	Ø. Œ2
7	ସ.ସସ	🗷 . ସାସ	Ø. ØØ	ଅ.ଅଅ	ଉ.ଡେଥ	ଉ.ଡଡ	ଉ.ଡାଡ	ହ.ଅହ
8	ୟା. ଏହ	ଡ. ଅପ	ଡ. ଡଡ	ଡ.ଡଡ	ଡ.ଅଡ	ଅ.ଅପ	ପି. ଅପି	ଅ.ଅପ
9	ଉ.ଉଡ	ଫ. ଉପ	ପ.ଅପ	ହ.ଉପ	ଉ.ଡାଇ	ଡା. ଅପ	ଉ.ଉପ	ଉ.ସହ
1 🗹	ହା. ହାହ	ପ.ପପ	ପ. ଫଣ	ව.වෙඩ	ଡ. ଡାଡ	ପ. ଅପ	ଅ.ଅପ	ଉ.ଉପ
11	ଉ.ଉଉ	Ø. ଉଉ	ଉ. ଅପ	ଉ.ଅପ	0.00	ଡ. ଡଡ	ଡ.ଡଡ	ଉ.ଉପ
J-ROW				I-COLU	MN			
	Э	10	1 1	12	13	14	15	16
1	ଫ.ଉପ	ପ.ପଠ	ଡ.ଡଡ	ଡ. ଅପ	ହା. ଅହା	ଉ. ଅଷ	ଏ. ଏହା	0.00
2	ପ. ସସ	Ø. 210	ଉ. ଅପ	ହା. ଅପ	ଉ.ଉପ	0.00	ଡ.ଡଡ	0.00
3	ଥା. ଥାର	0 .01	Ø. Ø1	Ø. Ø2	Ø. Ø2	0.02	0.01	0.01
4	0.04	ଡ. ଉଧ	Ø. Ø8	Ø. Ø9	ଡ. ଫ9	0.08	Ø. Ø7	0.05
5	Ø. Ø7	Ø. 10	Ø. 14	Ø. 16	Ø. 16	0.15	0.1E	Ø. Ø9
6	Q. Q4	0. 26	ଉ. ଅଞ	Ø. Ø9	0.09	0.08	Ø. 07 '	0.05
7	Ø. Ø1	0. 01	0.01	Ø.Ø2	0. Ø2	ଡ. ଅଥ	ø.øi	0.91
8	ହା. ହାହା	ক. তাতা	ଉ.ଉପ	ଡ.ଡଥ	Ø. ØØ	ଉ.ଉପ	ଉ.ଉଉ	ଉ.ଅପ
Э	ହା. ଥାହା	❷. ଉଚ	ଡ.ଡଡ	ଡା. ଡାଡା	ଡ.ଡଡ	ଡ. ଅପ	ଅ.ଅସ	ଡ. ଅପ
10	ହା. ହାହା	ଡ. ସେତ	ଉ.ଡବ	ଉ.ଉଷ	ଉ.ଅଷ	Ø. ØØ	ସ.ଅପ	0.00
1 1	ଅ.ଅପ	ଫି.ଅପ	ଅ.ଅପ	ଡ. ଉଡ	ଉ.ଅଅ	ଡି.ଅଡି	ග. නව	ଅ.ଅଅ

SIMULATION PERIOD DURATION IN DAYS: 6113.00

VALUES	OF CONT	TMANIMA	CONCENTR	ATION (M	G/L) AT	NODES:			
J-ROW	I-COLUMN								
	1	2	3	4	5	E	7	8	
1	ଅ. ଅପ	0. ଏହ	ଡ. ଡଡ	ଡ. ଡଡ	0. 00	ଉ. ଉଷ	ଉ.ଉପ	ଡ.ଡଡ	
≘	ଉ.ଅସ	છ.ସେଉ	ଉ.ଅଉ	0.00	ଅ.ଅପ	ପ.ଅପ	ଡ.ଡଠ	ହ.ଥାୟ	
3	ଡ.ଡଡ	ଆ. ଅଅ	21. Z/2	ଡ.ଡଡ	ଅ.ଅପ	Ø. ØØ	ହା. ହାଅ	ଅ.ଅପ	
4	ଡା. ସତ	ଡା. ଅପ	ଉ. ସହ	ଡ. ଅପ	ହା. ହାହ	0.00	Ø. Ø1	0.02	
ົວ	ହା. ହାହା	Ø.ଡଡ	ଅ.ଅଭ	ଡ.ଡଡ	ঐ. ঠাই	0.01	ଅ.ଅ1	0.03	
6	হৈ. হাহা	🛭 . ହେହ	ଡ. ଓଡ	Ø. ØØ	Ø. Ø Ø	ଉ. ଅପ	0.01	Ø. Ø2	
7	ଫ. ତତ	ଡ.ଡଡ	ହ. ହହ	ହା. ହାହ	ଅ.ଅପ	ଡ. ଅପ	ପ. ପପ	ଡ. ଅପ	
8	ଡ.ଡଥ	ଡ.ଅସ	ଡା. ହାଡା	ଡ.ଡଡ	ପ. ଅପ	ଡ.ଡଡ	ଅ.ଅପ	0.00	
9	ହା. ହାହ	Ø.ହାହା	Ø. ØØ	ଉ.ଅପ	ව. වැඩ	ହା. ଅପ	ଅ.ଅପ	ଡ.ଅପ	
10	ଉ.ଉଉ	ଅ.ଅନ	ହା. ହହ	Ø. ØØ	ଫ. ଫଟ	ଡା. ଡାଡ	ଅ.ଅପ	0.00	
11	ଅ.ଅପ	୭. ୭୭	ହ. ଅଷ	ହ-ୟାୟ	ଅ.ଅପ	ଡ.ଡଡ	ହ.ଅପ	ଡ.ଅପ	
J-ROW				I-COLU	MN				
	9	10	11	12	13	14 .	15	16	
1	ଉ.ଉଉ	0. 20	ଡ. ଡଡ	a. aa	ଉ.ଅପ	Ø. ØØ	0.00	ଡ.ଫଡ	
2	ଡା.ଡାଡା	ଡା. ହାହା	ଡ. ଫଡ	ଅ.ଅଅ	ଅ. ଅପ	ଉ.ଉଉ	0.00	ଅ.ଅପ	
2 3	Ø. Ø1	Ø. Ø1	0.01	0.0 <u>2</u>	Ø.ØE	ଉ. ଅଅ	Ø. Ø2	Ø.Ø1	
4	ଡା. ଡାଞ	0. 05	Ø.ØE	ଡ. ଡଃ	0.09	0.09	Ø. Ø8	Ø. 07	
្រ	0.05	ଫ.ଡୋଞ	Ø. 11	2.14	0.15	0.15	Ø. 14	Ø.11	
5	മ.മാ	Ø. Ø5	Ø. Ø6	ଅ.ଅଞ	ଡି.ଡି୨	ଡ. ଫ9	ଡ. ଅଞ	Ø.Ø7	
7	Ø. Ø1	0 .01	Ø. Ø1	Ø.ØE	ග. ගැළ	a.ae	Ø.ØE	Ø. Ø1	
3	াঠ. এপ	ଡ . ହେଉ	ହା. ଅପ	ଉ.ଉଅ	ଡା. ତାହା	ଡ. ଅଥ	ହା. ହାହ	ଡ.ଡଡ	
÷	2.20	হা, কৌফো	হী, ঠাহা	៤. ៧៧	ଉ. ଅପ	ଏ.ଡାନ	থা. কাৰো	ଅ.ଅଉ	

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ැය කු.පත ප.සංක ස.පත ප.පත ජ.සේම ප.පත ප.පත
11 ව.වන ව.වට වෙ.මීම නි.මීම මි.මීම මි.මීම වි.වීමී
```

ONITOR WELL COMPUTATION RESULTS:

IME-CONCENTRATION TABLE

MONITOR WELL NUMBER: 1

IME (DAYS)	CONCENTRATION (MG/L)
3922.000	ଫ. ଉପ
4287.000	0. 00
4652. QQQ	ଡ.ଡେଡ
5017.000	ଉ.ଉଡ
5383.000	Ø. ØØ
_5748.000	ଉ.ଉଉ
6113.000	Ø. ØØ

MONITOR WELL NUMBER: 2

IME (DAYS)	CONCENTRATION (MG/L
3922. ଉଉଉ	Ø. Ø6
4287. ØØØ	Ø. 2 4
4652.000	Ø. Ø2
5017.000	Ø. Ø1
5383.000	Ø. Ø1
5748.200	ହା. ହାତ
8113.000	ୟ. ସପ

MONITOR WELL NUMBER: 3

TIME (DAYS)	CONCENTRATION (MG/L)
3922.000	Ø. 11
4287.000	Ø. 07
4652.000	ø. 05
5017.000	Ø. Ø3
5383. ଉଉଷ	Ø. Ø2
5748.000	Ø, Ø1
6113.000	Ø. Ø1

MONITOR WELL NUMBER: 4

TIME (DAYS)	CONCENTRATION(MG/L)
3922. ଉ ଡିଡ	ଫ. ସଠ
4287. ଉଉଉ	ଫ. ପଠ
4652. <i>ଉଷ୍</i> ଡ	ଅ. ଅଡ
_ 5017.000	ወ. ହେଉ
5383. ଉଉଉ	ଉ. ଉଡ
5748. ଉଉପ	ଉ. ଉପ
6113.000	ଉ. ଉଡ

MONITOR WELL NUMBER: 5

TIME (DAYS)	CONCENTRATION (MG/L)
3922. ଉଦଦ	Ø.12
4287.000	Ø.15
465E. ଉଉପ	Ø. 17
5017.000	Ø. 18K
5383.000	Ø. 18
5748.000	Ø. 16
6113.000	Ø. 14

Simulation period number= 1 Simulation period duration in days= 6478.00 Simulation period number= 2 Simulation period duration in days= 6844.00 Simulation period number= 3 Simulation period duration in days= 7209.00 Simulation period number= 4 Simulation period duration in days= 7574.00 Simulation period number= 5 Simulation period duration in days= 7939.00 Simulation period number= 6 Simulation period duration in days= 8305.00 Number of grid columns= 16 Number of grid rows# 11 Grid spacing in ft= 1ଉଡ. ଅଡ X-coordinate of upper-left grid node in ft= ଉ. ଡଡ Y-coordinate of upper-left grid node in ft= 0.00 Acuifer actual porosity as a decimal= 0.400 Aguifer effective porosity as a decimal= 0.350 Simulation period number= 1 Additer thickness in ft= 90.00 Aguifer longitudinal dispersivity in ft=100.00 Adulfer transverse dispersivity in ft= 10.00 Seepage velocity in ft/day= Number of point sources= 1 Simulation period number= 2

Adulfer longitudinal dispersivity in ft=100.00 Adulfer transverse dispersivity in ft= 10.00

The Control of the Co

Adulfer thickness in ft= 90.00

Secoage velocity in ft/day= Number of point sources= 1 Simulation period number= 3 Acuifer thickness in ft= 90.00

Number of simulation periods for which contaminant concentration distribution is to be calculated 6

DATA BASE:

