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Draper Aden Associates
Blacksburg ◆ Richmond, Virginia
Engineering ◆ Surveying ◆ Environmental Services

January 5, 2000

Mr. Mark Poindexter
Hydrogeologist, Groundwater Compliance Unit
Solid Waste Section, Division of Waste Management
North Carolina Department of Environment and Natural Resources
401 Oberlin Road, Suite 150
Raleigh, N.C. 27605

RE: Watauga County Landfill, Assessment Monitoring Program
DAA Job No. 6520-21

Dear Mr. Poindexter:

Please find enclosed a report presenting the results of the seventh semiannual Assessment Monitoring event, conducted at the Watauga County Landfill on July 12-13, 1999, for your review. Preliminary, unvalidated analytical result summary tables for this monitoring event were provided on August 12, 1999. The report discusses sampling procedures, analytical results and overall conclusions of the monitoring event. Note that as requested, the report also includes a Conceptual Site Model Update.

The Conceptual Site Model Update includes a description of both the past and current extent of impact, including text and delineation maps, with vertical and horizontal isopleths. As presented graphically with both concentration trend graphs and chronological delineation maps, the analytical results indicate that significant reductions in the extent and concentration of impact have occurred across the site. Comparisons of relative concentrations over time demonstrate the role of reductive reactions in the natural attenuation processes active across the site. Although North Carolina Groundwater Protection Standards continue to be exceeded at the property boundary, all of these elements of the conceptual site model presented at the conclusion of the report indicate that the concentration, extent, and total mass of impact at the site is declining.

The next assessment monitoring event is scheduled for the first quarter of 2000. If you should have any questions or comments concerning the enclosed report, please do not hesitate to contact me.

Sincerely,
DRAPER ADEN ASSOCIATES

Jeffrey E. Smith
Project Geologist

JES
Enclosure
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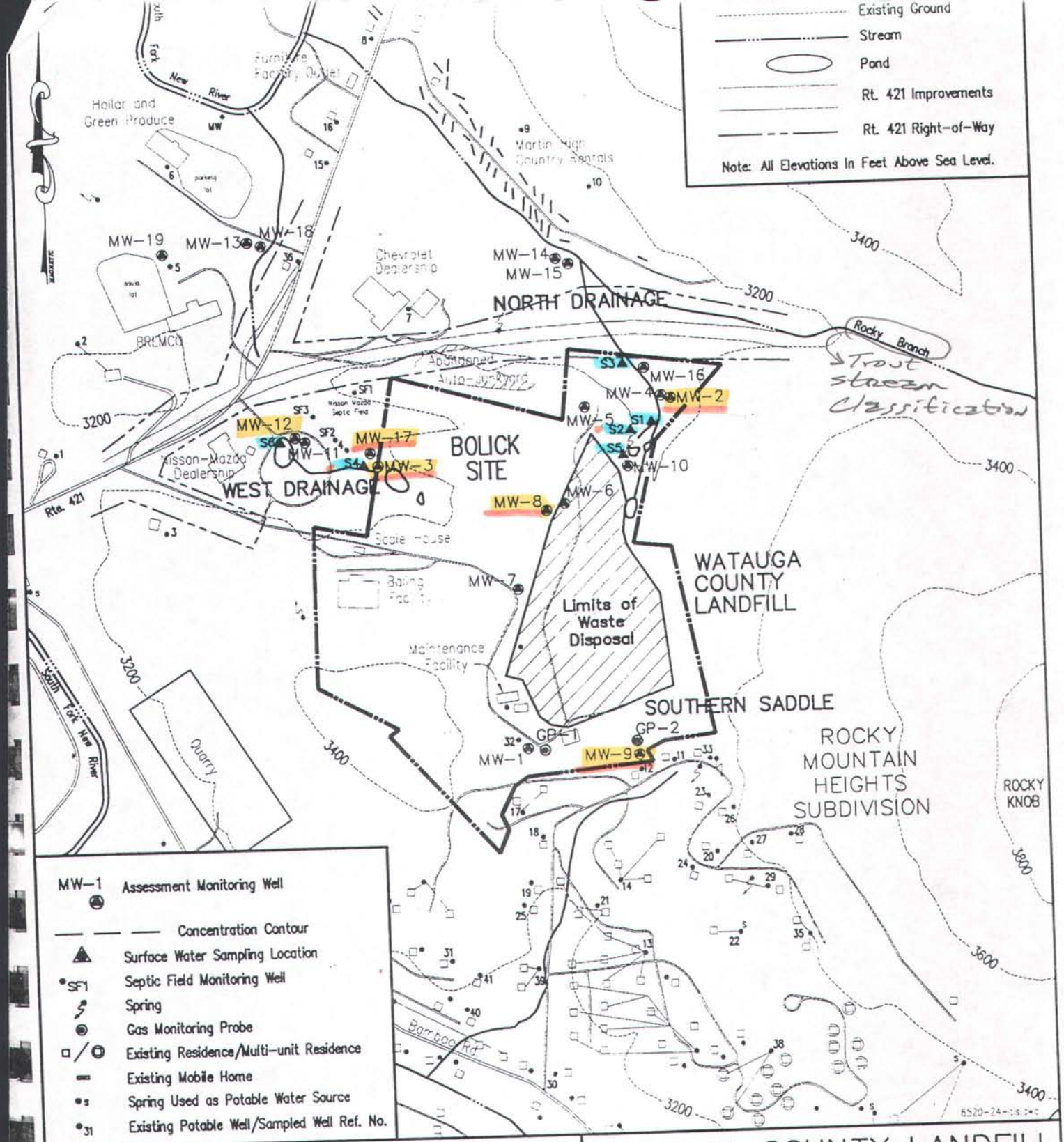
cc: Mr. Robert Nelson, Watauga County Manager (with enclosure)
Mr. James Potter, Watauga County Landfill Manager (with enclosure)
Mr. Richard DiSalvo, Jr., P.E., Vice-President, DAA (with enclosure)
Mr. Michael Lawless, P.G., Groundwater Project Manager, DAA (with enclosure)