```
೯೯೬೬ ೧೯೯೯ ಕನ್ನಡಚಿತ್ರವೇ ಹಚ್ಚಿತ ಚಿತ್ರಾವೆ ಗಡಿಸಿಗಳಿತ್ತು
                                ារីស ១៩២ ១៩៣៦៤
Seepage velocity in ft/day= 0.56
Number of point sources= 1
Simulation period number= 4
Adulfer thickness in ft= 90.00
Aquifer longitudinal dispersivity in ft=100.00
Acuifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sources= 1
Simulation period number= 5
Aquifer thickness in ft= 90.00
Acuifer longitudinal dispersivity in ft=100.00
Aguifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of boint sources= 1
Simulation period number= 6
Aquifer thickness in ft= 90.00
Aguifer longitudinal dispersivity in ft=100.00
Adulfer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sources= 1
Simulation period number= 1
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 1:00.000
Time after slug contaminant injection in days= 6478.20
Simulation period number= 2
Paint source number 1
X-coordinate of point source in ft=
Y-coercinate of point source in ft= 400.00
Slug point source solute ingect. vol. in gal- 15520.20
Eluc coint source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 6844.20
Simulation period number= 3
Paint source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 7209.00
Bimulation pariod number= 4
Point sounce number 1
X-coordinate of point source in fix
                                        a. 00
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500.00
Slub point source solute concentration in mg/l= 1100.000
Time after slug contaminant injection in days= 7574.00
Simulation period number= 5
Point source number 1
X-coordinate of point source in ft=
                                         0.00
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 1100. ඔවුම
Time after slug contaminant injection in days= 7939.00
Simulation period number= 6
Point source number 1
X-coordinate of point source in ft=
                                         Ø. Ø2
Y-coordinate of point source in ft= 400.00
Slag point source solute inject. vol. in gal= 16500.00
Slup point source solute concentration in mg/l= 1100.200
Time after slug contaminant injection in days= 8305.00
Bulk censity of dry acuifer skeleton in g/cu cm= 2.30
Assifer distribution opefficient in ml/g= .3
```

4.75 4 1 1 1 1 1 4 1 1 Monitor well dumbers i Independinate of monitor well= 12

J-coordinate of monitor well= 5

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 6478.00

VALUES OF CONTAMINANT CONCENTRATION (MO/L) AT MODES:

J-RGW				I-COLU	MM			
	1	2	3	4	Ξ	ē	7	8
1	ଡ. ଅପ	0. 00	Ø. ØØ	ପ. ସପ	ଉ. ଉପ	ଉ. ଉଉ	ସ. ଅଉ	0.00
ව ය	ସ.ସସ	ଫି.ଡିଡ	ଡ.ଡଡ	ହ.ଡାଡ	ଅ.ଉଉ	ଅ.ଅନ	0.70	ଅ. ଅପ
3	ହା. ହାହା	ଉ. ଉଉ	ହା. ଉପ	ହ. ହଇ	Ø. ØØ	(Z) . (Z) (Z)	a.a0	0.00
4	ହା. ଅପ	Ø. ସହ	ଅ.ଡଥ	ସ. ଅପ	ଡ.ସହ	ସି.ସଂୟ	Ø. Ø.	Ø1. Ø1
5	ହା. ହାହା	ହା. ସପ	Z. Z.Z	Ø. Ø2	ଆ.ଅପ	ହା. ଅହା	21.201	ସ.ଅଞ
a	ଡା. ଅଠା	ତ. ତତ	ව.ඔව	0.00	ଅ.ଅଅ	ଅ.ଅଭ	Ø. Øl	0.01
7	ୟ. ହାୟ	ଢା. ସସ	ଡ.ଡଥ	ଡ.ଡେ	ঠা. <i>ডোট</i> ।	ହା. ହାହା	ଡା.ଡାଡା	0.00
8	ତ.ଡଠ	ଡ.ସେଡ	21, 212	ହ. ଉତ	ଥ. ସଭ	ହା. ଉପ	ଅ.ଅପ	ାଅ. ଅପ
9	ଉ.ଉଉ	ଅ.ଅପ	ହା. ଉତ	ଡ.ଡଡ	হা. হাহা	ଅ.ଅଅ	ଡ.ଡଡ	0.00
1 🗷	ହା. ହାହା	ପ. ସହ	ହ.ଡଡ଼	ପ. ପପ	ଅ.ଅଭ	ଅ.ଅପ	ଅ.ଅପ	ଡ.ଡଡ
11	ହା, ହାହ	ହ.ଉପ	Ø. ØØ	ବ. ଉପ	ସ. ସସ	ଅ.ଅପ	ସ. ଅସ	ୟା. ହାହ
J-ROW				I-COLU	MN			
	9	10	11	12	13	14	15	16
<u> </u>	ව. ඔව	ক. হাহা	ව. වන	ଉ. ଉଦ	ଡ, ଡଡ	0.22	ପ. ଅବ	ତ. ଅଷ
Ξ.	12. 2121	Ø. 1212	ପି.ଅନ	ଉ.ଉପ	ව. වඩ	ଉ. ଉଉ	ଅ.ଅଅ	হা। হ াহা
3	ଅ.ଅପ	છ. છે:	21. 21	Ø. 21	0. ØE	ð. 82	Ø. 2E	2.72
4	ଡ.ଡ2	ଡ. ଅଞ	Ø. 75	Ø. 27	ଅ.ଅଞ	a. 05	0.09	Ø. Ø8
5	2.03	ଅ.ଅଟ	ଡା. ଉଞ	Ø. 11	D. 13	2.14	Ø. 14	Ø. 13
€	ರಾ. ಶಾವ	Ø. ଅଞ	0.05	0.07	ଡ.ଡଣ	Ø. 29	0.09	ଉ.ଅଣ
7	ହା. ହାହା	0. 21	Ø. Ø1	0.01	Ø. 32	0.0E	0.02	ව. වුව
3	হা. হাহো	ଉ.ଅଫ	ହ. ଉତ	ଉ.ଓଉ	Ø. 20	Ø. ØØ	ଉ.ଅଉ	0.00
9	হা. হাতা	ଅ.ଅଅ	ଡ.ଡଡ	ଡ.ଡଡ	ଡ.ଡାଡା	ପ. ଉପ	୍ତ. ତୁଠ	ව. වෙව
143	ହା. ଉତ	Ø. ଉପ	ଡ. ଉଷ	ହ. ଉତ	ଡ.ଡାଡ	ଅ.ଅଭ	ଉ.ଉଉ	0.20
1 1	ହ. ଅଷ	ଡ.ସେଷ	ଉ.ଅଅ	ଡ. ଅଷ	Ø. 20	ଡ. ଉଷ	ପ. ଅଅ	ଅ. ଅଷ

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 6844.00

4.5

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

JボロW	I-COLUMN									
	1	2	3	4	5	€	7	8		
1	ହା. ଅପ	ଉ.ଫେଅ	Ø. ØØ	ଡ. ଡଡ	ଅ.ଅଅ	ଅ.ଅଅ	ଉ. ଅଭ	0.00		
:3	ଡ଼ା. ଡାହା	ହା. ଉପ	Ø. ØØ	ଉ.ଅପ	Ø. 20	ଉ. ଉଉ	ଡ.ଡାଡ	0.20		
3	ଅ.ସସ	ହାଁ. ହହ	ව. ඔව	ଡ. ସହ	ପ. ଉଉ	ଡ.ଅଷ	Ø. Ø0	ଫ. ଅପ		
4	ଉ.ଡାଡ	ହା. ହାହା	ଉ.ଉଉ	ଉ.ଉଉ	ଉ.ଉଉ	Ø. ØØ	ව. හැට	0.01		
5	0.00	Ø. ଅପ	ଡା. ଡାଡ	ଉ.ଉଉ	ଡ.ଡେ	ହ.ଅପ	0.01	0.01		
6	ସ.ସସ	Ø. ଉପ	ඛ. ඔබ	ସ.ସହ	ଉ.ଉଉ	ଡ.ଡାଇ	ହା. ହାୟ	0.01		
7	ଡ. ସେପ	ପ. ପଠ	ଡା. ତତ	ହ. ଉଉ	ଅ. ଉପ	Ø. ØØ	0.00	0.00		
8	ପ. ସପ	ଡ.ହୋହ	ହା. ତାହା	ଉ.ଉଉ	ଅ.ଅସ	0.00	ପ. ଉହ	21.20		
9	ଅ.ଅଅ	ହା. ସହ	ZI. ZZ	ଡ.ଅସ	ପ.ଅଫ	ପ.ପପ	Ø. 22	2.20		
1 🗷	ହା. ହାହା	ই.ই	ପ. ଉପ	ଡ.ଡାଡ	ବ.ଉବ	ପ. ଉଉ	2.20	21. 212		
1.1	ଅ.ସମ	ඵ. නින	ව. ඔව	ଉ.ଉପ	ଫ.ଅବ	ଅ.ଅଷ	ଅ. ଅଥ	ଅ. ଅପ		

I-COLUMN

→ ± + ±

4 2

.234567890:	ି. ଥିବା ହି. ହି ଡ଼ି ହି. ହ ି 1 ହି. ହ ି 2 ହି. ହ ି 2 ହି. ହ ି 2 ହି. ହ ି 2 ହି. ହ ି 2 ହି. ହ ି 2 ହି. ହ ି 2 ହି. ହ ି 2	ଧ. ତିର୍ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ ବି. ବିଷ	ୟ. ଉତ୍ତ ଅ. ଉଷ ଉ. ଉଧ ଉ. ଉଧ ଉ. ଉଧ ଉ. ଉଧ ଉ. ଉଉ ଉ. ଉଉ ଉ. ଉଉ	2. 20 2. 22 2. 25 2. 25 2. 25 2. 25 2. 22 2. 22 2. 22	2.00 0.00 0.07 0.11 0.07 0.02 0.00 0.00	ହ. ଜନ ହ. ହନ ହ. ହେଞ ହ. ହଞ ହ. ହଞ ହ. ହଞ ହ. ହନ ହ. ହନ ହ. ହନ ହ. ହନ	ି. ହଉ ଅ. ଅଷ ଅ. ଅଞ ଅ. ଅଞ ଅ. 14 ଜ. ଅଞ ଅ. ଅଞ ଅ. ଅଉ ଅ. ଅଉ ଜ. ଅଉ	ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ
1 1	ଉ. ଉଉ	ଫ. ଉଦ	ଉ. ଉତ	ক. কক ক	থ. থাঞ থা. থাংগ	ପ. ହାପ ପ	ଡ. ହାହ ତ. ହାହ	ର. ଫ୍ର ସ. ଫ୍ର

SIMULATION PERIOD DURATION IN DAYS: 7209.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				I-COLL	JMN			
	1	2	3	4	5	6	7	8
1	0.00	ହ.ଉହ	ଉ.ଡାଡ	0.00	ପ. ହାପ	0.00	ଅ.ଫ୍ର	0.00
<u>2</u> 3	ହା. ସହା	ଥା. ଥାଥ	ଅ.ଅଅ	ZI. 242	0.00	তা. তাত	ଅ.ଅସ	ଅ. ଅଷ
	ଅ.ଅପ	ହ.ଉହ	ଡ.ଡଡ	ଡ. ଡଡ	ଉ.ଫର	ଡ. ଅପ	0.00	0.20
4	ହା. ହାହା	୍ ହି.ଥିପ	হা. হাই	0.20	0. 20	a.00	0.20	2.20
5	ସ.ସହା	ହା. ହାହା	0. এই	0. Ø0	ପ. ପାର	৫.৫০	0.00	21, 211
£	ଅ. ସହା	ହା, ସହ	ଉ. ଉତ	21. ZE	Ø. 20	ଅ.ଅପ	0.00	a. &2
7	ପ.ପସ	ହା. ଉପ	Ø. Ø2	Ø. ØØ	ଅ.୯୦	0.00	Ø. @Ø	2.20
8	ହ. ହହା	ଫି. ଅଅ	ক. হাক	Ø. ØØ	ଅ.ଅଡ	ପ.ଅପ	2.22	ව. වෙව
9	ପ. ଅପ	ଡ. ଫଟ	ଥା. ହହ	ଅ.ଅସ	ව. වඩ	ଅ.ଅପ	ପ.ଅସ	ଅ.ଡଡ
1 🕸	ହ. ସହା	🗗 . ସେପ	Z. Z.Z	21.22	ଅ. ହେଉ	ହା. ହାହା	ଉ.ଅଷ	Ø. ØØ
11	ଅ. ଉଫ	ହା. ଉପ	ক. কাহ	ଏ. ଅଥ	ଡି. ଫିଡ	0.30	ଥ. ଅପ	2.20
J-ROW				I-COLU	MN			
	Э	1 Ø	11	12	13	14	15	16
1	ସ. ସସ	ସ. ସସ	ଅ.ଅଅ	Ø. ØØ	Ø. ØØ	ଅ.ଫଡ	ଅ. ଅସ	ଉ.ଉଉ
2	ଡ.ଡେଡ	ହା. ଉପ	2.20	0.00	0.00	ଉ.ଅପ	0.00	ପ. ଅପ
3	ଡ. ହେଉ	ହି. ହାହ	0.01	Ø. Ø1	Ø. 211	a.æ2	0.02	0.02
4	Ø. Ø1	ಥ.ಥಾ	0.03	0.04	0.05	a. 27	Ø. Ø8	0.08
5	හි.හිළ	හ. ගෙය	0.05	Ø. Ø7	0.29	Ø. 11	0.13	Ø. 13
6	তা. তা	ହ.ହେ≘	Ø. Ø3	21.24	Ø. Ø6	a. 27	Ø. Ø8	Ø. Ø8
7	ଠ. ଉପ	ව.වෙව	0.01	0.01	Ø. Ø1	Ø. Ø2	0.08	0.02
8	ଉ.ହାହା	ଉ.ଉଉ	Ø. ØØ	ହା: ହହା	ପ. ଅପ	ଉ.ଅନ	0.00	0.00
9	ଫ.ପପ	ହ . ସସ	ପ. ଉପ	ହା. ହାହ	ପ. ଅପ	ଅ.ଅପ	ଡ.ଡଡ	ଡ.ଡ
1/2	ଉ.ଅଫ	ଉ.ଉଉ	ଉ.ଡାଇ	121. 21121	ଉ. ଉପ	হা হৈছে	0.00	ହ.ଉପ
1.1	ଅ.ଅଫ	ପ. ପଦ	ବ. ଉଚ	ଅ. ଅପ	2.20	ଉ.ଉଉ	ପ. ଅପ	ଫ. ଅପ

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 7574.00

J-R⊡W								
	1	2	3	4	5	5	7	8
1	ସ. ସହ	ଫ. ଅପ	ଡ.ଅଡ	ପ. ଅପ	ଅ.ଅଉ	ଅ.ଅନ	ଅ.ଅଉ	ହା. ଅପ
3	ঠা. ঠাঠা	ହା ସହ	Ø. ØØ	ଉ.ଡାଡ	0.00	0.00	ଉ.ଅଉ	21.212
3	থা. অথ	ହ.ଅପ	ପ.ଅପ	Ø. 20	ହା. ଅପ	2.00	ଅ.ଅପ	2.00 2.00
• 4	ଡା. ଜାତା	ହା. ହାତା	ହା. ହାହା	ସ. ଅନ୍	0.00	য়ে. হাহা	ଅ.ଅପ	2.22 2.29
5	ଡି.ଡିଡ	ଫ.ଡେଡ	(ZI _ (ZI)(ZI	0.00	0.00	ପ. ସହ	ଫ.ଫଟ	
<u>.</u> <u>6</u>	<u> </u>	ଅ.ସଅ	Ø. ØØ	Ø. ØØ	ଡ. ହେଉ	ව. වෙව	ପ. ଫଟ ସ. ସଫ	ପି. ଫି. ଫ. ଫଟ

• •	 	nu mustu				** * ** *	* * * * * *	1000
	2.20	3. <u>2</u> 0	ହି. ଅଥ	21. 1212.	ର୍ଜ ପ୍ରତ	ଏ. ଅଧା	थे. येख	ાં. યોજી
9	ହା. ହହା	ଅ . ଅପ	ව.වට	ଅ.ଉଷ	ହି.ହାହା	ହା.ଅହା	2.22	ତୀ. ତାତ
1 🗷	ତା. ତାତା	থা. তাথা	ଡା. ଡାଡା	ଡ.ଡଡ	ପ. ହହା	ଡ.ଡାଡା	ଉ.ଉଉ	ହା. ହାହା
■ ¹¹	ହ.ଉଡ	0. 0 0	0.00	ପ. ଉପ	ଡ.ଡଡ	ଅ.ଅଅ	ପ. ଯଦ	Ø. 00
S-ROW				I-COLU	MN			
_	9	1 ঐ	11	12	13	14	13	16
1	ଡ.ଡଡ	ଡ. ଡ ଡ	ଉ. ଉପ	0.00	ଉ.ଉଉ	ଡ. ଉତ	0.00	0.00
2	ହା. ହାହା	ହା 🕻 ଓ ।	ଉ.ଅପ	ଉ.ଉହ	ଫ.ଅସ	ହା. ହହ	ହା. ହାହ	ଡ. ଡଡ
— 3	ହା. ତହ	ଥା. ଉହା	0.01	Ø. Ø1	Ø. Ø1	0.02	0.0E	ව.වුළ
4.	Ø. Ø1	0. 0 1	Ø.Ø2	Ø. Ø3	0.05	0.0E	Ø. Ø7	Ø. Ø8
5	ପ.ହା:	ଡ.ଡିଥ	Ø. Ø3	0.05	0.07	Ø. Ø9	0.11	0.12
_ 6	Ø. Ø1	ଅ.ଅ1	Ø. Ø2	0.03	0.05	Ø. Ø6	0.07	Ø. 08
7	ହ. ହେତ	Ø. Ø Ø	Ø. Ø1	0.01	Ø. Ø1	ଉ.ଉଞ	a.ae	0.02
a	ঠা. ঠাঠা	ପ . ଉ ପ	ଡ.ଡାଡ	ଡ.ଡାଡ	ଡ.ଡଡ	Ø. ଅପ	0.00	ହ. ହେଉ
Э	ଡ.ଡେଡ	ହା. ହାହା	0.00	ଡ.ଡେଡ	ଡ.ଡାଡ	ଅ.ଅଭ	ଡା. ଡାଡା	ହା. ଉଉ
≘ 1⊘	ପ.ଡାଡ	ଅ . ଉପ	ଉ.ଅଉ	ଡ.ହାଡା	ଡ.ଡାଫ	ଉ.ଉଉ	ଅ.ଅପ	ପ. ଅପ
1.1	সা. সাস	0. 0 0	<i>ମ</i> . ୟମ	01. 0101	171. 171.671	מת הוא	17t - 17t(7t	21. <i>(2)</i> (2)

ICDAL COMPUTATI**o**n **resul**ts:

SIMULATION PERIOD DURATION IN DAYS: 7939.00

ALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

_T-ROW	I-COLUMN								
	î.	2	3	4	5	E	7	8	
 ÷	ଅ.ଅଅ	ହା. ଅହ	0.00	21.20	0.00	ଉ. ଉଉ	Ø. 22	0.00	
<u>e</u> 3	ଅ.ଅପ	0. 0 0	ଡ.ଡଡ	ହ. ଉତ	ଫ. ହହ	ପ.ଅପ	ଅ.ଅପ	0.00	
3	ଡା. ଉତ	Ø. Ø 12	ହ. ତହ	ଡ.ଡଡ	ଡ.ହାଡା	21. 2023	12) <u>-</u> 121121	ହା. ଅପ	
4	01.1210	ହା. ଅହା	ଅ.ଅପ	ଉ.ଅହ	ଉ.ଅହା	Z. 20	ଅ. ଅଅ	0.00	
T a	ହ-ହାହ	ଡ଼ା. ଉପ	0.02	ସ.ସହ	ଡ. ଉତ	ଉ.ଉଉ	ই. ইটো	ହ. ଅନ୍	
	ଡା. ହାଡା	ଡ. ଡ ଡ	ଡ.ଡଡ	ହା.ହାହ	ହ. ଅପ	ପ. ଅପ	12.12.12	0.00	
7	ପ.ସଠ	ଡା. ହାଡା	ଉ.ଅପ	ଅ.ଅଭ	ଡ.ଡାଡ	ଡ.ଡଡ	Ø. ØØ	0.00	
_ &	ଉ.ଉଡ	ଡ.ଡଡ	ଉ.ଡ଼ଉ	ଡ.ଡଡ	ହ.ହାହ	ଅ.ଅଅ	0.00	0.00	
9 10	ତା. ହାତ	Ø. Ø Ø	ଡ.ଡାଡ	ଡା. ଉତା	ଉ.ଅଭ	ଉ. ଉଉ	ଉ.ଉଉ	0.00	
10	ପା. ସପ	ଡ . ହ ଡ	ହା. ଅତ	0.00	ଅ.ଅଭ	ଉ.ଅପ	ZI. Z	0.00	
11	ହ, ହହ	ଫ. ହହା	ଉ.ଅପ	ଅ.ଅପ	ଅ:ଅଭ	ଡ.ଡେ	ଡ.ଡଡ	Ø. ØØ	
೯-೨೦೫				I-COLU	MN				
	3	1 ত	1.1	12	13	14	15	16	
<u>i</u>	ଉ. ଉଷ	a. a a	ଡ. ଅଷ	. ଡ.ଡଡ	ଉ. ଉଦ	ଅ. ଅଥ	Ø. ØØ	ପ. ଅଷ	
■ 2	টা. তাটো	ଅ. ଅ ୟ	ଉ. ଉଉ	ଉ.ଡାଭ	ଅ. ଉପ	ଅ.ଅପ	ହ. ଉପ	Ø1. Ø10	
3	ସ. ସସ	ଉ.ସହ	ହ. ହହ	0.01	0.01	0.01	0.02	ଡ.ଡଥ	
4	ଉ.ଉଉ	Ø. Ø 1	0.01	0.02	Ø. Q4	0.05	a. as	0.07	
5 6	থা. খা	0. 0 1	0.02	0.04	0.05	ଡ.ଡଃ	0.10	Ø. 11	
- 6	ଡ.ଅପ	ଉ. ହୀ	0.01	0.02	Q. Q4	a.a5	0.0E	0.07	
7	ହା. ଅହା	ଡ. ହାଡା	ଅ.ଅପ	ଡ.ଡ1	Ø. Ø1	0.01	Ø. 72	0.02	
8	ଉ.ଉଉ	ଅ . ଅ ଅ	0.00	ଡ.ଡଡ	ଡ.ଡେ	ଥ. ଉପ	0.00	0.00	
9	ଡ.ଡଡ	ହ .ଡ ହ	ଉ. ଅଷ	ଡ.ଡଡ	ଉ.ଉଉ	ହା. ହହ	ପ. ଅପ	0.00	
1 টা	ହା. ହାହା	ହା.ହାହା	Ø. ØØ	ତ. ହେଉ	ହା. ହାହା	ଉ.ଉଉ	ଅ.ଉଅ	0.00	
11	ହ. ହହ	ଅ . ଅ ଅ	0.00	ଅ.ଅପ	ଡ. ଉପ	Ø. ØØ	0.00	ଡ. ଡଡ	

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 8305.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

THROW THOSE THOSE WAY

12345678901	ର. ହେଥ ବ. ପ ର ବ. ପ ର ବ. ପ ର ବ. ପ ର ବ. ପ ର ବ. ପ ର ବ. ପ ର ବ. ପ ର ବ. ପ ର ବ. ପ ର	ହ. ଅବ ସ. ସହ ସ. ସହ ସ. ସହ ସ. ସହ ସ. ହହ ସ. ଦହ ସ. ହହ ସ. ଅସ ସ. ଅସ	2. 00 0. 00 0. 00 0. 00 0. 00 0. 00 0. 00 0. 00 0. 00 0. 00	ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ	ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ ହ. ହହ	ହ. ହର ହ. ହର ହ. ହର ହ. ହର ହ. ହର ହ. ହର ହ. ହର ହ. ହର ହ. ହର ହ. ହର	2. 00 2. 00 2. 00 2. 00 2. 00 2. 00 2. 00 2. 00 2. 00 0. 00	ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ ଅ. ଅବ
J-ROW	9	10	11	I-COLU 12	MN 13	14	15	16
1 2 3 4 5 5 7 8 9 9 1 1	ବ. ଅବ ବ. ଅବ ବ. ଅବ ବ. ଅବ ବ. ଅବ ବ. ଅବ ବ. ଅବ ବ. ଅବ ବ. ଅବ ବ. ଅବ	ହ. ଉହ ହ. ଉହ ହ. ଉହ ହ. ହ1 ହ. ହ1 ହ. ଉହ ହ. ଉହ ହ. ଉହ ହ. ଉହ ହ. ଉହ	Q. ØQ Q. ØQ Q. Ø1 Q. Ø2 Q. Ø1 Q. ØQ Q. ØQ Q. ØQ	0.00 0.00 0.01 0.03 0.03 0.03 0.01 0.00 0.00	ଉ. ଉଉ ଉ. ଉଉ ଉ. ଉଧ ଉ. ଉଧ ଉ. ଉଥ ଉ. ଉଉ ଉ. ଉଉ ଉ. ଉଉ ଉ. ଉଉ ଉ. ଉଉ	a. aa a. aa a. a4 a. a6 a. a4 a. a1 a. aa a. aa a. aa a. aa	ୟ. ହେଉ ସ. ହେଉ ସ. ହେଞ ସ. ହେଞ ସ. ହେଞ ସ. ହେଉ ସ. ହେଉ ସ. ହେଉ ସ. ହେଉ ସ. ହେଉ ସ. ହେଉ	ମ. ଫ୍ୟ ମ. ମହ ମ. ମହ ମ. ମହ ମ. ମହ ମ. ମହ ମ. ମହ ମ. ମହ ମ. ମହ ମ. ମହ ମ. ମହ ମ. ମହ

MONITOR WELL COMPUTATION RESULTS:

TIME-CONCENTRATION TABLE

Bimulation period number= 1

MONITOR WELL NUMBER: 1

```
TIME (DAYS) CONCENTRATION (MG/L)
6478. 000 0.11
6844. 000 0.09
7209. 000 0.05
7574. 000 0.05
7939. 000 0.03
DATA BASE:
```

Number of simulation periods for which contaminant concentration distribution is to be calculated 4

```
Simulation period duration in days= 5844.00
 Simulation period number= 2
. Simulation period duration in days= 7209.00
 Simulation period number= 3
 Simulation period duration in days= 7574.00
 Simulation period number= 4
 Simulation period duration in days= 7939.00
 Number of grid columns= 16
 Number of grid rows= 11
 Grid spacing in ft= 100.00
 X-coordinate of upper-left grid node in ft=
                                                 0.00
 Y-coordinate of upper-left grid node in ft=
                                                 0.20
 Aquifer actual porosity as a decimal= 0.400
 Adulfer effective porosity as a decimal= 0.350
 Simulation period humber= 1
 Acuifer thickness in ft= 90.00
```

DATA BASE:

Number of simulation periods for which contaminant concentration distribution is to be calculated 1

Simulation oeriod number= 1 Simulation period duration in days= 1000.00 Number of orid columns= 12 Number of grid rows# 11 Grid soacing in ft= 100.00 X-coordinate of upper-left grid node in ft=

01-010 Y-coordinate of upper-left grid node in ft= 0. 20 Aguifer actual porosity as a decimal= 0.400 Aguifer effective porosity as a decimal # 0.350

Simulation period number= 1 Adulfer thickness in ft= 90.00

Aguifer longitudinal dispersivity in ft= 30.00 Aquifer transverse dispersivity in ft= 10.00 Seepage velocity in ft/day= Ø. 56

Number of point sources= 1 Simulation period number= 1

Point source number 1

X-coordinate of point source in ft= 0. 20 Y-coordinate of point source in ft= 400.00

Slug point squrce solute inject. vol. in dal= 16500.00 Slug paint source solute concentration in mg/l= 950.000 Time after slug contaminant injection in days= 1000.00 Bulk density of dry adulfer skeleton in d/cu cm= 2.30 Aculfer distribution coefficient in ml/c= .23

Number of monitor wells for which time-

concentration tables are desired= 4

Monitor well number= 1

I-coordinate of monitor well= 2 J-coordinate of monitor well= 5

Monitor well number= 2

I-coordinate of monitor well= 5

J-coordinate of monitor well= 5

Monitor well number= 3

I-coordinate of monitor well= 6

J-coordinate of monitor well= 5

Monitor well number= 4

I-coordinate of monitor well= &

J-coordinate of monitor well= 7

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 1000.00

J-ROW	I-COLUMN								
	1	2	3	4	5	6	7	8	
1	ହା. ହହା	ଉ. ଉପ	0.00	ଉ.ଉଉ	ଏ.ଅପ	ଉ. ଉଉ	ଡ. ଉଡ	ଉ.ଅଉ	
2	ପ.ପଠା	ଡା. ଡାଡା	Ø. ØØ	ଡ.ଡଡ	ହା. ହାହ	ଥ. ଅପ	ହ. ହୀତ	ଫ. ଅପ	
[;] 3	ଉ.ଉଉ	ଡ.ଡେଡ	ଉ. ଉଉ	ଉ.ଉପ	ଉ.ଅପ	ଡ.ଡଡ	ଡ. ଏଡ	0.00	
. 4	ପ.ପଦା	ହା.ଡୋଲ	0.10	Ø. Ø9	0.02	0. <i>0</i> 0	ସ. ହାଡ	0.00	
5	ହା.ହା:	Ø.25	1.10	Ø. 37	Ø. 17	Ø. Ø1	ଡ.ଡଡ	0.00	
೯	ଡା. ଅତା	හ.ගොඩ	Ø.10	Ø. Ø9	0.0E	0.00	∅.ಹಾ⊘	0.00	
7	ହା. ହହ	ହା. ସହ	ଡା. ଡାଡ	ଉ. ଉପ	ହା. ହାହ	ଉ.ଉପ	ହା. ହାହା	ଉ.ଅଉ	
8	ଷ.ସାଡ	ହା.ଅହା	ଅ.ଅଷ	ଉ. ଉଉ	ଅ.ଅପ	ଅ.ଫାଫ	ଫ. ଉଡ	ଅ.ଅଅ	

i 3 11	ା. ଠାଡ ପ. ଅପ	ଧ. ସହି ତ. ଉତ	ସ. ହେଉ ଉ. ଅପ	ଓ. ଅଷ ଡ. ଉଡ	ହା. ହାଲ ଉ.ଅଭ	୬. ଅଇ ଉ.ଉଦ	છ. ଥିଅ ଉ. ଅପ	ଟା. ଥିବା ହା. ହାହା
J-ROW				I-COLU	MN			
	9	10	11	12	13	14	15	i €
1	a. a e	ଅ.ଅଫ	ଡ. ଡଡ	0.00				
2	0.00	ଡ.ଡଡ	ଡ. ଅପ	ଷ. ଷଷ				
3	a. a a	ଡ. ଡାଡ	ଉ.ଅପ	Ø. ØØ				
4	0.00	ଉ.ଉଉ	ଉ. ଉପ	ଉ. ଉଉ				
5	Ø. ØØ	ଡ.ଡଡି	ଉ. ଉଉ	ଡ.ଡଡ				
6	0. 00	ଉ. ଉଉ	ଡ. ଡଡ	ଉ. ଉଉ				
7	Ø. Ø Ø	ଡ.ଅଡ	ଡ. ଫଡ	ଡ. ଫଡ				
8	Ø. ØØ	ଡା. ଅଠା	ଡ. ଡଡ	ପ. ଅପ				
Э	Ø. Ø Ø	ଡ.ଡଡ	Ø. ØØ	Ø. ØØ				
1 🖸	0.00	ଡା. ଅଫ	0.00	0.00				
1.1	0.0 0	ଅ.ଅପ	ଡ. ଡଡ	ଡ.ଡେ				

MONITOR WELL COMPUTATION RESULTS:

TIME-CONCENTRATION TABLE

MONITOR WELL NUMBER: 1

TIME(DAYS) 1000.000 CONCENTRATION (MG/L)

Ø. 25

MONITOR WELL NUMBER: 2

TIME (DAYS)

CONCENTRATION (MG/L)

1000.000

Ø. 17

MONITOR WELL NUMBER: 3

TIME(DAYS)

CONCENTRATION (MG/L)

1000.000

Ø. Ø1 ·

MONITOR WELL NUMBER: 4 /

TIME (DAYS)

CONCENTRATION (MG/L)

1ଥାସର. ଉପର

ଫ. ହାଡ

DATA BASE:

Number of simulation periods for which contaminant concentration distribution is to be calculated 1

Simulation period number= 1

Simulation period duration in days= 1200.00

Number of grid columns= 12

Number of grid rows= 11

Grid spacing in ft= 100.00

X-coordinate of upper-left grid node in ft=

0.00 0.00

Y-coordinate of upper-left grid node in ft=

Aguifer actual porosity as a decimal= 0.400

Aguifer effective porosity as a decimal #0.350

Simulation period number= 1

Adulfer thickness in ft= 90.00

Aguifer longitudinal dispersivity in ft= 30.00

Aquifer transverse dispersivity in ft= 10.00

Seepage velocity in ft/day= 0.56

Number of point sources= 1

Simulation period number= 1

Point source number 1

Y-councinste of point sounce in Tt= - ಈಬೇಟೇ ಬೇಟ Slue point source solute inject. vol. in gal= 16500.00 Slug point source solute concentration in mg/l= 950.000 Time after slug contaminant injection in days= 1200.00 Bulk density of dry aquifer skeleton in g/cu cm= 2.30 Aguifer distribution coefficient in ml/g= .23 Number of monitor wells for which timeconcentration tables are desired= 4 Monitor well number= 1 I-coordinate of monitor well= 2 J-coordinate of monitor well= 5 Monitor well number= 2 I-coordinate of monitor well= 5 J-coordinate of monitor well= 5 Monitor well number= 3 I-coordinate of monitor well= 6 J-coordinate of monitor well= 5 Monitor well number= 4 I-coordinate of monitor well= 6 J-coordinate of monitor well= 7

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 1200,00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				I-COLU	MN			
	1	2	3	4	E3	દ	7	5
1	ଅ. ଅ ଡ	ଉ.ଉଉ	ଡ. ଅପ	ଉ.ଉଉ	ଉ.ଡାଉ	ව. වඩ	0.00	0.00
ē	ଅ.ଅ ଅ	ଡା. ଅତା	ଡ.ଡଡ	ව. ඔව	ଉ. ଅଉ	0.00	ଡ.ଡଡ	ଅ. ଉଷ
3	0.0 0	ଉ.ଉଚ	ଉ.ଅପ	ଡା. ଡାଡା	ଡା. ଡାଡା	Ø. ØØ	ଡ.ଡଡ	0.00
4	0.0 0	ହା. ହାର	ଫ.ଫେଟ	0.14	ଡ. ୭୫	21. ZII	Ø. ØØ	ହ. ଉପ
5	· ପ.ପ ଡ	ଷ. ଅଞ୍ [†]	0.61	1.05	0.47	Ø. Ø6	0.00	0.00
٤	0.0 0	0.01	ଡ.ଡ8	Ø. 14	Ø. Ø£	Ø. Ø1	ଅ. ଅପ	ව. ඔම
7	ଉ.ଅପ	ଉ.ଅପ	ହ. ତହ	ଡ.ଡେଡ	0.00	Ø. ØØ	0. 00	0.00
8	Zi.Zi🛭	ପ.ପପ	ଡ.ଡଡ	Ø. ØØ	ଡ.ଡଡ	ସ. ସତ	ପ ପତ	ଡ. ହହ
Э	0.0 0	ଉ.ଉଡ	ଉ.ଅପ	ଡା. ଡାଡ	ଡ. ତତ	ଡ. ଡଡ	ଡ.ଡଡ	ଡ.ଡଡ
1 🗷	ହା.ହା ଡ	ଅ.ଅଡ	ପ. ଅପ	ତ.ତାତ	. ଡ.ଡଡ	ଡ.ଡଡ	ଉ. ଉପ	ତା. ଉତ
1.1	ଡ. ଉ ଡ	ত. তাতা	ଉ. ଉପ	ଉ. ଅପ	ଉ.ଅପ	ଡି. ଡିଡ	ଉ.ଡାଡ	0.00
J-ROW				I-COLU	MN			
	9	1 2	11	12	13	14	15	16
1	ଅ. ଅ ଥ	ସ. ସହ	ව. වැට	ତା. ତାଷ				
2	മ. മ മ	ହା. ହହ	ଡ.ଡଡ	0.00				
3	ଅ.ଅ ଅ	Ø. 1210	Ø. ØØ	ଡ.ଡଡ				
4	0.0 0	ଉ.ସହ	0.30	ପ.ଠାର				
5	0.0 0	ସ. ସହ	ଡ.ଡଡ	ଉ. ଉଉ				
€	ଉ.ଉ ଅ	ଅ.ଅସ	ପ. ତାହ	ଅ.ଅପ				
7	ଅ.ଅ ଅ	ହା. ହହ	ଉ.ଡାଉ	ଡ. ଡଡ				
â	ଉ.ଅ ଡ	ହା.ହାହା	ଅ.ଅଅ	0.00				
⋺	ଅ.ଅ ଅ	ଡା. ତାତା	ଡ.ଡଡ	ଅ.ଅପ				
10	0.00	ହା. ଅଫ	ଡ.ଡଡ	0.00				
11	Ø. Ø Ø	ହା. ହହ	ଡ.ଡଡ	ଡ. ଡଡ				

MONITOR WELL COMPUTATION RESULTS:

TIME-CONCENTRATION TABLE

MONITOR WELL NUMBER: 1

Time (DAYS) CONCENTRATION (MG/L) 1800.000

ଅ.ଡ5

MONITOR WELL NUMBER: 2

TIME (DAYS) CONCENTRATION (MG/L)

1200.000

Ø. 47

MONITOR WELL NUMBER: 3

TIME (DAYS) CONCENTRATION (MG/L)

1200.000

Ø. Ø6

MONITOR WELL NUMBER: 4

TIME (DAYS) CONCENTRATION (MG/L)

1200.000

0.00

DATA BASE:

Number of simulation periods for which contaminant concentration distribution is to be calculated 15

```
Simulation period number= 1
Simulation period duration in days= 1000.00
Simulation period duration in days= 1730.00
Simulation period duration in days= 1730.00
Simulation period duration in days= 2095.00
Simulation period duration in days= 2461.00
Simulation period duration in days= 2461.00
Simulation period duration in days= 2826.00
Simulation period duration in days= 2826.00
Simulation period duration in days= 3191.00
Simulation period duration in days= 3191.00
Simulation period duration in days= 3556.00
Simulation period duration in days= 3556.00
```

```
Elmulation benico number= 9
Simulation period duration in days= 4287.00
Simulation period number= 10
Simulation period duration in days= 4652.00
Simulation period number= 11
Simulation period duration in days= 5017.00
Simulation period number= 12
Simulation period duration in days= 5383.00
Simulation period number= 13
Simulation period duration in days= 5748.00
Simulation period number= 14
Simulation period duration in days= 6113.00
Simulation beriod number= 15
Simulation period duration in days= 6478.00
Number of grid columns= 16
Number of orid rows= 11
Grid soacing in ft=     1ଅଡି.ଅଡି
                                                 Ø. 00
X-coordinate of upper-left grid node in ft=
                                                 Ø. 22
Y-coordinate of upper-left grid mode in ft=
Aguifer actual porosity as a decimal= 0.400
Adulfer effective porosity as a decimal= 0.350
Simulation period number= 1
Aquifer thickness in ft= 90.00
Aguifer longitudinal dispersivity in ft= 30.00
Adulfer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sourcess 1
Simulation geriad number= 2
Aquifer thickness in ft= 90.00
Aquifer longitudinal dispersivity in ft=100.00
Adulfer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sources= 1
Simulation period number= 3
Aquifer thickness in ft= 90.00
Acuifer longitudinal dispersivity in ft=100.00
Acuifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sources= 1
Simulation period number= 4
Adulfer thickness in ft= 90.00
Acuifer longitudinal dispersivity in ft=100,00
Aquifer transverse dispersivity in ftm 10. এত
Seepade velocity in ft/day= 0.56
Number of point sources= 1
Simulation period number= 5
Aquifer thickness in ft= 90.00
Aquifer longitudinal dispersivity in ft=100.00
Aquifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sources= 1
Simulation period number= 6
Adulifer thickness in ft= 90.00
 Acuifer longitudinal dispersivity in ft=100.00
 Adulfer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sources= 1
 Simulation period number= 7
Adulfer thickness in ft= 90.00
 Adulfer longitudinal dispersivity in ft=100.00
Aquifer transverse dispersivity in ft= 10.ଅଷ
Seepage velocity in ft/day= 0.56
 Number of point sources= 1
 Simulation period rumber= 8
 Adultien thiakness in fite 安徽, 30
```

```
ចែកដ្ឋារូក ខាងខាងជារប្បារៈ ប្រាប់ប្រាក្សាម
                            4.2
Number of point sources= 1
Simulation beriod number= 9
Aquifer thickness in ft= 90.00
Aduifer londitudinal dispersivity in ft=100.00
Aguifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day=
                              Ø. 55
Number of point sources= 1
Simulation period number= 10
Adulfer thickness in ft= 90.00
Adulfer londitudinal dispersivity in ft=100.00
Acuifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day=
                             Q.56
Number of boint sources= 1
Simulation period number= 11
Adulfer thickness in ft= 90.00
Acquifer longitudinal dispersivity in ft=100.00
Aquifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sources= 1
Simulation period number= 12
Adulfer thickness in ft= 90,00
Aquifer longitudinal dispersivity in ft=100.00
Acuifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day=
Number of point sources= 1
Simulation beriod number= 13
Adulfer thickness in ft= ସଉ.ଡବ
Acuifer longitudinal dispersivity in ft=100.00
Adulfer transverse dispersivity in fb= 10.00
Seebage velocity in ft/day= 0.56
Number of point sources= 1
Simulation beriod number= 14
Aquifer thickness in ft= 90.00
Aquifer longitudinal dispersivity in ft=100.00
Adulfer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day= 0.56
Number of point sources= 1
Simulation period humber= 15
Adulfer thickness in ft= 90.00
Aquifer langitudinal dispersivity in ft=100.20
Aquifer transverse dispersivity in ft= 10.00
Seepage velocity in ft/day=
                              Q.56
Number of point sources= 1
Simulation beriod number= 1
Paint source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft=-400.00
Slub point source solute inject. vol. in cal= 16500.00
Slug point source solute concentration in mg/l= 950.මමම
Time after slug contaminant injection in days= 1000.00
Simulation period number= 2
Point source number 1
X-coordinate of point source in ft=
                                         0.70
Y-coordinate of point source in ft = 400.00
Slug point source solute inject. vol. in gal= 16500.ଡଡ
Slug point source solute concentration in mg/l=  950.ହେଉ
Time after slug contaminant injection in days= 1730.00
Simulation beriod number= 3
Paint source number 1
X-coordinate of point source in Tt=
                                      423.00
Y-coordinate of point source in ft=
Slug point sounce solute inject. vol. in gal= 18500.බඹ
Slug point source solute concentration in mg/1=-950.022
```

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مَمَّ الْجُمْ الْجُورِ وَرَجُورُونَ وَالْجُورُونِ وَالْجُمُونِ وَالْجُمُونِ وَالْجُمُونِ وَالْجُمُونِ وَالْجُم
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500. ඔම
Slug point source solute concentration in mg/l = -950.000
Time after $1up contaminant injection in days= 2461.00
Simulation period number= 5
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Sind point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 950.000
Time after slug contaminant injection in days= 2828.00
Simulation period number= 6
Faint source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft=-400.00
Slug point source solute inject. vol. in gal= 18500.ඔම
Slug point source solute concentration in mg/l= 950.000
Time after slug contaminant injection in days= 3191.00
Simulation period number= 7
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slup point source solute inject. vol. in pal= 18500.00
Slug point source solute concentration in mg/l= 950.000
Time after slug contaminant injection in cays= 3536.20
Simulation period number= 8
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of boint source in ft= 400.02
Slug point source solute inject. vol. in gal= 185මර, ඔව්
Slug point source solute concentration in mg/l= 550.020
Time after slug contaminant injection in days= 3922.00
Simulation period number= 9
Paint source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration.in mg/l= 950.000
Time after slug contaminant injection in days= 4887.00
Simulation period number= 10
Paint saurce number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 18500.00
Slug point source solute concentration in mg/l= 950.000
Time after slug contaminant injection in days= 4652.00
Simulation period number= 11
Paint source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slup point source solute inject. vol. in gal= 18500.00
Slug point source solute concentration in mg/l= 950.000
Time after slug contaminant injection in days= 5017.00
Simulation period number= 12
Point source number 1
X-coordinate of point source in ft=
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 185ଉଡ.ଡଡ
Slug point source solute concentration in mg/l=   ୨୭ଉ.ହେଉ
Time after slug contaminant injection in days= 5383.00
Simulation period number= 13
Paint source number 1
```

and the second of the second o

```
ಕಿಂಗಾರ್ವದರು ಮಾರುವಾರಕ ಮಾಹಿತಿ ರಾಧ್ಯವರು ಕಾರಾಚಿಕ್ರಗಳು ಅರ್ವ ಅಂತಿ ಸೇವಿ ಅಭಿಯಾಗಿಗಳು
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 950. ພັບທຸ
Time after slug contaminant injection in days= 5748.200
Simulation period number= 14
Foint source number 1
X-coordinate of point source in ft=
                                          Ø. 20
Y-coordinate of point source in ft=
                                       400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 950.000
Time after slug contaminant injection in days= 6113.70
Simulation period numbers 15
Point source number 1
X-coordinate of point source in ft=
                                         0.20
Y-coordinate of point source in ft= 400.00
Slug point source solute inject. vol. in gal= 16500.00
Slug point source solute concentration in mg/l= 930.000
Time after slug contaminant injection in days= 6478.00
Bulk density of dry addifer skeleton in g/ou on= 2.30
Adulfer distribution coefficient in ml/g= .23
Number of moritor wells for which time-
concentration tables are desired= S
Monitor well number= 1
I-coordinate of monitor well= 2
J-coordinate of monitor well= 5
Monitor well number= 2
I-coordinate of monitor well- 5
J-coordinate of monitor well= 5
Monitor well number= 3
I-coordinate of monitor well= 6
J-coordinate of monitor well= 5
Moniton well number  4
I-coordinate of monitor well= 8
U-coordinate of monitor wells 7
Monitor well number  5
I-coordinate of monitor well= 12
J-coordinate of monitor well= 5
```

SIMULATION PERIOD DURATION IN DAYS: 1000.00

J-ROW				I-COLL	MM!			
	1	2	3	4	ij	6	7	Ė
1	ପ. ଥ ଥ	ত. তত	0. ØØ	0.00	0.20	ଅ. ଅଷ	ଫ. ଅପ	ଅ. ଅଅ
2	ପ. ଉ ପ	01. 00	ହା. ଅନ୍	0.00	ଡ.ଅୟ	ව. ඔව	0.00	ର. ଉତ୍ର
3	21. 121 2	হা. হাহা	ହ. ତଥ	ଅ.ଅପ	ହା. ହାୟ	a. aa	ଅ.ଅପ	2.22
4	ଉ. ଉ ଡ	ത.തള	Ø. 10	Ø. Ø5	0.02	0.00	2.20	Ø. 22
5	ଅ.ଅ1	Ø.26	1.11	Ø.96	Ø. 17	Ø. Ø1	21.12.21	ଅ.ଅଥ
6	ସ.ସ ଥ	ଡ.ଡାଥ	0.10	0.05	0.02	ହ. ଅପ	ව. වාඩ	ହ. ଉଚ୍ଚ
7	ହା. ହା ଡା	ଅ.ଅସ	ଅ.ଅଅ	ଉ.ଅଉ	Ø. ØØ	ଅ.ଅଅ	ଅ. ଅପ	ଅ.ଅଅ
ತ	ସ. ଅ ପ	ଡା. ସହ	ହା ଅନ୍ତ	0.20	ହା. ହାହା	Q1. Q1Q1	ଉ.ଅଅ	ଅ.ଅଅ
9	ZI. ZIQ	ଡ.ଡଡ	ପ. ଅପ	ଡ. ଅପ	Ø. ØØ	0.00	21. 22.20	ହ. ହଥ
12	ହା. ହା ହା	ଡ.ଡଡ	ଡ. ଅପ .	ଡ.ଡାଡ	ଅ.ଅ.ଅ	a. aa	ଅ.ଅଅ	ହ. ଅନ
11	ପ.ପଠ	ଉ.ଉଉ	ଅ.ଅଷ	0.20	ZI. 2020	0.00	ଅ.ଅଥ	ପ. ହାଞ
J-ROW				I-COLU	MiN			
	Э	10	11	12	13	14	15	16
1	ଅ.ଅନ	ସ.ସଥ	ଅ.ଅପ	তা. হাঞ	ଉ.ଡାଉ	Ø. Ø2	ଦ.ଡାଡ	a ca
2	2.22	ଅ.ଅଅ	তে. তাতা	0.00	0.00 0.00	ଅ.ଅଫ ଅ.ଅଫ		ପ.ଡଣ
				Series Subsection			हा.हा 	ଫ. ୬ଉ

- 5 5 7 8 9 1 1 1	ି. 20 ଉ. ଫ ଡ ଉ. ଫ ଡ ଉ. ଫ ଡ ଉ. ଫ ଡ ଉ. ଡ ଉ ଉ. ଫ ଡ ଉ. ଫ ଡ	ି. ି ବ ବି. ବିହା ବି. ହେବ ବି. ହେବ ବି. ହେବ ବି. ହେବ ବି. ହେବ ବି. ହେବ	ି. ୯୬ ଅ. ୬୬ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ ଅ. ଅନ	ି. ଅନ୍ ବି. ସହ ସି. ସହ ସି. ସହ ସି. ସହ ସି. ଅନ ସି. ସହ	. ପ୍ର ଉ. ବ୍ୟ ଉ. ବ୍ୟ ଉ. ବ୍ୟ ଉ. ବ୍ୟ ବ. ବ୍ୟ ବ. ବ୍ୟ	ି. ୦୦ ବି. ସହ ବି. ହହ ବି. ହହ ବି. ହହ ବି. ଜନ	ଥ. ଓଡ଼ି ଅ.ଅଅ ଅ.ଅଅ ଅ.ଅଅ ଅ.ଅଅ ଅ.ଅଅ ଅ.ଅଅ ଅ.ଅଅ	ଧ. ଧର ବ. ଅନ ବ. ଉନ ବ. ଉନ ବ. ଅନ ବ. ଅନ ବ. ଉନ
11	ହା . ଓ ହା	ZI. ZIZI	0.00	ଅ. ଅଥ	ର. ଅପ	ଡ. ଅପ	ক. তাক	21. 20