SITE MAP
FIGURE 1

WATAUGA COUNTY LANDFILL
WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±

Groundwater and Surface Water Assessment Monitoring Results Report July 12-13, 1999 Event Including Site Conceptual Model Update

Watauga County Landfill
Watauga County, North Carolina
NCDENR Permit No. 95-02

Prepared for:

Watauga County Board of Commissioners

and

North Carolina Department of Environment and Natural Resources
Division of Solid Waste Management
Solid Waste Section

Prepared by:

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DAA Job No. 6520-21

January 5, 2000

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EXECUTIVE SUMMARY

This report presents the results of the semiannual Assessment monitoring groundwater and surface water sampling event conducted at the Watauga County Landfill, NCDENR Permit No. 95-02, Watauga County, North Carolina, on July 12-13, 1999 by Draper Aden Associates. Assessment monitoring was conducted in accordance with the Watauga County Landfill Assessment Plan (DAA, Sept. 3, 1993) and subsequent monitoring program revisions as approved by the NCDENR. The analytical results indicate the extent and concentration of impact continues to diminish. Although the northern edge of the occurrence of assessment target parameters in the groundwater continues to primarily exist within the construction right-of-way for the pending Route 421 bypass, reductions of concentrations and extent are observed to the south. South of the bypass, the detection of assessment target parameters continues to be concentrated between the saddle, located between the landfill and the Rocky Mountain Heights Subdivision, and the west and north drainages below the landfill. Again, note that reductions of concentrations and extent are observed.

In June 1998, the NCDENR approved the following monitoring program revisions:

1) the initiation of monitoring a smaller set of the core monitoring wells for semiannual monitoring and a larger set for annual monitoring,
2) annual rather than semiannual analysis for target metals, and
3) withdrawal of select non-impacted assessment monitoring wells from routine groundwater monitoring during 1998-1999.

The July 1999 event incorporated the subset of the core monitoring wells and the annual analysis for target metals. The subset approved for semiannual monitoring includes the following six wells: MW-2, MW-3, MW-6, MW-9, MW-12 and MW-17. The groundwater at these six monitoring points has historically exceeded the EPA MCL for one or more target parameters.

A remedial cap was installed at the facility in the fall of 1996. The remedial cap focuses on source containment as an immediate remedial action, as established by the EPA's presumptive remedy directive (EPA 540-F-93-035, September 1993). Additional risk assessment activities address exposure pathways outside the source area. These activities include the extension of public water along the existing Route 421 alignment north of the facility and to select residences located south of the facility. These response actions for exposure pathways outside the source area are being combined with the presumptive remedy to develop a comprehensive site response. Source containment, implemented through a remedial cap, supplemented by risk assessment, institutional controls, natural attenuation, and continuing assessment investigation comprise the broad package of remedial actions currently being conducted at the site.

Significant decreases in target parameter concentrations continue to be observed in impacted groundwater and surface water across the site. Note that no target parameters were detected in well MW-12 as a result of the July 1999 monitoring event. This bedrock well, located beyond the property boundary in the west drainage, has historically exceeded the EPA MCL for one or more

organic target parameters. Other reductions in either the extent or concentration of impact are observed at every monitoring location across the site. These monitoring results demonstrate that the extent of impact is retreating and that concentrations within the core continue are diminishing.

Concentrations of benzene, TCE, cis-1,2-DCE, methylene chloride, and vinyl chloride, only reported within the west drainage and southern saddle, have all decreased to levels below EPA MCLs at several core monitoring locations. Concentrations of 1,1,1-TCA and PCE have decreased to levels below EPA MCLs at both MW-2 and MW-10 in the north drainage. A general reduction trend from more highly chlorinated compounds (i.e., PCE, TCE, and 1,1,1-TCA) to less chlorinated compounds (i.e., cis-1,2-DCE and 1,1-DCA) is observed. Note that although the formation of these two daughter products is observed, even concentrations of cis-1,2-DCE and 1,1-DCA continue to decrease significantly across the site. Although 1,1-DCA is observed in more monitoring locations than any other target parameter, concentrations are considerably below the North Carolina Groundwater Protection Standard. No EPA MCL exists for 1,1-DCA.