SIMULATION PERIOD DURATION IN DAYS: 1730.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				I-CGLU	MN			
	1	2	3	4	5	٤	7	3
1	ଡ. ଡ ଡ	ହ. ଉଦ	2.20	Ø. ØØ	ଡ. ଉପ	Ø. 1212	ଡ.ଡଡ	ଅ. ଆଧ
2	ଫ. ପ ର	ତା. ଅତା	ଅ. ଅଅ	QI. QUZ	Ø. 20	ଥା. ଅପ	21. 2121	Ø1. Ø1Ø
3	ଅ.ଡାଅ	তে. তেত	ଡ.ଡାହ	ପ. ୟପ	ହ.ଉପ	ଉ.ଅନ	ପ.ଅପ	0.00
4	Ø. Ø 1	ଉ.ଉ≘	0.05	Ø. Ø8	Ø. 12	0.09	0.05	a. 33
5	21 . 2 14	0.10	Ø.21	0.33	Ø. 4Ø	0.38	Ø.25	Ø. 13
દ	Ø. Ø1	ହା. ଅଥ	Ø.Ø5	ଡ.ଡଃ	0.10	2.29	Ø. 26	2, 23
7	ଅ . ଅ ଉ	એ. এই	ହ.ହହ	ହା. ହାହା	Ø. ØØ	ହ. ଡାହ	21. 20:21	21. 73.04
3	ଅ.മଅ	ZI. ZIZI	ଡ.ଅଅ	Ø. ØØ	ଉ.ଅଉ	0.00	7.90	0.70
9	ଅ . ଅ ଅ	ଉ. ଉଉ	হা, হাহা	ଉ. ଉଉ	ତ. ହେଉ	Ø. Ø2:	ଅ.ଅଫ	21.242
1 (2)	121 . 13 13	থা. তথ	ଅ.ଅପ	ହ. ହହ	ଅ.ଅଅ	ହା. ହାୟ	Ø. 20	2.20
1.1	ଉ . ଏ ଉ	ସ. ସଥ	0. এই	ଡ.ଡାଅ	0.30	ව.වාඛ	ઇ.ટ્ટ	2.30
J-ROW				I-COLU	PEN4			
	Ŧ	10	11	12	13	1.4	15	16
1	ଅ. ଅ ଅ	ଉ. ଉତ	ଥ. ୟୟ	ହ. ହାୟ	ව. ශුව	0.02	ପ. ପ୍ର	ଉ. ଅପ
2	ହ .ଡ ା	ଡ.ଡାଡ	ଡି. ହାହ	ହା. ହହ	0.00	Ø. 200	ପ. ହସ	0.00
3	ଫ . ପ ଫ	ଡା. ଡାଡା	ଅ.ଅପ	ZI. ZIZI	ଅ.ଅପ	0.00	তা. তাত	0.00
4	0. 0 1	থা. হাহো	ହ. ହତ	ଉ.ଅସ	0.00	0.00	Ø. 20	121. (21/2)
5	0. 0 5	ଡ.ଡ≘	ව. ඔබ	21. 200	ଅ.ଅନ	0,00	0.00	ଅ. ଅପ
6	Ø. Ø 1	ଅ.ଅପ	0.00	0.00	ପ. ସହ	2.22	Z1 . (Z1:Z1	21. 200
7	ପ. ଡ ପ	ଅ.ସସ	ଫ. ଉଉ	ଅ.ଅଅ	ଉ.ଡାଇ	0.00	ZI. 2021	Q. 20
S	ପ . ହ ପ	ହା: ହହା	ଉ.ଉନ	Ø. ØØ	ପ. ଏହା	ପ. ପ୍ର	ସ. ଓଡ଼	21. (202)
Э	ପ . ହ ପ	ପ. ପାପ	೮.೩೩	ଥି. ହାଷ	8. BB	ଅ.ଜ୍ଞ	য়ে. প্ৰথ	ට. ඉහ
1 ②	ପ. ହ ପ	ସ.ଅସ	0.00	ଅ.ଅୟ	ව. ඔව	ঠা. ঠাটা	2.22	2.702
1 1	ଅ. ଡ ଥ	ଅ.ଅଥା	ହ, ହାୟ	या. यय	ଅ. ୧୪୬	0.00	ଅ.ଅଅ	ହ. ଅଷ

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 2095.00

J-ROW	I-COLUMN										
	1	Ξ	3	4	5	٤	7	පි			
1	ଫ. ଉପ	ଡ. ହଡ	ପ. ଅପ	Ø. 20	(Z) . (Z)(Z)	ହା. ହାୟ	0.00	ହ. ଅପ			
2	ଅ. ଅ ପ	ତୀ. ତାହା	ଅ.ଅପ	ଡ.ଡାଡ	ଉ. ଉଦ	ଉ.ଡାଡ	Ø. ØØ	0.00			
3	ଅ . ଅପ	ତା. ହାହା	Ø. 2021	0.22	2.22	Ø. ØØ	(21. (21/2)	ଥ.ଅପ			
4	Ø. Ø 1	a. a2	Ø. Ø4	ଡ.ଡେ	0.05	Ø. 10	Ø. 205	Ø. 27			
S	21. 0 2	ത.ത5	Ø. 11	2. E2	Ø. 29	2.33	0.30	2.21			
6	Ø. 0 1	Ø.Ø2	0.04	ଉ. ଉଚ	0.25	Ø. 10	Ø. Ø9	0.07			
7	ଉ. ଅପ	হা . । হাহা	য় . প্র	J. 23	ତ. ଅଥ	ପ. ସହ	ହା. ଅପ	Ø. 20 Ø. 20			
9	ପ. ଅପ	ୟା. ହାହା	ଉ.ଅଥ	ସ. ତହ	a.20	ଅ.ଅନ	æ. 22	a.20			
	ହା, ଅପ - - -	ଅ.ଅପ 	ଅ. ଅଅ	7.22	ପି. ଓଡ଼	2. BB	건. 경공 -	ව. මෙලි ව. මෙලි			

J-ROW				I-COLUMN				
•	Ð	10	11	12	13	14	15	16
1	ସ.ଉହ	ଉ. ଅଫ	ଉ.ଅପ	ව. ඔබ	ଉ.ଡଡ	ଡ. ଅଭ	ଅ. ଉଉ	ଉ.ଅଷ
2	ହା. ଅହା	ସ.ସତ	ଅ.ଅପ	ଅ.ଅପ	ହା. ସଥ	0.00	ଅ.ଅପ	0.00
3	ଡା. ଅତ	ଅ. ଅସ	ଉ.ଉପ	Ø. 30	0.00	ପ.ଅପ	ସ. ଉଉ	ଉ. ଉପ
ŹŢ.	Ø. Ø4	ଡ.ଡ≘	0.01	වි.වච	ତ. ତତ	ඛ. ඔබ	ଉ.ଅସ	21. 212
5	Ø.12	ସ. ଅବ	a.de	0.Q1	ଉ.ଡାଡ	ବ. ୟର	ø. তাক	0.30
٤	ZI. 214	ව.වෙත	Ø. Ø1	ଅ.ଅଅ	ହା. ଅପ	ଡ.ଡଡ	ව. ඔබ	ଡା. ଅପ
7	ଉ.ଉପ	ଉ.ଉସ	ହା. ଉତ	ପ. ସହା	ହ. ଉପ	ଉ.ଉଉ	ଉ.ଉଉ	0.02
3	ହା. ଅହା	ଅ . ହ ଥ	ଡା. ସଥ	ହ. ହାହ	ହ. ଅପ	ଅ. ଅପ	Ø. 22	0.00
9	ୟା. ୟାହା	ବ.ଅପ	ହା. ଅହା	0. BO	ଉ.ଉପ	ହା. ଉଉ	ව. ඔව	0.00
10	ହା. ହାହା	ହା. ହାହା	ହା. ହହ	ଅ.ଅଅ	ଉ.ଡାଡ	ZI. 202	2.22	21.22
1.1	ଅ.ଅଅ	ଡ.ହାଫ	ଅ.ଅଅ	ଅ.ଅପ	0.00	ଅ.ଅଅ	ହ.ଅୟ	ଅ.ଅଅ

SIMULATION PERIOD DURATION IN DAYS: 2461.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

JHROW				I-CGLU	MM			
	1	2	3	4	5	É	7	3
- - -	ହା. ହହ	0.00	2.20	ପ. ସସ	ଉ. ଉପ	ଅ. ଅଉ	2.22	a. aa
<u>a</u> 3	ව. වට	ଅ. ସେଅ	ಡ.ರಾತ	ଡା. ତାହ	୍ହ.ଅପ	ଡ.ଡାଡ	ଅ.ଅପ	Ø. Øð
3	ପ. ଅପ	ଅ. ଅପ	ହା. ଉପ	ଡା. ଅହା	ୟ. ଉତ	છા. છા	0.01	0.01
<u>4</u> .	হা. হাহা	ਹ.ਹ1	Ø.ØE	ಶ.ಶಾ	Ø.37	ই.12	Z(, 1.1	Z.39
5 3 7	ଡା.ଡାୀ	ଅ. ଅଞ	೩.೨€	2.1E	જ. 표정	ð.35	2. 35	Ø.25
ā	ව. වඩ	তি. তা	ಶ.ಫಾಟ	0.ವಾ	ଉ.ଅଟ	0.10	Z + 1.1	ক. ଅর
	ঠা. ঠাঠ	ହ. ସିହାଁ	ହା. ହାହା	ସ. ଅପ	ହା. ଉତ	A. 61	ZI. 13 1	0.01
ತ	ঠা. অংকা	হা. হাহা	ସ. ତାତା	ୟ.ଅପ	ଅ. ଅପ	ଡ.ଅପ	ಶ.ಶಾಶ	ଡା. ହାହା
8 9	ଉ. ଉଉ	ଡ. ସପ	ଥା. ଅପ	ହା. ଅପ	ପ. ଏପ	ହା. ଅପ	ଡ.ଡର	0.00
10	তা. হাতা	ଉ. ହେଉ	ଉ.ଅପ	ව. වැඩ	ଡ.ଡଡ	ହ. ହୃତ	2.22	Ø. ØØ
11	ଉ.ଉଉ	ଅ.ଉଡ	ଡ. ଡଡ	0.00	0.00	21. ØØ	0.00	ৱ. ইউ
J-ROW				I-COLU	MM			
•	Э	10	11	12	13	14	15	16
1	ଉ.ଅଉ	ଅ. ଅଅ	ପ. ଅଥ	ව. වැඩ	ଡ. ଅପ	ଡ. ଅପ	ହା. ଅପ	ଅ.ଅଅ
<u>2</u> 3	ହା, ଅହା	ଉ.ଉପ	ଉ. ଉପ	ZI. ZZ	ଡ.ଅଧ	া. এটা	য়. উঠ	0.00
3	ହା. ଅହା	ହା. ଅପ	ව. වඩ	ଏ.ଅପ	0.30	ව. වට	0.32	Ø. 39
4	Ø. Ø7	Q. Q4	0.0E	0.01	ପ. ପପ	a. aa	છો, હોાટા	ଡ.ଅପ
5	Ø.19	Ø. 11	0.0E	0.0E	2.21	ଅ.ଅପ	୍ଟ.ଅପ	ଥି.ଅପ
5 ៩	ø. Ø7	Ø.04	Ø. Ø2	Ø. Ø1	ହ. ହେତ	0.00	ଡ଼. ଉପ	ଅ.ଅପ
7	ତା. ସତା	ସ.ପସ	121. 12121	ଅ. ଅଅ	0. ØØ	ହ. ଅପ	0.00	ଉ.ଅପ
ස	ଡ. ଅଫ	ଯା. ଉପ	ଉ.ଅପ	ଅ. ଉପ	ଉ.ଉଉ	ଉ.ଉଉ	ହା. ଉପ	ଅ.ଅସ
9	ই. এই	Ø1. Ø1Ø1	ଡ. ଅପ	ଅ.ଅପ	0.00	0.00	ଅ.ଅପ	ଅ.ଅଅ
10	ଉ.ଉଡ	ଉ.ଉଉ	0.00	0.00	ସ.ସସ	2.22	ହ. ହୟ	Ø. 00
11	ଡ.ଡଡ	ଉ. ଉପ	ଉ.ଅଉ	ଉ. ଉପ	ଅ.ଅଅ	ଥ. ଅଅ	0.00	ଡ. ଅଷ
4								

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 2826.00

ブーネロ ₩	I — COLUMN								
ì	1	2	3	4	5	6	7	8	
			ଫ.ଅପ						
-	→ •, - ,	, -,	÷	. 	~ -, -,	* * *	~	· - ·	

3	S. 22	J. J2	20 July 12	Zi. Zizi	المائية المائية	24 34	Ø. Zi	
4	ଅ. ଅପ	ଅ.ଅ:	Ø. Ø:	a. a3	0.05	ā. 08	ଉ. 1ଉ	21.12
5	ાટી . છીવી	Ø. Ø1	0.03	Ø. Ø7	Ø. 13	Ø.19	0.23	∅. 24
٤	Ø. 1 20	ଉ.ଡା:	0.01	0.03	0.05	0.08	0.10	0.10
7	ଅ.ଅଫ	ঠা. ঠাঠা	ପ.ଅଫ	ପ. ହାୟ	ଡ.ଅସ	21.121	0.01	0.01
8	0.00	ହା. ହାହ	ପ. ଉପ	0.00	ସ. ସହା	0.00	ଉ.ଅଉ	0.00
9	ହ . ହାହ	ହା ଅଧାର	ପ. ଅପ	0. 20	ପ. ଉପ	0.00	0.00	0.00
10	Ø. ØØ	ପ.ପତ	ଉ.ଅପ	ଥି. ହାହା	ଡା. ଏହା	21. 212	21.00	ଉ.ଅଉ
11	ଅ.ଅଅ	ପି.ସେଧ	ଡ.ଡଡ	ଡ. ଡଡ	ଅ. ଅଷ	ଅ.ଅଅ	ତ.ଅପ	ଅ.ଅପ
J-ROW				I-COLU	MN			
	Э	1 ঐ	11	18	13	14	15	16
1	Ø. ØØ	ଉ.ସସ	ଉ. ଉଉ	ଉ. ଉଉ	ଉ. ଉଉ	a. 00	ଏ. ଏହ	a.20
2	ଅ.ଅ ଅ	ହା. ହାହା	Ø. ØØ	ଡ. ଅଷ	ପ. ସହ	0.00	ଅ.ଅଥ	ହ. ହହ
3	0.01	Ø. Ø1	Ø. ØØ	Ø. QQ	ଉ.ଅଉ	Ø. ØØ	0.00	0.00
4	Ø. Ø9	Ø. 27	0.04	Ø. Ø2	0.01	ହ.ହାହ	ହ. ହାହ	Ø. ØØ
5	0.22	Ø.16	0.12	ଉ. ଉଥ	0.02	0.01	21. 2121	ଉ.ଅଅ
ε	Ø. Ø9	Ø. 27	0.04	ହ. ହେଥ	Ø. Ø1	21.122	0.00	2.20
7	Ø. Ø1	Ø. 01	ଉ.ଉଉ	Ø. 00	ଡ.ଡଡ	0.00	ଉ.ଅଉ	ଡ.ଡାଡ
ā	ଅ. ଅ ପ	ହା. ଅହା	ହା. ହାହା	ଉ. ଉଉ	ହା. ଅପ	0.00	0.00	21. 20
9	ଅ.ଅ ଅ	ଡ.ଡଡ	ଡ.ଡଥ	0.00	ଡ. ଅହ	0.00	ଉ.ଅଉ	0.00
10	ଉ.ଅ ଅ	ଡ.ଡଡ	ව. වන	ପ. ଅପ	ଅ.ଅଅ	ହ. ହୃତ	Ø. ØØ	0.00
11	0. 00	ଉ.ଡେ	0.00	21. AZ	ଡ.ଡାଡ	ଉ.ଉଉ	0.00	0.00
NODAL	COMPUTAT	ION RESU	LTS:					
-								
SIMULA	ATION FER	IOD DURA	MI MOIT	D9Y5: 31	91.00			

J-ROW				I-COLU	MN			
	1	Œ	3	4	5	6	7	Æ
1	0.00	ଡ. ହେଉ	0.00	ଅ.ଅଅ	ଡ.ଡଡ	Ø. ØØ	0.00	0.00
2	ଉ. ଉ ଡ	ଡ.ଡାଡ	ଡ.ଡଡ	ଅ.ଅପ	ହା. ଅଷ	ଅ. ଅଭ	ଫ. ଅପ	0.20
3	0.00	ଅ.ଉପ	0.00	ଅ.ଅପ	0.00	Ø. Ø1	Ø. Ø1	0.01
4	ଅ. ଅ ପ	ଡ.ହେତ	ZI. 21	0.02	0.24	Ø. Ø5	Ø. Ø8	0.10
5	ଉ.ଡାଡ	ወ. 01	ହ. ହେଲ	0. 214	Ø. Ø8	Ø.13	Ø.18	Ø.21
€	ଅ. ଅ ପ	হা. হাহা	Ø. Ø1	Ø. Ø2 .	. 0.04	Ø. Ø6	Ø. 28	0.10
7	ଡ.ଡ ଡ	ଡ଼. ଉତ	ଉ.ଡାଡ	0.00	ଅ.ଅଉ	0.21	0.01	0.01
3	ଅ.ଅ ଅ	ହା. ସହ	ହା. ଅପ	ଅ.ଅସ	ବ. ଅସ	ପ. ସପ	වේ. ඔව	ତି, ଅପ
Ð	ଉ.ଉଡ଼	ଡା. ଏହ	ଅ.ଡାଡ	a. 20	ଉ.ଉଡ	2.20	0.00	ଉ. ଓଡ଼
10	ଉ.ଉ ଅ	ଡ.ଅପ	ଅ.ଅସ	ଥ.ଅନ	0.00	2.22	ପ.ଅପ	0.20
11	ଉ.ଅ ଡ	ହି.ହାହ	ଅ.ଅଅ	0.00	ସ. ସହ	ଡ.ଡେନ	ଫ. ଉଉ	ව.පම
J-ROW				I-COLU	MN			
	Э	10	1 1	18	13	14	15	16
1	ଅ. ଅ ପ	ଡ. ଡଡ	ଅ. ଅଭ	0.00	ପ. ସହ	0.00	ଡ. ଫଡ	Ø. 32
2	ଉ. ଉ ପ	ହା. ହାହା	তা. তাতা	0.02	ପ. ଅପ	Ø. Z02	0.00	Ø. ØØ
3	ଥା. ହାରୀ	Ø. Ø1	ଥ.ଥୀ	ହ. ହହ	ව. වැඩ	ଡ.ଡଡ	ହା ଅଧାର	ଉ. ଉଷ
4	0.10	Ø. Ø9	0.07	0.04	0.03	Ø. Ø1	0.01	ମ. ଅପ
5	Ø.2 2	Ø.19	0.15	Ø. 10	Ø. Ø5	Ø. Ø3	0.01	ଡ. ଉଷ
€.	0.1 0	ଡ.ଡ9	0.07	0.04	0.03	Ø. Ø1	0.01	ଉ.ଉଉ
7	0.01	Ø.Ø1	0.01	ଉ. ଉପ	ଡ.ଡାଡ	ହ. ହହ	0.00	ଅ. ଅପ
8	ଅ.ଅ ଡ	হা. হাহা	0.00	ଡ.ଅପ	ସ. ସହ	ଅ.ଅଅ	ଅ.ଅଉ	ଉ.ଉଉ
Э	ହା. ଥା ଡ	ହା. ତହା	ହ.ଡାହ	0.00	2.22	0.00	ଡ.ଡଡ	0.00
10	ଅ.ଥା ଅ	ପ.ଉପ	ପ.ଉପ	Ø. 20	ଉ.ଅସ	2. 2D	0.00	0.00
1.1	ଅ. ଅ ଅ	ଡ.ପଡ	ଅ. ଉଦ	ଅ.ଅୟ	ଉ.ଉଛ	ଡ.ଅଥ	ହ. ଅପ	Z. 23

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW		I-COLUMN							
	1	2	3	4	5	E	7	8	
1	ଉ. ଉଷ	ଡ. ଅପ	ଅ. ଅଅ	ଅ. ଅପ	ଅ.ଅପ	0.00	ହ. ଅପ	0.00	
2	ଉ.ଉପ	ହା.ହାହ	ହି. ହହ	0.00	Ø. ØØ	ଅ. ଅଷ	0.00	ඔ. ඔබ	
3	ଅ.ଅଅ	ହା. ଉପ	0.00	ଅ.ଉପ	0.20	0.01	0.21	Ø. Z:	
4	ଉ.ଅପ	ହା. ହହ	0.01	Ø. Ø1	0.02	0.04	2.26	ଉ.ଅଞ	
5	ଉ.ଉଉ	ଷ. ସେଷ	0.01	ඛ. ඔව	a.a5	Ø. Ø8	Ø. 18	Ø. 17	
6	ହା.ହାହା	ହା. ଉଉ	છે. છેર	Ø. Ø1	0.02	0.04	Ø.Ø6	0.08	
7	ଡ.ଡଡ	ତି. ସହ	ତ.ଥାଉ	ପ.ଅଷ	2.72	Ø. Ø1	2.21	Ø. 20	
8	୭.ଜଡ	ଉ.ସହ	Ø. ØØ	ହା. ଓଡ	ଅ.ଅସ	0.00	ଅ. ଅପ	0.00	
9	ଅ.ହାଆ	ହା. ଉତ	ଡା. ତାହା	ଡ.ଡଥ	ହା. ଅପ	ଡି. ଡିଡି	ଥା. ଅପ	Ø. 00	
10	ଉ.ଉଡା	ଅ.ସେନ	Ø. 22	ଉ.ଉପ	ଏ.ଉଉ	ହା. ହାହା	ଅ. ଅଧ	ହା. ଅନ୍	
11	21.20	ଅ.ଅଅ	ଅ.ଅଅ	ව. වඩ	ଅ. ଅସ	ZI. ZIO	ଅ. ଅପ	2.20	
J-RCW				I-CGLU	MN				
	Э	13	11	12	13	<u> </u>	13	16	
1	ව. වන	ହା. ଅଫ	ව. ශාව	ជា.៤	ଅ. ଉଚ	Ø. 20	0.00	ପ. ଅପ	
<u> </u>	ଅ.ଅପ	ହି.ସହ	ව. වුට	ହ. ଅପ	ପ. ଅପ	a. 20	ව. හැව	ଉ.ଅସ	
3	ଅ.ଅ1	ଡ.ଡା:	2.21	0.01	Ø. Ø1	ୟା. ହାହ	Ø. ØØ	21. 212	
4.	0.10	Ø. 10	ð. Ø9	Ø. Ø7	2.24	a. a3	a. @i	2.21	
5	Ø.19	Ø.19	2.17	Z.13	2.29	a. 35	a.a3	0.21	
٤	21. 121	ହି. 1 ଅ	0.05	2.27	ZI. 214	ಲಾ. ಪ3	Ø. Ø1	0.01	
7	21.21	Ø. Ø:	2.21	Z. Z1	Ø. Q1	Z. ZZ	5. DO	ଅ.ସହ	
ā	या. या या	ঠা. ঠাঠা	ට.වන	2.22	ହା: ହୃଷ	2.00	0.00	2. 22	
∌	ଉ.ଡାଡା	2 .30	Z. ØØ	ସ.ଜତ	ঠা. ঠাৰ	ହ. ୧୦	±ិ.ជាធ	2.23	
10	ಎ.ಎಎ	ଅ.ଅଅ	2.22	3.20	2.32	2.70	2.30	2.00	
er er man sån	ସ. ନହ	2. 32	2.20 2.20	2. DX	3.22	2.32	2.22	ସି.୧୬୫	

SIMULATION PERIOD DURATION IN DAYS: 3988.00

4 HEGES	0, 2014	UBAT MUBAT	C014C214114	MITCH (III	G/L/ HI	MODE2:		
J-ROW				I-COLL	lmN			
	1	2	3	4	· 5	S	7	3
- -	ଉ.ଉଉ	ହା. ଅଅ	ଡ. ଉପ	ଡ.ଚନ	ଅ.ଅୟ	ର. ଅପ	2.90	ଥା. ଅସ
2	খা. তথ	ZI. (ZI(Z)	ව. ඔබ	ଅ.ଅଅ	0.00	2.00	ଥି.ଅପ	7. DO
3	ପ.ଜାତୀ	ତା. ଉତା	ଡ.ଡାଡ	0. az	ව. ඔබ	2.00	3.01	21.241
4	ଫ. ଅପ	ହି.ଅପ	তা. তাতা	Ø. Ø1	ව. වැඩ	0.03	团。闭5	ZI. 97
5	ପ୍ରାଧ୍ୟ	ପ.ପର	0.01	0.01	0.03	Ø. Ø5	0.09	0.12
€	ହା. ହାହା	ହା.ହହ	ଡ.ଡଡ	0.01	Ø. Ø2	Ø. Ø3	0.05	Ø. 27
7	ପ.ଯପ	ଉ.ଉଉ	ହ. ତହ	ପ. ଉପ	ଉ.ଉଞ	21. 20	0.01	0.01
8	ଅ.ଅସ	ହା. ଅପ	ଅ. ଅପ	ଡ.ଡଡ	ହି. ହେନ	ହା. ଉପ	0. Z0	হা. হাই
9	ଡ.ଡଡ	ଷ. ଉତ	হা. হাহা	ത. മുമ	Ø. 20	ଅ.ଫାଡ	ଥ.ଉପ	ଅ.ଅବ
10	ଡା.ଡାଡା	ହି. ସସ	ହା. ହାହା	ව. ඔබ	ଅ. ଅପ	ଡ. ଅଷ	0.00	ଥା. ଅଥ
11	ଉ.ଉଉ	ହି.ଅଅ	Ø. 00	ପ.ପାସ	ଡ. ଅଷ	ପ.ଡାଡ	ଫ. ଉପ	ଉ.ଅଷ
J-ROW				I -COLU	MN			
	Э	1 ত	11	12	13	14	15	18
1	ଉ.ଉଉ	ବ.ଡବ	0.00	ଅ.ଅପ	0.00	ପ. ପାପ	Ø. ØØ	ଉ.ଅବ
2	ଉ.ଉବ	ହା. ଉପ	ଡ. ଉପ	ହା. ହାହ	ଏ. ଏହ	ପ. ଉପ	0.00	0.00
3	0.01	0 .01	0.21	Ø. Ø1	Ø. Ø1	Ø.Øi	0.00	ପ.ଅପ
4	ଉ. ଉଞ	ୟା. ସେୱ	ଉ.ଉନ	ଡ. ଡଃ	ଅ. ଅଧ	Ø. 04	ව.ශ්ය	0.01
5	Ø.18	Ø.17	Ø.17	Ø.15	Ø.12	മ.താട	Ø. Ø5	ଡ. ସଞ
B	ව.වෙළ	ଉ.ଅ୨	Ø. ØS	ଡ.ଜଃ	Ø. Ø8	Q. Q4	0.03	2.21
7	ଅ.ଅ:	ଅ.ସ1	0.21	Ø. 21	ଅ.ଅୀ	ଅ.ଅମ	ଅ.ଅଡ	ଅ.ଅଅ
-	-: ·		5		4.0			

Э	చె. ణంచి	Q. 20	ଅ.ଡାୟ	ଏ.ଅପ	a.20	્રાય કહેવા	2,04	8.80
1 🕫	ତି. ଅହ	ୟା. ହେତ	তা. তাতা	0.CD	2.22	ପ. ସସ	ଅ.ଅପ	ឆ. ៤២
1 1	ହ. ଉ ଡ	ତ.ଡାଡ	21. 21.Z1	ଅ.ଅଅ	ව. ඔව	ପ. ସହ	0.00	2). 2(2)

SIMULATION PERIOD DURATION IN DAYS: 4287.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				I-COLU	MN			
	1	2	3	4	5	6	7	8
1	ହା. ହ ଡ	ଉ.ଉଉ	0.00	ଡ. ଡଡ	ପ. ଅପ	ଉ.ଅପ	ଡ. ଉପ	21.1212
2	ଡ.ଅ ଅ	ଉ.ସେସ	ପ.ପପ	ଡ.ଡଡ	এ. এথ	ଥ. ଅଷ	0.00	Ø. 22
3	ଅ.ଅ ଅ	ହା. ହାତ	ପ. ଉତ	ଷ. ଅପ	ପ. ଅପ	Ø. ØØ	0.01	0.01
4	ଉ. ପ ପ	ଉ.ଉବ	ଡ.ଡାଡ	ଉ. ଉପ	0.01	0.0E	0.03	Ø. Ø5
5	ଅ. ଅ ଡ	ପ.ଥାପ	ହା. ହାହା	0.01	Ø. Ø2	0.03	Ø. ØS	a. 25
5	ଉ. ଉ ଡ	ଉ.ହାହ	ଡ.ଡଡ	৫.৫⊄	0.01	a. 02	a.a3	0.05
7	ଅ.ଥ ଡ ଼	ହା.ହାହା	ପ.ପଦ	ଡ.ଡାଡ	2.22	Ø. ØØ	Ø. Ø1	0.01
8	ଉ. ଅ ଡ	ହା . ହାହା	ହ. ଅପ	ଉ. ଉଉ	0.00	ଡ.ଡଡ	ଉ.ଅପ	ଉ.ଅଷ
9	ଏ. ଅ ଡ	ହା. ହାହ	ବ.ଡଡ	ହା. ତାହ	0.00	ପ. ଅପ	ଅ.ଅଅ	Ø. 1212
1 🗷	ଉ. ଉ ଉ	ହା.ହାହା	ଥ.ଥାଇ	ଡ଼ା. ଡାହା	ପ.ଅପ	ଥ.ହେଉ	ହ.ହହ	7.00
11	ଥ. ଅ ଡ	থৈ. থেখ	ଡ.ଡଡ	2.00	ସ.ସସ	ଡ.ଡଡ	ଡ.ଅପ	ଅ.ଅପ
J-ROW				I-COLU	MN			
	9	10	11	12	13	14	15	16
1.	ହ. ହ ହ	ହା. ହାହା	ହ.ଉଭ	ଉ.ଉଉ	ଅ. ଏହା	ପ. ପର	ଅ.ଅଅ	ଉ. ଓଡ
2	ଅ.ଅପ	ତୀ. ତାତ	ପ. ପଦ	ପ.ସଥ	ବ. ବବ	ଡ.ଡାଡା	ତ.ସମ	ଅ. ଅୟ
3	2. 01	ଉ.ଉଞ	a. 92	ව. ඔව	១.ធារ	Ø.Ø1	া. এয়	Ø:, Ø:1
4	21 . 21 7	ଅ.ଅଞ	Z. 25	2.QB	ଉ. ଉଞ	ଡ. ଡ.	Ø. Ø4	0.03
5	Ø. 1 2	Ø.15	Ø. 16	Ø.16	Ø. 14	थ.11	0.08	0.05
Đ.	ଅ.ଅ7	ଫ.ଫର	Ø. Ø9	Ø. Ø9	ଅ. ଅଞ	0.0E	Ø. Ø4	0.03
7	ଥି.ଥି1	ଡ.ଡଥ	0.02	0.02	Ø. Ø1	0.01	0.01	0.01
8	ହା. ହା ଡ	ଡ.ଡଡ	0.00	ଡ.ଡଡ	ପ. ତାହ	ପ. ଅପ	ଡ.ଡାଡା	0.00
9	ହ. ହ ଞ	ଡ.ଡଡ	ଅ.ଅପ	ପ.ଅପ	ପ. ଉହ	ଅ.ଅଅ	0.00	0.00
1 2	ସ.ସ ଡ	ପ. ପଠ	ଅ.ଅଅ	ଉ.ଅପ	ଡ. ଉତ	ଅ.ଅବ	ଅ.ଅଅ	ଡ.ଡଡ
11	ୟ. ଉ ଡ	ହି. ହାହ	ପ. ସପ	a.00	ଅ.ଉପ	ଡ. ଡହ	ଅ.ଡାଡ	ଉ.ଅନ

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 4652.00

J-ROW				I-COLU				
	1	2	3	4	5	٤	7	8
1	ଡ.ଡ ଡ	ଉ.ଉଉ	ଉ. ଉଉ	ଉ.ଉଡ	ପ. ପପ	ଉ.ଅଉ	ଉ.ଅଉ	0.00
2	ତା.ଡାଡା	ଡ.ଡାଡ	ଡ.ଡଡ	ହି. ହିଛ	ହ. ଅପ	ZI. ZIZ	ହ. ଉତ	0.00
3	ଉ.ଉଡ	ହା. ହାହା	ଉ. ଉପ	ଉ.ଉପ	0.00	ଡା. ଉତ	0.00	0.01
4	ଉ.ଉ ଡ	ତା. ହତ	ପ.ଅପ	Ø. ØØ	0.01	0.01	Ø. Ø2	Ø. 1214
5	ହ. ହ ନ	ହା. ହାହା	Ø. ØØ	ଡି.ଡିଡ	a.ai	0.02	0.04	0.26
٤	ଥ.ଅ ଥ	ଅ.ଅଅ	ଡ.ଡଡ	ଅ.ଅଭ	0.01	ZI. Ø1	0.02	0.04
7	ଡ.ଡ ଡ	ହା. ହହ	ହ. ଉତ	Ø. 00	0.00	ପ.ପଦ	0.00	0.01
ප	ହ. ହ ହ	ହା. ହାହା	ପ.ପଦ	ଡ.ଡାଡ	Ø. 122	ପ. ଉପ	0.00	21.20
Э	ସ.ସହା	ଉ.ଉଉ	ଡ.ଡଡ	ଅ.ଅସ	ହ. ଉହ	21.20	ହା. ଅଅ	0.00
1 🛭	ହା. ଅ ଞ	ପି.ପଠ	0.00	ହା. ହହ	হা. ≥াহা	ଡ.ଡେନ	ව. වට	ତ.ତଥ
11	Ø. ØØ	ଡ.ଅଉ	ହ. ଉପ	ଅ.ଅପ	ଅ.ଅଅ	ବ. ବର	ଉ.ଉଉ	ଡ. ଅଜ
J-RCW				I-COLU	MN			
	Э	1 ହା	11	13	13	14	15	16

1	ଅ. ଧହା	હો. જોટી	리. 호텔	ଧ.ଅଡ	ದ.ಕಾರ	: 일급	81. JE	2.30
3	ହା. ହାହ	ଡ଼ି. ହେତ	ଡ.ଡ୬	ଡ.ଡାଡ	ସ. ସହ	ଅ.ଅୟ	ଉ.ଉଉ	0.00
3	Ø.Ø1	0.01	മ. മുല	ଡ. ଅଅ	ව. ඔ≘	ଥି. ଅଥ	0.01	0.01
4	0.05	Ø. Ø7	ଡ.ଡଃ	Ø. Ø9	Ø. Ø9	Ø. Ø8	ത. തെട	0.04
5	ଉ.ଉ୨	0.12	0.14	0.15	0.14	Ø.13	0.10	0.07
٤	Ø. Ø5	0. 07	0.08	0.09	0.09	ଉ. ଉଞ	a. a6	0.04
7	Ø. Ø1	তা. তা৷	0.0E	Ø. Ø2	Ø. ZE	Ø. Ø2	0.01	0.01
8	ତା. ତାତା	0.00	ପ. ଏହ	0.00	ଉ.ଅପ	ପ. ଉପ	0.00	21.00
9	0.00	ଉ. ସପ	Ø. ØØ	ଉ.ଡାଉ	ସ. ସପ	0.00	ଡ. ଅନ	0.00
10	ଡ.ଅଡ	ଡ଼ା. ଅହା	ଷ. ଅପ	ଉ.ଉପ	ଉ.ଉପ	ଡ.ଡାଇ	ଥା. ଉଉ	0.00
11	ହ.ଡାଡ	ଅ.ଅସ	ଡ. ଅପ	Ø. 1210	2 22	ଅ.ଅପ	ହ. ହେନ	ଉ.ଉଡ

SIMULATION PERIOD DURATION IN DAYS: 5017.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW		I-COLUMN									
	1	2	3	4	5	6	7	8			
1	ହା. ହହ	ହା. ହହ	ව. වෙව	ଉ. ଉଷ	ଡ. ଡଡ	Ø. ØØ	ଅ. ଅଷ	ଉ.ଉପ			
2	ହା. ହାହ	ই. এই	ଡ.ଡଡ	0.00	Ø. &Ø	ପ. ଅପ	ZI. ZIZ	0.00			
3	ହା. ହାହା	ଡା. ଉତା	ଡ.ଡେଉ	ଡ.ଡଡ	ହ. ଅପ	ହା. ତହ	ତ.ଡାସ	Ø.Øi			
4	৩. হাহা	୬. ସହ	ଡ.ଡଡ	ପ.ପର	ଉ.ଡବ	0.01.	2.01	ଡ. ଡଥ			
5	টা. ঠাঠা	ଡ଼ା. ସେତା	ଡ. ଅପ	ଡ. ଅପ	Ø. Øi	0.01	Ø.ØE	0.04			
6	ହା. ଉହା	ଉ.ଅପ	ଅ.ଅପ	21. ØØ	ଡ.ଅପ	0.01	21.01	Ø. Ø2			
7	হা.হাতা	ହା. ତହ	ଡ.ଡଡ	ହା. ହାଡା	ଡ. ଡଡ	ହ. ହହ	0.00	0.01			
8	ଅ.ଅଅ	0. 00	ପ. ଅପ	ପ. ପର	ପ. ଉପ	ଉ.ଡାଅ	0.00	0.00			
∍	তে. হাত্	ව. වෙව	ଅ.ଅଭ	ව. වෙව	ହ. ଅପ	ଡ.ଡଡ	ପ. ଅପ	ଅ.ଅଫ			
10	ପ.ପଥ	অ. হাহা	ଆ.ଆସ	୬. ଅପ	21. এই	0.00	ପ.ଅପ	ଉ.ଅଉ			
1.1	ହା. ହାହା	ଡ଼ି. ଡଡ଼	ଅ.ଅପ	ଅ. ଅପ	ପ.ଅପ	অ. এক	2.22	0.00			
J-ROW				I-COLU	MN						
	9	10	11	12	13	14	15	16			
1	ହା. ଉହ	ଉ.ଅସ	0.00	ව. වෙව	0.00	ଉ. ଅଉ	0.00	ଉ.ଡାଡ			
2	01. 00	ଉ.ଡଡ	Ø. ØØ	ହ. ହେଉ	Ø. ØØ	ଉ.ଅପ	වේ. වැට	0.00			
3	ଅ.ଅୀ	0. 01	∅. ඔ⊇	0.0E	Ø. Ø2	0.0E	0.02	0.01			
4	Ø. Ø4	Ø. Ø5	Ø. Ø7	0.08	Ø. Ø9	Ø. Ø8	Ø. Ø7	0.06			
5	Ø. Ø6	Ø. Ø9	Ø. 11	Ø.13	Ø. 14	Ø.13	0.12	0.09			
E	21.214	D. 25	Ø. Ø7	ව. විසි	Ø. Ø9	Ø. Ø8	0.07	0.26			
7	0.01	0. Ø1	0.02	Ø. Ø2	0.0E	0. Œ	0.0E	0.01			
ਲ	ZI. ZIZ	ହା. ହାହା	Ø. ØØ	ଡ.ଡଡ	Ø. ØØ	ଅ. ଅପ	ପ.ଅପ	ଅ.ଅପ			
9	ପ.ଉପ	ଉ.ଉସ	ଡ.ଡଡ	ଡ.ଡଡ	Ø. 20	ଉ.ଉଉ	0.00	121.1212			
1 🖄	ଉ.ସହ	ଅ. ଅପ	ঠা. ঠাঠা	0.00	ଡ.ଡେ	Z. ZŌ	ଡ. ଅପ	ଅ.ଅପ			
11	ଉ.ଉଉ	ଫ. ପତ	ଷ. ଉଷ	0.00	ପ.ଉପ	ଉ.ଉଉ	ଡ. ଉପ	ଅ.ଅପ			

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 5383.00

J-ROW				I-COLU	MN			
	1	٤	3	4	5	E	7	8
1	ତ.ହେ	0. 20	Ø. ØØ	ଡ. ଡଡ	ସ. ଉପ	0.00	0.00	0.00
≘:	ଅ.ଅଅ	ଡ. ସସ	ଡ. ଅପ	ଉ.ଉପ	ହ. ତତ	2. 2 2	ଏ.ସଥ	(Z). (Z)(Z)
3	ହା. ହାହା	ଉ.ଉନ	ଉ.ଅପ	ଉ.ଡଡ	ଅ.ଅଅ	Ø. ØØ	Ø. ØØ	0.00
4	ଅ.ଅପ	ହା. ହାହା	ଡ.ଡଡ	Ø. ØØ ·	ଡ.ଡଡ	Ø. 00	Ø. Ø1	Ø. Ø2
5	ଡ.ଡଡ	0. ଅପ	ହା. ହାହା	ଡା. ଡାଡା	ଡ.ଡାର	0.01	છા. છાદ	Ø.Ø3
	তা. তাক	0. 22	ই. কেক	ଫ.ସହ	බ.හන	ZI. (21/2)	Ø. Øi	ସ. ଫେଲ

ä	u. 2a	వే. వెప	2.22	10 a 2	0.44	<u> 3. 3</u> 9	4. 44	2,23
Э	ଥି.ଅଫ	ಎ.ಫರ	ଅ.ଅଅ	্য়. সূত্	ସ. ଅପ	21. 212	ଡ.ଡଡ	Ø. 30
10	ଡ.ଅଫ	ଡ ଼ ଅଫ	থ. ঠাঠ	ପା. ହାହା	ଡ.ଡଡ	ଡ. ଓଡ	ଅ.ଅପ	ଡ.ଅପ
11	ଡ.ଡଡ	ଉ.ଉଡ	তা. তাত	ଉ. ତହ	ପ. ଅପ	ZI. ZIZI	ଅ.ଅପ	ଉ.ଉଡ
J-ROW	,			I-COLU	MN			
	Э	10	1 1	18	13	14	15	16
1	ପ.ଅଫ	ଡ. ଡାଡ	ଅ. ଅପ	ව. වැඩ	ବ. ସହ	ଅ. ଅପ	ව. ඔව	ଡ.ଡେଉ
ء	ପ.ପଠ	Q1. (21/21	ହା. ହାହା	ଅ.ଅପ	ଉ.ଅପ	2.20	ଉ.ଫାପ	(21 . (21 /2)
 3	ଉ.ଡା:	0.01	Ø. Ø1	0.02	ହା. ହାଥ	ව. ඔඩ	회. 최근	ত. হাভ
4	Ø. Ø3	Ø. Ø4	ଉ.ଉ∈	Ø. Ø7	ଉ.ଜଞ	ଉ.ଉଞ	ଉ.ଉଞ	Ø. Ø7
5	0.04	ଡା. ଅଟ	Ø. Ø9	0.11	Ø.12	Ø.13	Ø.12	0.11
5	0.03	0.04	0.06	Ø. Ø7	ଉ.ଅଞ	ଷ. ଷଣ	Ø. Ø8	0.07
7	0.01	Ø. Ø1	0.01	∅. ඔ⊇	Ø. ØE	Ø. Ø2	Ø.Ø2	Ø. Ø2
8	0.0 0	ହ. ହହ	ଅ.ଅପ	ପ. ସପ	ଅ.ଅପ	তা. তাথা	ଅ. ଅପ	ଉ.ଫର
9	ଅ.ଅଫ	ହା. ହହ	তা. তাতা	ଉ.ଅପ	ଉ. ଅପ	ହ. ହେଉ	ଡ.ଫଡ	ଡା. ତାତା
1 🖸	2.20	ହା. ହାହା	0.00	ଡ.ଡାଡ	ପ. ଉପ	ଉ.ଉଉ	ପ.ପପ	ଡ.ଡଡ
1 1	21. 20 3	ଅ.ଅଅ	ପ. ହାପ	ଉ. ଉପ	ପ. ସହ	ପ. ଅପ	ত. হাঠ	ପ. ସହ

SIMULATION PERIOD DURATION IN DAYS: 5748.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW								
	1	2	3	4	5	٤	7	8
1	മ. മമ	ই. কেকো	তা. তাহা	ව. වුව	ହ. ଅପ	ଡ. ଅପ	ହ. ହାହ	ସ. ସସ
2	ହା. ହା ଡ	ପ.ଅପ	ঠা। টাই	ଫ.ସହା	ଅ.ଅପା	া. তাকী	71. QQ	ୟ. ଅପ
3	ହ. ଅ ଫ	ଥା. ଅପ	ଡା. ଓଡା	া. তাত	ଡ.ଡାଡ	ପ. ଅପ	ଡ.ଅପ	ହା. ଅହା
4	ପ.ସ ଡ	তা. তাতা	ଡ.ଡଡ	ଅ.ଅଡ	0.00	ହା. ୟସ	Ø.Ø1	0.01
5	Ø. ØØ	ହା.ହାହା	ଡ.ଡଡ	ପ. ଉପ	ପ. ତାହ	ପ. ପପ	Ø.Øi	ଡ.ଡାଥ
E	ଅ.ଅ ଅ	ଡ.ଡଡ	ଡ. ତାତ	ଅ.ଅପ	a. 00	ଉ.ଉଉ	0.01	Ø. Ø1
7	0.0 0	ଅ.ଅପ	ଡ.ଡଡ	ଅ.ଅପ	ପ- ଅପ	ହ.ଅବ	ଅ.ଅପ	এ. াটাই
8	0.0 0	ଡା. ଡାଡା	ଅ.ଅପ	ଉ.ଅପ	ଉ.ଉଉ	ଅ.ଅଅ	ଉ.ଅପ	া. এত
Э	0.0 0	ହା. ଅହା	ଉ.ଉପ	ଡ.ଡଡ	ଥି. ଅପ	ଅ.ଅପ	Ø. ØØ'	খ. ঐথ
10	ସ.ସ ହ	ଉ.ଉଉ	0.00	ହା. ତାହା	ଡ. ଫଡ	ଉ. ଉପ	ଉ.ଉଉ	ଉ.ଉଷ
1 1	ଫ. ଅ ପ	ଡ.ଡଡ	ଡ. ଫଡ	ව. වැඩ	ଉ.ଉପ	ଉ. ଅପ	ত. তত	ଅ.ଅପ
J-ROW				I-COLU	MM			
	9 .	10	11	12	13	14	15	18
1	0.00	ଡ. ହେଉ	ଡ. ଫର	ଡ. ଡଡ	ଡ. ଉପ	ଡା. ଉପ	ସ. ସସ	0.00
2	മ.മ മ	ହା. ହହ	ව. ඔම	0.00	ଡ.ଅଡ	ଅ. ଅପ	ଅ.ଅପ	ඛ. ඔම
3	0.01	a. 01	Ø. Ø1	0.02	0.0E	0.0E	Ø. Ø2	0. BZ
4	a.a2	ಥ.ಥಾತ	Ø. Ø4	Ø.Ø6	Ø. Ø7	Ø. ØS	ଡ.ଡେ୫	ଡ.ଡଃ
5	0.0 3	0.04	0.0E	Ø. Ø9	ଡ. 10	Ø. 12	Ø.12	0.11
€	ଡ.ଡ2	ଡା. ଡାଞ	0.04	Ø. Ø6	Ø. Ø7	ଡ.ଅଞ	ଅ.ଅବ	Ø. Ø8
7	Ø. Ø1	0.01	0.01	0.02	0. QE	Ø. Ø2	0.0E	ଡ.ଫଅ
8	ହା. ହା ଡ଼	ତା. ତାତ	ଉ. ଉଅ	ହା. ହାହ	ଡା. ଅପ	Ø. 00	ඔ. ඔහ	ଡ.ଡାଡ
Ð	0.0 0	ଉ.ଅପ	ଉ. ଉପ	া. তাত	ଅ.ଅପ	ଉ.ଉଉ	ଡ.ଡଡ	ଉ.ଉଷ
1 🗷	ପ.ପ ପ	ଅ.ଡାଡା	ଡ.ଡଡ	ଅ. ଅଷ	ଡ. ଫଡ	Ø. ØØ	ව.වෙව	a. aa
11	0.0 0	ଉ.ଉଡ	ଡ.ଡଡ	ଡ.ଡେ	0.00	ଡ. ଡଡ	ହ. ଅପ	ଅ.ଅପ

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 6113.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW I-DOLLINA

1	ଉ. ଅପ	Ø. 22	ଉ.ଅପ	ଉ.ወଉ	তা . তাতা	ଅ. ଅପ	ଉ.ଉଷ	ឌា.២ឆ
2	ଅ.ଅଭ	ଫା. ଅପ	ପ. ସହ	ଉ.ଡାଡା	ପ. ଅପ	0.00	ପ.ଉପ	ଡ.ଡଡ
3	ପ.ପଠ	୭.୭୭	ପ. ଉପ	ଉ.ଅଉ	ହ. ଅପ	Ø. ØØ	ପ.ପତା	ଅ.ଅଅ
4	ଡ.ଡଡ	ଡା.ଡେଡ	ପ. ପପ	ଡ.ଡଡ	ଅ. ଅହା	ପ. ତତ	ଡ.ଡଡ	Ø. Ø1
5	ସ.ସସ	ଫ.ସେସ	ଡ.ଅଫ	হা. হাই	ଉ.ଉଉ	ଅ.ଅପ	0.01	0.01
Ē	তা. তাতা	ହା. ଅପ	ହ. ଅହ	ଅ.ଅପ	তা. তাতা	ଉ.ଅପ	ହା. ହାହା	0.01
7	ଉ.ଉଉ	ହା. ହୋଡା	21. 2121	ଉ. ଉପ	ଉ.ଅପ	ZI. 12121	ୟ ଅପ	0.00
8	ଡ. ସଥ	ଅ. ଅପ	ହା. ହାହା	ପ.ଯହା	ପ. ପଠ	ଉ.ଅଭ	ଅ.ଅପ	ପ. ଅପ
9	ଉ.ଅଉ	ହା. ହହ	ଉ. ଉପ	ଉ.ଅପ	ଉ.ଅସ	ව.ලාව	a. 22	ସ.ସସ
12	ଅ.ଅସ	ପ.ପପ	ව. ඔව	থা. ঠাথা	ହା. ହାତ	ପ. ୟପ	ହା.ଅପ	ହ. ହହ
11	ଉ. ଉଉ	ଉ. ଉପ	ඛ. ඔබ	ଏ. ଉଷ	ଏ. ଏଏ	ଉ. ଉପ	ଡ. ଅଧ	ଅ.ଅପ
J-ROW				I-COLU	IMN			
	Э	10	11	12	13	14	15	1 €
<u>1</u>	ଅ.ଅପ	ଉ.ଉଡ	ଅ.ଅଅ	ଥା. ଅପ	ସ. ଅପ	0.00	ଡ. ଡଡ	ପ. ଅପ
2	ହା. ହାହ	ସ.ସସ	ଡ. ସହ	ව. ඔබ	ଉ.ଅପ	য়ে. ঠাঠা	া. তাতা	ହା. ଅପ
3	হা. হাহা	3. 01	a. &i .	Ø. Ø1	ව. ඔඩ	0.0E	0.02	ව.වෙඩ
4	0.01	0. 02	Ø.Ø3	0.04	0.0E	0.07	Ø.Ø7	0.08
5	ව. වෙත	ത.താട	Ø. Ø5	Ø. Ø7	Ø. Ø8	Ø. 10	0.11	Ø. 11
6	0.01	0. 02	മ. മാട	0.04	Ø. Ø6	Ø. Ø7	Ø.Ø7	ଉ.ଅଞ
7	০. তাতা	0. 01	0.01	0.01	0.02	ଡ. ଅଥ	Ø. ØE	ව.වෙළි
8	ଡ.ଡଠ	ୟା. ୟାଠା	ଡା. ଡାଡା	ବ.ଡାଡ	ব. কাক	0.00	ଡ. ଅପ	ଉ. ଅଷ
Э	ଡା. ଡାଡା	ହା- ହାହ	ହ.ସହ	ହ. ଫଡ଼	ପ. ଅପ	a. aa	Z. ZZ	0.00
10	ଡା.ଜାନ	🗷. ଉପ	ଅ.ଅପ	ই.ইই	ଡା. ଫାଡା	0.00	ସ. ସହ	0.00
11	ଯା. ଉପ	ଫା. ସହ	∅. ැව	ଡି. ଅପି	হা. হাহা	ଡା. ଅପ	0.00	ଅ. ଅପ

ธาพบบลราดท period duration in days: 6478. ชช

J-ROW				I-COLU	MN			
2 / 2 / 1	1	2	3	4	5	€	7	8
1	ଅ.ଫାଡା	ଡ. ଉପ	ଡ.ଡଡ	ଅ.ଅପ	তা. তাত	ପ. ଅପ	ଉ. ଅପ	ଡ.ଡେଡ
; = :	ପ. ପାଠ	0.ପର	হা. হাঠা	ଉ.ଉଉ	Ø. ØØ	া. এতা	খ. অত	ଓ.ଅଣ
9 3	ଅ.ଅଅ	ବ.ଡଡ	হা. হাহা	ପ. ସହ	ପ. ସହା	ව. ඵච	ଡ.ଡଡ	ଡା. ଅପ
4	ಡ.ಫಾರಾ	ଉ.ଅଭ	ପ. ଉପ	থা. ঐথো	ଉ.ଉଉ	ଉ.ଅପ	ଉ.ଅଉ	ହା.ହାହା
5	ପ. ସହ	ହା. ଅପ	ୟ. ଅଂପ	হা. হাটো	ହା. ତହା	ଡି.ସିଡ	ଅ.ଅପ	Ø. ØI
5	ଅ.ସାସ	0.ଉପ	ହା. ଆଧ	12. 201	হা. হাতা	හ.වෙව	ଅ.ଅପ	ସ.ଅପ
7	ଡ଼. ଅପ	ହା. ହୋହା	হা. যাহা	ହ. ଅବ	ව. වැව	ව. ලැබ	ଅ.ଅପ	ଡ.ଅପ
g	ଉ.ଉଉ	0. ଏହ	তা. হাতা	হা. হাহা	ඛ. වැඩ	ହା. ହାହା	ව. නව	0.00
9	ହା. ଅପ	0. ଅପ	তা. তাতা	ପ. ଅପ	ව.වැට	12 . IZ1IZ1	ଉ. ହାହ	ଅ.ଅଅ
10	ଅ.ଅଅ	ହା. ହାହା	া. ইংঠা	ৱ. কাক	ଉ.ଉପ	ଅ.ଅଅ	ର.ଡାଠ	ଅ.ଅଅ
11	ଥା. ଅପ	ଅ. ଅଅ	ହା. ଦହା	তা. তাতা	তা. তাতা	ଡ. ଅପ	ପ- ସହ	ଅ.ଅପ
JHROW				I-COLU	MN			
	Э	10	11	12	1 3	14	15	16
<u>1</u>	0.00	Ø. ହାହ	থ. কক	ଡ. ଏହ	୭.୭୭	0.00	ଉ.ଉପ	0.20
2	ପ. ତାସ	ଡା. ଡାଡା	থ. থাং	ଅ.ଅପ	ପ. ଅପ	ଡ.ଡବ	ଉ.ଉପ	ହ. ହହ
3	হা. হাহা	ତ୍ର ବର	0.01	ପ.ପ:	0.01	Ø.ØE	ව. ඔට	Ø. Ø2
4	Ø. Ø1	0. Ø1	Ø. Ø2	Ø. Ø3	0.05	ଡ.ଡ=	Ø. Ø7	Ø.Ø7
5	ଷ.ଡା:	හැ. හි≘	ହା. ହାଞ	Ø. Ø5	0.27	ଉ.ଅଞ	0.10	Ø.11
ಕ	21.21	Ø. 01	Ø. ØZ	Ø. Ø3	ଡ. ସ୍	Ø. ØS	a. a 7	0.07
7	ଡା. ଡାଡା	🗷. ସେପ	Ø. Ø1	0.01	0.01	0.0E	ල.ලුද	Ø. Ø2
8	ଡା. ହାହା	ଥ . ଅଫ	ව.වෙව	ව. නැහ	ହା. ହାହା	ଡା. ଡାଡା	ଉ.ଉଡ	তা. তাও
9	ଷ. ସମ	ଉ.ଉଉ	ව.වාච	ଥା. ଏହା	ව.ඉව	তা. তাত	ଉ.ଅସ	ଡ.ଡେଡ
1 2)	ଅ.ଅସ	ৱ. ঠোক	ପ. ତପ	হা. যথ	হা . হাহা	ଅ. ଅଅ	তা. তাতা	ଅ.ଅପ
11	න. වන	ଉ.ଅଛ	হা. তাক	থ. কেন	ଅ.ଅପ	ଅ. ଅଅ	ଡ. ଡଡ	ଉ.ଅଉ

```
MONITOR WELL COMPUTATION RESULTS:
TIME-CONCENTRATION TABLE
MONITOR WELL NUMBER: 1
                  CONCENTRATION (MG/L)
TIME (DAYS)
                           Ø.28
1000.000
 1730.000
                           Ø. 10
                           Ø. Ø5
 2095.000
                           Ø. Ø3
 2461.000
                           0.01
 2826.000
                           Ø. Ø1
 3191.000
                           Ø. 00
 3556.000
                           Ø. 00
 3922.000
                           তা. তাতা
 4287.000
                           ଡା. ଡାଡ
 4652.000
                           0.00
 5017.000
                           ାୟ . ହାହା
 5383.000
                           0.00
 5748.000
                           থা. থাথ
 6113.000
 6478.000
                            Ø. 00
MONITOR WELL NUMBER: 2
                   CONCENTRATION (MG/L)
TIME (DAYS)
                            Ø.17
 1ପ୍ଟର.ପ୍ରସ
 1730.200
                            10.43
 2055.000
                            图, 29
 2461.000
                            Ø.ET
                            2.13
 2826.000
                            W. 78
 3191.000
                            W. 05
 3556,000
                           Ø. Ø3
 3922.000
                           Ø. Ø2
 4287.000
                           0.01
 4652.000
 5017.000
                           0.01
                           Ø. Ø0
 5383.000
                           0.00
 5748.000
```

Ø. ØØ 6113.000 21. QQ 5478.000

MONITOR WELL NUMBER: 3

TIME (DAYS) 1000.000 1730.000 295.000 2461.000 2826.000 3191.000 3556.000 4287.000	CONCENTRATION (MG/L) 0.01 0.36 0.33 2.26 0.19 0.19 0.05 0.05
· ·	
5383. ଉଉଷ 5748. ଉଉଉ 6113. ଉଉଷ	ଅ.ଡା1 ଅ.ହାଥ ଅ.ହାୟ
6478.ଅଡିଡି	ଫ. ଫ୯

MONITOR WELL NUMBER: 4

-- va - 5175 FINERWINDS TO THE MERCEN

3. 20
ক. এই
Q. Qi
Q. Q1
0.01
0.01
වැ. වෙව
3.20
ව. වෙව
ଉ.ଉଡ
0.00
2.22
ପ. ପ୍ର
0.00

MONITOR WELL NUMBER: 5

TIME (DAYS)	CONCENTRATION (MG/L)
1ପ୍ରତ. ପ୍ରତ	ଡ ଼ ହେବ
1730.000	ର.ହାଡ
2095. 000	Ø. Øi
2461.QQQ	Ø. Ø2
2826. ଉଉଉ	Ø. Ø6
3191.000	2.10
3556.000	Ø. 13
3922. 000	Ø. 15
4287. ଅପତ	Ø. 16
4652.ØØØ	Ø. 15
5017.000	Ø. 13
5383. തതത	2.11
5748.000	Ø. Ø9
6113.ସହସ	2.27
8478.භූතිව	4. 45

Assistan transverse dispersivity in ⊤t≕ iಲೇ.ಭ∂ Seepage velo**ci**ty in ft/dav= - 2.56 Number of point sources= 1 Simulation period number= 2 Adulfer thickness in ft= 90.00 Aquifer longitudinal dispersivity in ft=เพช. ขด Acuifer transverse dispersivity in ft= 10.00 Seepape velocity in ft/dav= 0.56 Number of point sources= 1 Simulation period number= 3 Acuifer thickness in ft≔ 90.00 Aquifer longitudinal dispersivity in ft=100.00 Aquifer transverse dispersivity in ft= 10.00 Seepage velocity in ft/day= Ø. 56 Number of point sources= 1 Simulation period number= 4 Adulifer thickness in ft= 90.00 Aduifer long ${f it}$ udinal dispersivity in ${f ft}$ =100.00 Acuifer transverse dispersivity in ft= 10.00 Seepage velocity in ft/day= Ø.58 Number of point sources= 1 Simulation period number= 1 Point source number 1 X-coordinate of point source in ft= 0.00 Y-coordinate of point source in ft= 400.00 Slug point source solute inject. vol. in gal= 16500.00 Blug point source solute concentration in mg/l= 950.000 Time after slug contaminant injection in days= 6844. ØØ Simulation period number= 2 Point source number 1 X-coordinate of point source in ft= Y-coordinate of point source in ft= 400.00 Slug point source solute inject. vol. in gal= 15500.00 Slug point source solute concentration in mg/l= 950.000 Time after slug contaminant injection in days= 7209.00 Simulation period number= 3 Point source number 1 X-coordinate of point source in ft= Y-coordinate of point source in ft= 400.00 Slug point source solute inject. vol. in pal= 16500.00 Slug point source solute concentration in mg/l= 950.000 Time after slug contaminant injection in days= 7574.20 Simulation period number= 4 Point source number 1 X-coordinate of point source in ft= Y-coordinate of point source in ft= 400.00 Slug point source solute inject. vol. in gal= 16500.00 Slug point source solute concentration in mo/l= 950.000 Time after slug contaminant injection in days= 7939.00 Bulk density of dry acuifer skeleton in g/cu cm= 2.30 Aquifer distribution coefficient in ml/g= .23 Number of monitor wells for which timeconcentration tables are desired= 1 Monitor well number= 1 I-coordinate **o**f monitor well= 12 J-coordinate of monitor well= 5 NODAL CEMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 6844.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-46W

1	ହା. ହହ	ଡ. ସହା	ଅ. ଏହ	ଅ.ଅଫ	ଅ.ଅସ	ବ. ଉପ	ଡ.ଡଡ	া. তাতা
2	ଅ. ଅସ	21 . 2020	ଡ.ଡଡ	ଅ.ଅହା	ଡ. ଡହ	ତ.ଉତ	ହା. ହାହା	ଉ.ସହ
3	ଉ.ଉଉ	ୟ. ଅପ	ଡ.ଡଡ	ହ. ଉତ	ଅ. ସହ	ঠা. ইছী	ଡ.ଡଡ	তা. তাতা
4	ଅ. ଅସ	0. 2121	ପ.ପଦ	Ø. 200	ପ. ସପ	ତା. ତତ	ଅ.ଅପ	ହ. ହହ
5	ହା. ଉତ	ଫି.ପଠ	তে. তেত	ପ. ତାତ	ଡ.ଡଡ	Ø. ØØ	ଅ.ଅଅ	া. তাতা
5	ଡ.ଉଡ	ଉ.ଅବ	Ø. ØØ	ପ.ଯତ	ପ. ହେବ	ଡା. ଉପ	ଡ.ଡଡ	তা. তাতা
7	ପ.ପପ	Ø.ଉପ	Ø. ØØ	ପା. ହାହ	ව. වෙව	21. 22	Ø. 202	2. ZIZ
e	ଉ.ଉଉ	🕢. ହାହ	21. 2 0 2	ව. ඔහ	ଉ. ଉଉ	ଅ.ଅପ	ଅ.ଅପ	ଡା. ଅଥ
9	ଉ.ଉଉ	ହା. ଉତ	টা. তাক	ହା. ଅପ	ଡ.ଡଡ	ଅ.ଅପ	ව.ඵව	খ. হাত
10	ଡ଼ା. ଉପ	ଡ. ଅପ	27. ZUZ	ଅ.ଅପ	හ. හැන	খা. খাহা	(Z) . (Z) (Z)	ල. වුව
11	ଥ. ହାତ	0. ଉଉ	ହା. ଅହା	তা. তাতা	ହା. ଅତ	ସ. ୟସ	ଅ. ଅସ	এ. এএ
JROW				I-COLU	MN			
•	9	10	11	12	13	14	15	16
1	ସ.ସସ	ග. ඔබ	ହା. ଅଫ	ତ. ଅପ	ଉ. ଉପ	ହା. ଅପ	ଉ.ଉଉ	ଡ. ଅପ
≘	ହା. ଉହ	0. 20	ଡ.ଡଡ	তা। তথ	ଡା. ଅପ	ৱ. কাফা	ପ.ଡାପ	ହା. ହାହା
3	හු. ඔබ	ଫ. ଅପ	0.01	ZI. Zī1	Ø. Ø1	ව. වඩ	ව.වැඩ	ව. වඩ
4	0.01	0.01	ଉ.ଉଥ	Ø. Ø2	മ.താട	0.05	0.0E	Ø.Ø7
5	0.01	Ø. Ø1	Ø. Ø2	Ø.Ø3	Ø. Ø5	Ø. Ø7	ଫ. ଫର	ଉ.ଅ9
5	0.01	0. 01	ව. වැඩ	Ø. Ø2	Ø. Ø3	Ø. Ø5	ଡ.ଡାଲ	₡.₡७
7	ଡ. ସେଷ	ହା. ଉପ	ଡ.ଡୀ	0.01	0.01	Ø. Ø2	여. 경근	Ø. Ø2
8	ସ.ସସ	ହା. ହାହା	তা. তাক	তে.তাত	ହ. ଅପ	তা. তাতা	ସ. ସପ	ୟ. ଫୟ
9	ଡା. ଡାଡା	ଡ. ଉଡ	0. QQ	ହ. ହହ	ହା. ହାହା	2.22	ସ.ସହ	ପ. ସହ
12	ଡ. ଡାଡା	🗷. ସେସ	Ø. <i>ত</i>	তা. তাতা	ଉ.ଅପ	0.00	তে. তেই	ଏ. ଅଧ
1.1	ଉ.ଡାଡ	ହା. ଅଧ	ଅ.ଅଡ	Ø. 22	ତା. ତାହ	ହା. ଉହ	তা. তাটা	ව. වඩ

NCDAL COMPUT**a**tion Results:

SIMULATION PERIOD DURATION IN DAYS: 7209.00

				I-COLUMN						
J-ROW	i	2	3	4	5	٤	7	3		
1	ଉ.ସସ	ଡ. ସସ	ව. ඵව	ଅ.ସଦ	ସ. ସପ	ඛ. ඛුඛ	ଫ. ଅପ	ଡ. ଅଷ		
ė	ଅ.ଅସ	ହା. ହହ	ହା. ହହା	ପ.ପସ	ව. වෙව	ଉ.ଉପ	তা. তথ	ତ.ସହ		
3	Ø. ØØ	ହା. ଅହା	Ø. ØØ	ଡ.ଡଡ	ପ. ପପ	Zা. হাহা	ଅ.ଅପ	ପ. ଅପ		
4	ଉ.ଉପ	ଉ.ସେଅ	া. উটা	হা. কথা	ව. ඔව	াটে. এটো	ୟ. ତହା	ହା. ହାହା		
5	ୟ, ଅପ	ହା. ହାହା	ପ.ଅପ	ଅ.ସେଅ	ଡ.ସହ	Ø. 202	ହା. ହହ	ড়া. ঐপূ		
<u>s</u>	ଡ. ସଥ	ହା.ସହା	ହା. ହହା	(Z) . (Z)(Z)	ල. වැඩ	ව.වට	2.00	তা. কাম		
- 7	2.22	ହା. ଅପ	তা. তাতা	121. 1212	ହ. ହେହ	ව.වාච	ହା. ତହା	ଅ.ଅଅ		
S	ଉ.ଉଉ	ହା. ଉପ	ଡ.ଡଡ	ଅ.ଅପ	ଉ.ଅସ	ଡ.ହେଉ	ତା. ତତ	া. কেক		
9	ଅ.ଅଅ	ହା. ସଥ	ଉ.ଅନ	ହା. ଅଂସ	ହା. ହାହ	0. তাত	ଅ.ଅଅ	ହା. ଅପ		
10	a.aa	ত. হাত	0.00	01. 00	ଡ.ଡେଡ	থা. ঠা থ া	ହା. ହାହ	হো. তাহো		
1 1	ଅ. ଉପ	ହା. ଅପ	ଅ.ଅଅ	ଡ. ଅପ	এ. ফাফা	ଅ. ଅପ	তা. তাতা	· ଅ.ଅଅ		
J-ROW				I-COLU	MN					
0 1,27	Э	10	11	12	13	14	15	16		
4	ව.වඩ	ହା. ହାହା	ወ. ወወ	ଡ.ଡଡ	ପ. ହାହା	0.00	Ø1. Ø21	ଅ.ଅପ		
Ē	Ø. ØØ	ହା. ହହ	ଡ. ଫଡ	ට. ඔහ	ପ. ସହ	ව. ඵාව	ତା. ସହ	ଉ.ଅପ		
3	ଅ.ଅଫ	ହା. ହୋଇ	ହା. ହାହ	0.01	0.01	0.01	Ø.Ø2	ව.ඵට		
4	ହ. ହଥା	ଡା. ଡାୀ	Ø. Ø1	ව. ඔඔ	മ.താട	0.04	Ø. 25	ଡ.ଫର		
5	ଡ. ହାର	Ø. Ø1	0.02	බ. ඔව	Ø. Ø4	0.05	a.a7	ଡ. ଅଞ		
É	ଅ.ଅଫ	Ø. Ø1	ଡ. ଡୀ	Ø. Ø2	Ø.Ø3	Ø. Ø4	ଅ. ଅପ	Ø.Ø6		
7	ଉ.ସଉ	ଉ.ଉଉ	ଉ.ଉଦ	Ø. Ø1	0.01	0.01	Ø.ØE	ව.ඵට		
౭	ହା. ସହା	ଉ.ଅଭ	ହା. ତହ	হা. হাতা	ହା. ଫଟ	ଡ. ଅପ	য়ে. কাহা	ତ. ତହ		
æ	മ.മമ	മ. ଉପ	ହା . ହାହା	ହା , ହାହା	ହା. ଅଥ	121. 121121	ତା. ଉତ୍ତ	৩. কথ		
1/2	ସ.ସ ାଆ	ହା.ଅବ	হা. ফাফা	ଡ.ଫଅ	ට. තිබ	건. 경건	ଅ. ତାହ	ତ. ସେପ		
1.1	ହା. ହା ଥ ା	থ. থাখ	0. এএ	ସ.ଅମ	୍ତ. ଉପ	ଅ.ଅପ	টা. টাঠো	ର. ଅସ		

ma ha lauremus moleus kamuu jad

SIMULATION PERIOD DURATION IN DAYS: 7574.00

VALUES OF CONTAMINANT CONCENTRATION (MG/L) AT NODES:

J-ROW				I-COLL	IMN			
-	1	2	3	4	5	6	7	8
1	0.00	ଡା. ଉହ	ତ. ହେତ	ଡ.ଡଡ	Ø.00	ଅ. ଉଥ	ହ. ପ୍ର	2.22
೭	ପ. ଅପ	ଡି.ପଡି	ଫ. ଅପ	0.00	ଉ.ଅଉ	0.20	ଡ. ଅଅ	0.00
. 3	ପ. ପପ	ଡ.ଡେ	Ø. ØØ	ହା- ହାହ	ପ. ପଦ	Ø. ØØ	0.00	0.00
4.	ଥ. ଅପ	ଡି.ଡେଡ	ଡ.ଡଣ	0.00	ଅ.ଅଅ	ଡ. ହେଉ	ଅ.ଅପ	0.00
· 5	0.00	0.00	ଡି. ହେବ	0.100	ଅ.ଅଅ	0.00	0.00 0.00	ହ. ଅବ ହ
£	0.00	ପି.ଅଫ	0.20	0.00	0.20	ଡ.ଡଡ	ଅ.ଅଥ	ଅ.ଅଅ
7	ଉ. ଉଡ଼	ପ.ଅପ	ଡ.ଡଡ	ପ.ପ୍ର	ହା. ହାହା	ଉ. ଉଉ	ହି. ହିଅ	2.00 2.00
8	ଡି.ଡିଡ	ଡ.ଡଡ	ଏକ ପ୍ର	ଡି.ସଡ	ଡା. ହାଡା	0.00	ହି. ହିଡ	ଅ.ଅଅ
9	ଡ.ଡଡ	ଅ.ଅପ	ଡା. ଏହ	0.00	ପ. ପଠ	0.00	Ø. ØØ	ଅ.ଅଅ ଅ.ଅଅ
- 10	ଡ.ସଡ	Ø. ØØ	Ø. ØØ	ଡ.ଅପ	ଉ.ଉଉ	0.00	Ø. ØØ	Ø. ØØ
11	ଡ.ଅହ	ଡି.ହୌଡ	ପ. ପ୍ର	ଉ. ଉଡ	ପ. ଅପ	0.00	ଅ. ହହ	0.00
J-ROW				I-COLU	MN			
	Э	10	11	12	13	14	15	16
1	ଅ. ଅହା	0.00	ଡ. ସଡ	ଅ.ଅଅ	ଅ.ଅଅ	ଅ.ଅଅ	ଡ. ଅଧ	ଉ. ଉପ
2	Ø. ØØ	ଡ.ଡଡ	0.00	a.aa	ଉ.ଉଡ	0.00	ହା । ହେହ	ହ-ହେତ ହ-ହାହ
3	ଉ.ଅପ	ପ.ଉପ	ଡା.ଡାଡା	ପ.ସେଅ	0.01	0.01	0.01	0.02
4	ପ.ପର	Ø. 20	Ø. Ø1	0.01	a.02	0.03	0.04	0.05
্ 5	ଅ.ଅଅ	0.01	Ø. Ø1	ව. ඔට	Ø. Ø3	Ø. Ø4	0.05	Ø. 27
6	ଡ.ଅପ	ଥା. ଅଫ	ଷ- ଷୀ	0.01	0.02	0.03	21.24	2.25
7	ସ.ହାତ	ଡା. ଡାଡା	ଫ.ଅପ	ପ. ସମ	0.01	0.01	0.01	Ø. Ø2
3	ଡ.ଡେଡ	Ø.00	ଉ.ଅସ	ହି. ହେହ	ଅ. ଅଅ	ই. ইন্টো	ව.මන	ଅ.ଅଅ
9	ଅ. ସେପ	ଅ.ଅଅ	ହା. ଉପ	ତି. ତିଥି	ଅ.ଅଅ	0.00	0.20	0.00
10	ଅ.ଅଫ	ହ. ଉପ	වැ.වෙව	ଅ.ଅଅ	ZI. (2)(2)	2.02	Ø. ØØ	2.00
1.1	ZI - ZIZI	ପ.ଅପ	ହା. ହେଅ	ଅ. ଅଅ	ଅ. ଅଥ	ଉ. ସଥ	ଡ. ଅଷ	0.00

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 7939.00

8
a. @a
ZI. ZIZ:
7. 20
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1.00
 0.22
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2 2 2

5 7 8 9 10 11	7. 23 2. 22 2. 22 3. 22 9. 22 9. 22 9. 22	3. 32 3. 33 3. 39 3. 39 3. 39 3. 29 3. 29	2. 25 2. 21 2. 22 2. 22 2. 22 2. 24 2. 24	2. 21 2. 21 2. 22 2. 22 2. 22 2. 22 2. 22	ର. ଅଞ୍ଚ ଅ. ଅ: ଅ. ଅ: ଅ. ଅପ ଅ. ଅପ ଅ. ଅପ ଅ. ଅପ ଅ. ଅପ	7. 23 2. 22 2. 21 2. 22 2. 22 2. 22 3. 23	2,24 2,25 2,21 2,20 2,20 2,22 2,22	ଅ. ଅଥ ଅ. ଅଥ ଅ. ଅଥ ଅ. ଉଉ ଅ. ଉଉ ଅ. ଅଉ ଅ. ଉଉ
	WELL C		ON RESUL	.T9:			•	
MONITOR TIME (DR 5844. 0 7209. 0 7574. 0 7939. 0 8305. 0 8670. 0	28 188 188 188 160 170		NTRATION 0.03 0.03 0.03 0.01 0.01 .0.01	I(MG/L)		· .		

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Appendix F

Modified HRS Scoring Sheets

Facility name: Town of Machias Gravel Pit
Location: Very Road, Town of Machias, Cattaraugus County
EPA Region:
Person(s) in charge of the facility: Town of Machias
Machias Gravel Pit Name of Reviewer Steering Committee Date: 3 April 1991
General description of the facility: (For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the
facility; contamination route of major concern; types of information needed for rating; agency action, etc.)
The Town of Machias gravel pit is an active sand and gravel quarre
located on Very Road in the Town of Machias. Approximately 600
55-gallon drums of wastes including epoxy resins, acids, cutting
oils, and flammable and non-flammable liquids generated by the
Motorola Corporation of Arcade, New York, were transported to the
Machias Gravel Pit. About one half of the drums were dumped or h
leaked onto the ground surface prior to being hauled off site.
Analyses of groundwater samples collected from monitoring well has somes: S _M = 3.86(S _{gw} = 22.37 S _{sw} = 8.62 S _a = 0) detected volatile organic
SFE = Not scored contamination.
S_{DC} = 12.50

FIGURE 1 - HRS COVER SHEET

	Ground Water Route Work Shee	t			
Rating Factor	Assigned Value (Circle One)	Multi- piler	Score	Max. Score	Ref. (Section)
Observed Releas	0 (45)	1	45	45	3.1
	e is given a score of 45, proceed to line 4. e is given a score of 0, proceed to line 2.			•	
Route Characteris Depth to Aquife Concern		2		6	3.2
Net Precipitation Permeability of t Unsaturated Zo	he 0 1 2 3	1		3 3	
Physical State	0 1 2 3	1		3	
	Total Route Characteristics Score			15	
3 Containment	0 1 2 3	1		3	3.3
Waste Characterist Toxicity/Persiste Hazardous Waste Quantity	nce 0 3 8 9(12)15 18	1 1	12	1 8 8	3.4
	Total Waste Characteristics Score		15_	28	
5 Targets Ground Water Us Distance to Neare Well/Population Served		3 -	9 1 0	3 40	3.5
	Total Targets Score		19	49	
	uitiply 1 x 4 x 5 itiply 2 x 3 x 4 x 5			57,330	
Divide line 6 by	57,330 and multiply by 100 S	gw =	22.37	7	

FIGURE 2
GROUND WATER ROUTE WORK SHEET

	S	s²
Groundwater Route Score (Sgw)	22.37	500.42
Surface Water Route Score (S _{SW})	8.62	74.30
Air Route Score (Sa)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		574.72
$\sqrt{s_{gw}^2 + s_{sw}^2 + s_a^2}$		23.97
$\sqrt{s_{gw}^2 + s_{sw}^2 + s_a^2} / 1.73 = s_M -$		13.86

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Appendix G
Site Characterization Fact Sheet

	1.	SITE IDENTIFICATION -
		a. NAME: Machias Gravel Pit b. I.D.NO.: 905013 c. LOCATION-TOWN/CITY: Machias d. COUNTY: Cattaraugus e. REGION: 9
;	2.	SITE CLASSIFICATION -
		FEDERAL SUPERFUND: D PRP SITE: X
,	3.	PROJECT MANAGER - SECTION CHIEF/RHWRE -
		a. Name: Gerald Pietraszek Martin Doster b. Regional Office: Buffalo c. Telephone: 716/847-4585
L	4.	GENERAL SITE CHARACTERISTICS (2)(3) -
		a. Description of Area (4): Gravel Pit b. Area (acres): 20 Acres c. Site Topography: Rolling Hills d. Adjacent Waterbody Within One-Half Mile: Ischua Creek Yes X Distance from the site: 1500 Feet No e. Adjacent Wetlands Within One-Half Mile: Bird Swamp Yes X Distance from the site: 2000 Feet No f. Source of Water Supply: Local residences get water from upper aquifer g. Distance To Nearest Residential Area: 1000 Feet
((1) (2) (3)	The SCFS must be updated by the Project Manager to incorporate new data as the data becomes available.

5. GEOLOGY -

a. Soil in Overburden: Type: Sand and gravel with interlayered silt Thickness: Approximately 90 Feet Permeability: 1.3×10^{-4} ft/sec b. Depth of Contaminant Migration: + 75 Feet c. Depth to Water Table: 60-15 Feet d. Depth to Bedrock: Approximately 90 Feet e. Range of Permeability of Bedrock: Estimate for shale 10^{-9} to 10^{-3} ft/sec f. Depth to Clay Layer: N/A g. Permeability of Clay Layer: N/A 6. PHYSICAL CHARACTERISTICS OF WASTE -Non-Aqueous Not Applicable - Source removed Phase Liquid Soil (gal) (cu yd) a. Waste Volume of contaminated area b. BTU/1b c. Viscosity (units) d. Ash Content (%) e. Density (q/cc or lbs/cu ft) 7. BIOLOGICAL NUTRIENTS INFORMATION (ppm) - Not applicable Range a. Total Ammonia b. Total Nitrogen c. Organic Nitrogen d. Nitrate Nitrogen e. Total BOD f. Total Phosphorus g. Total Organic Carbon h. Total Suspended Solids i. Total Volatile Suspended Solids

(5) Total number of data points for the stated parameter.

j. Dissolv**e**d O**xy**gen______

(6) Specify whether groundwater, surface water, etc.

k. Total COD

8. CHEMICAL ANALYSIS - LIQUID MEDIUM Aqueous Phase (5) Range Pts (5) Range Pts (5) Range Pts (5)
Range Pts(5) Range Pts(5)
nange
<u>High Low High Low</u>
a. TVOC (ppm,%) Not Applicable
b. TSVOC (ppm,%)
c. Total Metals (ppm,%)
d. Total Pesticides (ppm,%)
e. PCBs (ppm,%)
f. Dioxins (ppb)
g. Total P henols (ppm, %)
h. Cyanid e s (pp m)
i. Total S ulf ur (%)
j. Total C hlorine (%)
A. AQUEOUS PHASE (6) Groundwater
A. Address Times
Major Volatile Semivolatile Heavy
Mak-1-
00/10/07/07/07
<u> High Low High Low High Low</u>
(1) First: TCE
Conc (ppb, p pm, %) 720 ppb ND 9
(2) Second:
Conc (ppb, ppm, %)390ppb ND 9
(3) Third:
Conc (ppb, ppm,%) 60ppb ND 9
ND - Not Detected
B. NON-AQUEOUS PHASE Not Applicable - no evidence of non-aqueous phase on
B. HOR Addeds Times
Major Volatile Semivolatile Heavy
M Lala
Construction
Range Pts Range Pts Range Pts
<u> High Low High Low</u>
(1) First:
Conc (ppb,ppm,%)
(2) Second:
Conc (ppb, p pm,%)
(a) This.d.
(3) Inira:

9. CHEMICAL ANALYSIS - SOLID MEDIUM(7) Soil

	Rang	<u>e</u>	Pts ⁽⁵⁾
a. TVOC (ppm,%)	<u>High</u> .318 ppm 7.810 ppm*	<u>Low</u> 100 100	10
b. TSVOC (ppm,%)	7.810 pm*	ND	10
c. Total Metals (ppm,%)	.622 ppm	.015 ppm	10
d. Total Pe st icides (p p m,%)	N/A		
e. PCBs (ppm,%)	N/A		
f. Diox in s (p pb)	N/A		
g. Cyan id es (ppb)	N/A		
h. Total Phenols (ppm,%)	N/A		10
i. Total Sulfur (%)	N/A		
j. Total Chlorine (%)	N/A		

	Constit ue nt <u>s</u>		0	rgani	<u>cs</u>		Organi	<u>cs</u>		Metals	
			Rang	e	Pts	Rai	nge	Pts	Ran	ige	Pts
	•	<u>Hig</u>	<u>1</u> h	Low		<u>High</u>	Low		High	Low	
(1)	First: TCE										
	Conc (ppb,ppm,%)_	291	ppb	ND		<u></u>					
(2)	Second:										
` ′	Conc (ppb,ppm,%)	27	ppb	ND							
(3)	Third:										
(0)	Conc (ppb,ppm,%)_	<u></u>				 			608 ppb	13.6 ppb	10

Volatile

Semivolatile

Heavy

- 10. PUBLIC HEALTH CONCERNS Potential ground water recepter identified as cabin well approx. 450 feet north of Cole residence.
- 11. HISTORY OF FIRES AND EXPLOSIONS No
- 12. OTHER INFORMATION -

Majo**r**

- (7) Specify whether soil, sediment, etc.
- *Polyaromatic hydrocarbons detected in two test pit fill/soil samples which included pieces of asphalt.

13. LISTING OF TECHNOLOGIES BY WASTE CATEGORY PROPOSED OR CONSIDERED TO DATE -

<u>Groundwater</u>	<u>Soil</u>	<u>Sediment</u>
Air Stripping Carbon Absorption Biodegradation Steam Stripping	N/A	N/A

14.	BACKGROUND LEVELS	<u>A</u> Soil	<u>B</u> Sediment	<u>C</u> Groundwater	<u>D</u> Surface
	a. LISTING OF CONTAMINANTS AND THEIR CLEANUP LEVELS WHICH HAVE BEEN PROPOSED BY PRP's, CONSULTANTS, OR THE USEPA.	#5503-01 (ppm)	(mpm)	GW01-01 (ppb)	Water (ppb)
	(1) Trichloroethene	BDL*	N/A	BDL*	N/A
	(2) 1,1,1-Trichloroethane	BDL*	N/A	BDL*	N/A
	(3)				
15.	(4) *Below Detection Limit, CLEANUP LEVELS	N/A=not ay A Soil	pplicable <u>B</u> Sediment	<u>C</u> Groundwater	<u>D</u> Surface Water
	a. LISTING OF CONTAMINANTS AND THEIR CLEANUP LEVELS WHICH HAVE BEEN PROPOSED BY PRP's, CONSULTANTS, OR THE USEPA.	(ppm)	(ppm)	(ppb)	(ppb)
	(1) Trichloroethene	N/A	N/A	0.005 mg	/l N/A
	(2) 1,1,1-Trichloroethane	N/A	N/A	0.005 mg	/1 N/A
	(3)				

(3)

(4) N/A=Not Applicable

- b. LISTING OF CONTAMINANTS FOR WHICH CLEANUP LEVELS ARE REQUESTED FROM THE TECHNOLOGY SECTION.
 - (1) None
 - (2)
 - (3)
 - (4)

Appendix H
Geotechnical Results

EPA SAMPLE NO.

MGGW0101 Name: VERSAR INC Contract: Lab Code: VERSAR Case No.: 4101 SAS No.: SDG No.: 3-6 Lab Sample ID: 40531 Matrix: (soil/water) WATER_ Sample wt/vol: 1020 (g/mL) ML Lab File ID: W1601____ Date Received: 12/17/90 Level: (low/med) LOW___ Moisture: not dec. _____ dec. ____ Date Extracted: 12/18/90 Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 01/18/91 GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.00 CONCENTRATION UNITS: Q COMPOUND (ug/L or ug/Kg) UG/L CAS NO. 10 U 91-20-3-----Naphthalene U 208-96-8-----Acenaphthylene_ 10 83-32-9-----Acenaphthene 10 10 U 86-73-7----Fluorene U 10 *85-01-8-----Phenanthrene 10 U 120-12-7-----Anthracene 10 U 206-44-0-----Fluoranthene 10 129-00-0-----Pyrene 56-55-3----Benzo(a)anthracene____ 10 U 10 U 218-01-9-----Chrysene 10 U 205-99-2----Benzo(b) fluoranthene 10 Ŭ 207-08-9----Benzo(k) fluoranthene U 10 50-32-8-----Benzo(a)pyrene 193-39-5----Indeno(1,2,3-cd)pyrene__ 10 U

Total Phenols

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EPA SAMPLE NO.

Code: <u>VERSAR</u> Case No.: 4101 SAS	No.: SDG N	o.: <u>3-6</u>
rix: (soil/water) WATER	Lab Sample ID:	40529
ple wt/vol: 1040 (g/mL) ML	Lab File ID:	W1592
vel: (low/med) LOW	Date Received:	12/17/90
Moisture: not dec dec	Date Extracted:	12/18/90
craction: (SepF/Cont/Sonc) CONT	Date Analyzed:	01/17/91
C Cleanup: (Y/N) N pH:	Dilution Factor:	1.0
CAS NO. COMPOUND (ONCENTRATION UNITS:	Q
91-20-3Naphthalene	,	
JI 20 J Naprichatere	\	.ס ע
208-96-8Acenaphthylene	1	.ס טו
208-96-8Acenaphthylene 83-32-9Acenaphthene	1	.0 U
208-96-8Acenaphthylene 83-32-9Acenaphthene 86-73-7Fluorene	1	.0 U .0 U
208-96-8Acenaphthylene 83-32-9Acenaphthene 86-73-7Fluorene 85-01-8Phenanthrene	1 1	.0 U .0 U .0 U
208-96-8Acenaphthylene 83-32-9Acenaphthene 86-73-7Fluorene 85-01-8Phenanthrene 120-12-7Anthracene	1 1	.0 U .0 U .0 U .0 U
208-96-8Acenaphthylene 83-32-9Acenaphthene 86-73-7Fluorene 85-01-8Phenanthrene 120-12-7Anthracene 206-44-0Fluoranthene		.0 U .0.0
208-96-8		.0 U .0. U .
208-96-8Acenaphthylene 83-32-9Acenaphthene 86-73-7Fluorene 85-01-8Phenanthrene 120-12-7Anthracene 206-44-0Fluoranthene 129-00-0		.0 U .00 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0
208-96-8		0 U 0.
208-96-8	1 1 1 1 1 1 1 1	U 0.0.0 U 0.0.
208-96-8	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 U U O O O O O O O O O O O O O O O O O
208-96-8Acenaphthylene 83-32-9Acenaphthene 86-73-7Fluorene 85-01-8Phenanthrene 120-12-7Anthracene 206-44-0Fluoranthene 129-00-0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 U U U U O O O O O O O O O O O O O O O
208-96-8	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 U U U U U U U U U U U U U U U U U U U
208-96-8	le le la cene	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

FORM I SV-2

1/87 Rev.

EPA SAMPLE NO.

		MGGW	70501
Name: VERSAR INC Contract	C:		
no Code: VERSAR Case No.: 4101 SAS No	.: SDG	No.: 3	3-6
trix: (soil/water) WATER	Lab Sample ID:	40393	}
ample wt/vol: 1060 (g/mL) ML	Lab File ID:	<u>W1588</u>	3
vel: (low/med) <u>LOW</u>	Date Received:	12/17	7/90
Moisture: not decdec	Date Extracted:	12/18	<u>3/90</u>
traction: (SepF/Cont/Sonc) CONT	Date Analyzed:	01/1	7/91
C Cleanup: (Y/N) N pH:	Dilution Factor	: 1.00	0
* * * * * * * * * * * * * * * * * * * *	ENTRATION UNITS:	-	Q
91-20-3Naphthalene 208-96-8Acenaphthylene 83-32-9	e	999999999999	ממשממממממממממ

EPA SAMPLE NO.

	MG	GWO	601	
_				

Name: <u>VERSAR INC</u> Contract:		
ab Code: <u>VERSAR</u> Case No.: 4101 SAS No.:	SDG N	No.: <u>3-6</u>
trix: (soil/water) WATER	Lab Sample ID:	40342
	Lab File ID:	W1586
ample wt/vol: 1020 (g/mL) ML	Date Received:	12/15/90
Evel: (low/med) <u>low</u>		
Moisture: not dec dec	Date Extracted:	12/18/90
xtraction: (SepF/Cont/Sonc) CONT	Date Analyzed:	
C Cleanup: (Y/N) N pH:	Dilution Factor	: 1.00
CONCE	NTRATION UNITS: or ug/Kg) UG/L	
91-20-3Naphthalene 208-96-8		10 U U U U U U U U U U U U U U U U U U U

50-32-8-----Benzo(a)pyrene_

193-39-5----Indeno(1,2,3-cd)pyrene____

53-70-3-----Dibenz(a,h)anthracene____

191-24-2----Benzo(g,h,i)perylene____

EPA SAMPLE NO.

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act:		MG	GW0701
No.:	SDG	No.:	3-6

Name: <u>VERSAR INC</u> Contr Lab Code: VERSAR Case No.: 4101 SAS Lab Sample ID: 40343 ftrix: (soil/water) WATER Lab File ID: W1587 Sample wt/vol: 970 (g/mL) ML Date Received: 12/15/90 (low/med) LOW___ Date Extracted: 12/18/90 %_Moisture: not dec. ____ dec. ___ Date Analyzed: 01/17/91 traction: (SepF/Cont/Sonc) CONT Dilution Factor: 1.00 C Cleanup: (Y/N) N pH: ____ CONCENTRATION UNITS: Q (ug/L or ug/Kg) UG/L COMPOUND CAS NO. U 10 91-20-3----Naphthalene_ U 10 208-96-8-----Acenaphthylene 10 U 83-32-9-----Acenaphthene U 10 86-73-7----Fluorene_ 10 U 85-01-8-----Phenanthrene 10 U 120-12-7-----Anthracene___ U 10 206-44-0----Fluoranthene 10 IJ 129-00-0----Pyrene 10 U 56-55-3----Benzo(a) anthracene 10 U 218-01-9-----Chrysene_ 10 U 205-99-2----Benzo(b) fluoranthene 10 U 207-08-9----Benzo(k) fluoranthene

Total Phenols

) Name: <u>VERSAR INC</u>	Contract:	MGGW0801	
Lab Code: <u>VERSAR</u> Case No.: 4101	_ SAS No.:	SDG No.: 3-6	
Matrix: (soil/water) WATER_	Lab Sample	ID: 40528	-
Sample wt/vol: 1060 (g/mL)	ML Lab File I	D: <u>W1591</u>	
Level: (low/med) LOW	Date Recei	ved: <u>12/17/90</u>	
% Moisture: not dec dec.	Date Extra	cted: <u>12/18/90</u>	
Extraction: (SepF/Cont/Sonc)	CONT Date Analy	zed: <u>01/17/91</u>	
PC Cleanup: (Y/N) N pH:	Dilution F	actor: <u>1.00</u>	
CAS NO. COMPOUND	CONCENTRATION UN (ug/L or ug/Kg)		
91-20-3Naphthalene 208-96-8Acenaphthyle 83-32-9Acenaphthene 86-73-7Fluorene	pracene pranthene pranthene ene ene ene ene ene enthracene	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	5

EPA SAMPLE NO.

) Name: <u>VERSAR INC</u> Contract	t:	MGGW0901
Lab Code: VERSAR Case No.: 4101 SAS No	.: SDG No	o.: <u>3-6</u>
Matrix: (soil/water) WATER_	Lab Sample ID: 4	0530
Sample wt/vol: 970 (g/mL) ML	Lab File ID: <u>W</u>	71600
evel: (low/med) <u>LOW</u>	Date Received: 1	2/17/90
% Moisture: not dec dec	Date Extracted: 1	2/18/90
Extraction: (SepF/Cont/Sonc) CONT	Date Analyzed: <u>(</u>	01/18/91
PC Cleanup: (Y/N) N pH:	Dilution Factor:	1.00
CAS NO. COMPOUND (ug/	ENTRATION UNITS: L or ug/Kg) <u>UG/L</u>	Q
91-20-3Naphthalene 208-96-8		ם ע ע ע ע ע ע ע ע ע ע ע ע ע ע ע ע ע ע ע

Total Phenols

10 U

EPA SAMPLE NO.

) Name: <u>VERSAR INC</u> Contrac	ct:MGSB0101
ab Code: <u>VERSAR</u> Case No.: 4101 SAS No.	sDG No.: 3-6
(atrix: (soil/water) SOIL	Lab Sample ID: 40127
Sample wt/vol: 30.0 (g/mL) G	Lab File ID: W1584
evel: (low/med) <u>LOW</u>	Date Received: 12/13/90
Moisture: not dec dec	Date Extracted: 12/18/90
extraction: (SepF/Cont/Sonc) SONC	Date Analyzed: 01/17/91
GPC Cleanup: (Y/N) N pH: 8.2	Dilution Factor: 1.00
	CENTRATION UNITS: /L or ug/Kg) UG/KG Q
91-20-3Naphthalene 208-96-8	460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U 460 U

APPENDIX B: TICS

1E VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

TRIP-BLANK

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121908

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121908

Date Received: 12/17/90

Level: (low/med)

Date Analyzed: 12/20/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found:

CAS NUMBER

% Moisture: not dec.

EST. CONC. RTCOMPOUND NAME

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

MGGW01-01

EPA SAMPLE NO.

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121907

Sample wt/vol:

5.0 (g/mL) ML

Lab File ID:

121907

Level: (low/med)

Date Received: 12/17/90

% Moisture: not dec.

Date Analyzed: 12/20/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found: 0

RT

EST. CONC. COMPOUND NAME CAS NUMBER

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

MGGW03D-01

EPA SAMPLE NO.

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121905

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121905

Level: (low/med)

Date Received: 12/17/90

% Moisture: not dec.

Date Analyzed: 12/19/90

Column (pack/cap) CAP

Dilution Factor: 1.0

Number TICs found: 1

CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q =====
76-13 -1	, 1, 2-TRICHLOROTRIFLUOROETHAN	10.43	20	J
 				l ———

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGGW05-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121903

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121903DD

Level: (low/med)

Date Received: 12/17/90

% Moisture: not dec.

Date Analyzed: 12/19/90

Column (pack/cap) CAP

Dilution Factor: 5.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found: 0

RTEST. CONC. COMPOUND NAME CAS NUMBER _____ =======

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

MGGW06-01

SDG No.:

EPA SAMPLE NO.

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.: Lab Sample ID: 90121902

Matrix: (soil/water) WATER Lab File ID:

Sample wt/vol: 5.0 (g/mL) ML Date Received: 12/15/90 Level: (low/med)

Date Analyzed: 12/19/90 % Moisture: not dec.

Dilution Factor: 1.0 Column (pack/cap) CAP

CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/L Number TICs found: 1

CAS NUMBER	COMPOUND NAME	RT ====================================	EST. CONC.	Q ===== J	
76-13 -1	1,1,2-TRICHLOROTRIFLUOROETHAN			l	

1E VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGGW07-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121901

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: 121901

Date Received: 12/15/90

Level: (low/med)

Date Analyzed: 12/19/90

Column (pack/cap) CAP

% Moisture: not dec.

Dilution Factor: 1.0

CONCENTRATION UNITS:

Number TICs found: 0

(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q =====	
		l		·——·	

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

MGGW08-01

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 90121904

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID:

121904

Date Received: 12/17/90

Level: (low/med)

Date Analyzed: 12/19/90

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found: 0

% Moisture: not dec.

1	- 1		ļ			·	
CAS NUMBE	R	COMPOUND	NAME	RT	EST.	CONC.	Q
=======================================					**====	======	
					l		

VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

MGGW09-01

EPA SAMPLE NO.

Lab Name: MD. SPECTRAL SERVICES, INC. Contract: CTRL-4117

Lab Code: MSS Case No.: VR4117 SAS No.:

SDG No.:

Lab Sample ID: 90121906

Matrix: (soil/water) WATER

Lab File ID: 121906

Sample wt/vol: 5.0 (g/mL) ML

Date Received: 12/17/90

Level: (low/med)

Date Analyzed: 12/19/90

% Moisture: not dec.

Column (pack/cap) CAP

Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

Number TICs found: 0

-	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q =====
					ll

Region II Organic Dala Valido

ATTACHMENT 1 SOP NO. HW-6

PAGE / OF/2

TOTAL REVIEW

	CI	LP DATA ASSESSMEN	T
	Functional Guidelines	s for Evaluating	Organics Analysis
Case	No. 41/7 SDG No.		Y mss (wa) site Motorola
DATA	A ASSESSMENT:	Versar	(BNA)
	The current functional have been applied.	guidelines (1988)) for evaluating organic
have (unu mate	e been qualified with ausable),or "JN" (presu	. "J" (estimated), mptive evidence f	pt those analytes which "U" (non-detects), "R" for the presence of the ion is detailed on the
flag due no i valu reli mind OC t	y means that the associto significant QC probinformation as to whether should not appearied upon, even as a ladisthat no compound tests, is guaranteed rease confidence in designations.	ated value is unu lems the analysis ner the compound on data tables ast resort. The concentration, ev- to be accurate.	users. First, the "R" sable: In other words, is invalid and provides is present or not. "R" because they cannot be second fact to keep in en if it has passed all Strict QC serves to be potentially contains
Revi Sign	iewer's nature: <u>for m zimm</u>	euman Dat	e: <u>2/7</u> /19 <i>9</i> /
	ified By:		:/19

DATA ASSESSMENT:

1. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detects (sample quantitation limits) will be flagged as estimated, "J", or unusable, "R", if the holding times are grossly exceeded.

The following action was taken in the samples and analytes shown due to excessive holding time.

All holding times were met

DATA ASSESSMENT:

2. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip field, rinse and water blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field blanks measure cross-contamination of samples during field operations. If the concentration of the analyte is less than 5 times the blank contaminant level (10 times for the common contaminants), the analytes are qualified as non-detects, "U". The following analytes in the samples shown were qualified with "U" for these reasons:

A) Method blank contamination

none

B) Field or rinse blank contamination ("water blanks" or "distilled water blanks" are validated like any other sample)

Not applicable

C) Trip blank contamination

none

DATA ASSESSMENT:

3. MASS SPECTROMETER TUNING: All quality criteria were met

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds, and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organics is bromofluorobenzene (BFB) and for semi-volatiles is decafluorotriphenyl- phosphine (DFTPP).

If the mass calibration is in error, all associated data will be classified as unusable, "R".

DATA ASSESSMENT:

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) RESPONSE FACTOR:

The response factor measures the instrument's response to specific chemical compounds. The response factor for the Target Compound List (TCL) must be ≥ 0.05 in both the initial and continuing calibrations. A value < 0.05 indicates a serious detection and quantitation problem (poor sensitivity). Analytes detected in the sample will be qualified as estimated, "J". All non-detects for that compound will be rejected ("R").

All response factors were > 0.05

DATA ASSESSMENT:

5. CALIBRATION:

A) PERCENT RELATIVE STANDARD DEVIATION (%RSD) AND PERCENT DIFFERENCE (%D):

Percent RSD is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent D compares the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be <30% and %D must be <25%. A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J" and non-detects are flagged "UJ" (if %D or RSD >50%). If there is a gross deviation of %RSD and %D, the non-detects may be rejected ("R").

For the PCB/PESTICIDE fraction, %RSD for aldrin, endrin, DDT, and dibutylchlorendate must not exceed 10%. Percent D must be within 15% on the quantitation column and 20% on the confirmation column.

The following quality criteria were not met

See attached Form 7As, insert after pp. 12213 of Checklist

1) Calibration Date: 12/19/90

· Vinyl acetate 10 D= 30,0

, 4-methyl-d-pentanono 10 D= 30,0

· 2 - hexanone 10 A= 34.9

2) Calibration Date: 12/20/90

· 2-hexanone io D= 27.9 · 4-methyl-d-pentanone io D= 25.3

- Ho action taken because no positive results were reported

DATA ASSESSMENT:

6. SURROGATES:

All samples are spiked with surrogate compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

All quality criteria were met.

DATA ASSESSMENT:

7. INTERNAL STANDARDS PERFORMANCE:

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every experimental run. The internal standard area count must not vary by more than a factor of 2 (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary more than ± 30 seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated, "J", and all non-detects as "UJ", or "R" if there is a severe loss of sensitivity.

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgment to determine either partial or total rejection of the data for that sample fraction.

All quality (riteria were met

DATA ASSESSMENT:

8. COMPOUND IDENTIFICATION:

A) VOLATILE AND SEMI-VOLATILE FRACTIONS:

TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and by comparison to the ion spectra obtained from known standards. For the results to be a positive hit, the sample peak must be within ± 0.06 RRT units of the standard compound and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For the tentatively identified compounds (TIC) the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

B) PESTICIDE FRACTION:

The retention times of reported compounds must fall within the calculated retention time windows for the two chromatographic columns and a GC/MS confirmation is required if the concentration exceeds 10 ng/ml in the final sample extract.

For all samples with positive results, the sample peaks were not within I 0.06 RRT units of the Standard compounds. However, the sample mass spectra did mutch well with the Standard spectra, Compound identification was not adversely affected; therefore no action was taken.

DATA ASSESSMENT:

9. MATRIX SPIKE/SPIKE DUPLICATE, MS/MSD:

The MS/MSD data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for some additional qualification of the data.

For ms/ms/D Sample MGC wos-oi, the percent recovery of trichloroethene exceeded quality control criteria. The positive result for trichloroethene for sample MGC wos-oi was qualified as estimated, "J",

see insert following page 6 of charklist



February 15, 1991

Hydro-Search Inc. 350 Indiana Street, Suite 300 Golden, CO 80401

Attention: Larry Gardner

Reference: Machias Gravel Pit

Testing Results

Gentlemen:

As per your request, we have completed the laboratory tests on the recovery split spoon samples for the Machias Gravel Pit.

Enclosed please find Table 1, which summarizes the results from the testing program.

We appreciated the opportunity to perform this work for your firm. If we can be of further service, or there are any questions, please contact our office.

Sincerely,

EMPIRE SOILS INVESTIGATIONS, INC.

Frank R. Minnolera, Jr.

Geologist

FRM:clc

TABLE 1
LABORATORY TEST RESULTS
MACHIAS GRAVEL PIT

			(GRAIN SI	ZE		ATTERBER	RG LIMITS
BORING NO.	DEPTH (FT)	NATURAL WATER CONTENT	% GRAVEL	% SAND	% SILT	% CLAY	LIQUID LIMIT	PLASTIC INDEX
GW-7	10-12'	4.5%	31.1	59.5	6.9	2.5	NP	NP
GW-7	24-26'	4.2%	43.1	47.0	6.6	3.3	NP	NP
GW-7	40-42'	9.8%	34.7	57.5	6.1	1.7	NP	NP
P-1	14-16°	23.1%	0	9.5	67.0	23.5	23	5
P-1	18-20°	11.5%	26.4	46.8	20.4	6.5	NP	NP
GW-8	8-10°	9.5%	55.7	37.5	5.3	1.5	NP	NP
GW-8	16-18°	24.1%	0	9.8	74.7	15.6	NP	NP
GW-8	2 0- 22°	10.3%	11.2	46.8	32.9	9.2	NP	NP
GW-3D	8-10°	16.3%	18.6	44.7	30.4	6.3	NP	NP
GW-3D	18-20°	5.5%	27.00	69.7		0.8	NP	NP
GW-5	8-10 °	8.8%	0	81.9	15.8	2.4	NP	NP
GW-5	24-26 '	7.5%	0	69.3	27.1	3.7	NP	NP
GW-5	36-38 '	4.0%	38.0	48.8	8.4	4.8	NP	NP
GW-6 GW-6	4 8- 50 5 4- 56	12.1%	38.3	48.1 86.4	10.8	2.9 2.6	NP NP	NP NP