In August 1999, the NCDENR requested that Watauga County present an updated site conceptual model incorporating recent Assessment results. An initial site conceptual model was presented in the Assessment Plan, dated September 3, 1993. Specifics of the site conceptual model (i.e., geologic maps, potentiometric maps, cross-sections, boring logs, etc.) have been refined in subsequent investigation reports (i.e., the Assessment Activity Report, dated July 1994; the Remedial Investigation and Alternatives Report, dated January 1996; and multiple semiannual monitoring event reports). In due consideration of the reductions in extent and concentration of impact observed across the site, the site conceptual model is revisited in the conclusion of this report.

As presented graphically with both concentration trend graphs and chronological delineation maps, the analytical results indicate that significant reductions in the extent and concentration of impact have occurred across the site. A description of both the past and current extent of impact, including text and delineation maps, with vertical and horizontal isopleths, is included. Comparisons of relative concentrations over time demonstrate the role of reductive reactions in the natural attenuation processes active across the site. Although North Carolina Groundwater Protection Standards continue to be exceeded at the property boundary, all of these elements of the site conceptual model presented at the conclusion of the report indicate that the concentration, extent, and total mass of impact at the site is declining.

1.0 INTRODUCTION

This report presents the results of the seventh semiannual Assessment monitoring groundwater and surface water sampling event conducted at the Watauga County Landfill, NCDENR Permit No. 95-02, Watauga County, North Carolina, on July 12-13, 1999 by Draper Aden Associates. The report discusses sampling procedures, analytical results, and overall conclusions of the seventh semiannual Assessment monitoring event. Tables and figures are provided in Appendix A. A summary of target parameter analytical results is presented in Tables 2A and 2B. Non-target parameter analytical results are provided in Table 3. Groundwater elevation measurements are provided in Table 4. Background Assessment analytical results are provided in Tables 5A-E and Tables 6A-B. The Groundwater and Surface Water Monitoring Program site map is provided as Figure 1. Figure 2 depicts the potentiometric surface as inferred from static water level elevations obtained during the July 1999 sampling event.

Appendix E contains copies of the laboratory summary data sheets. A data validation summary and completed Quality Assurance/Quality Control (QA/QC) criteria forms used to validate the data are also contained in Appendix E. The comprehensive laboratory data report was scanned for inclusion on CD-ROM and will be combined with the laboratory reports generated from the next several events prior to distribution.

The report concludes with a presentation of the site conceptual model, including a detailed description of both the past and current extent of impact. Total concentration trend graphs are provided to illustrate the reductions in target parameter concentrations observed across the site and relative concentration pie charts are provided to illustrate the reduction reactions observed across the site. Plume delineation maps, with vertical and horizontal isopleths, are included in Appendix F.

Assessment monitoring is conducted in accordance with the Watauga County Landfill Assessment Plan (DAA, September 3, 1993) and monitoring program revisions as detailed in the Remedial Investigation and Alternatives Report (DAA, January 12, 1996) and subsequent monitoring event reports. Appendix I of the Assessment Plan, The Groundwater and Surface Water Monitoring Program, details the schedule and procedures to be implemented for collecting groundwater and surface water samples, analyzing the samples for specified parameters, and evaluating and reporting data.

1.1 Groundwater Monitoring Well Network

Nineteen groundwater monitoring wells (MW-1 through MW-19) have been installed at the Watauga County Landfill. Monitoring well locations are shown on the Groundwater and Surface Water Monitoring Program site map (Figure 1). MW-6 and MW-16 were abandoned subsequent to the second semiannual assessment monitoring event (April 1996). As shown on the site map, the abandonment of MW-6 was necessary to permit construction of the landfill cap and the abandonment of MW-16 was necessary to permit construction of the 421 bypass.

In order to maximize the effectiveness and efficiency of the groundwater monitoring program, the assessment well network is stratified into two groups of "core" and "boundary" wells.

Core assessment wells are selected based on each well's ability to monitor and characterize migration of potential impacts. Boundary assessment wells are selected based on each well's ability to monitor and characterize the limits of the horizontal and vertical extent of impact.

In July 1995, after the first semiannual assessment monitoring event (fifth assessment event), NCDENR approved the withdrawal of non-impacted boundary wells from the routine compliance monitoring program on the condition that the boundary wells be rotated in and out of routine monitoring on a regular basis. The boundary wells were sampled again during 1997-1998. NCDENR subsequently approved withdrawal of select non-impacted boundary wells from routine groundwater monitoring during 1998-1999. The six non-impacted boundary wells remain operational. Future monitoring of these wells will be based on annual review of temporal contaminant distribution trends.

In June 1998, NCDENR approved the initiation of monitoring a smaller set of the core monitoring well network for semiannual monitoring and a larger set for annual monitoring. The subset of the existing twelve core well network approved for semiannual monitoring includes the following six wells: MW-2, MW-3, MW-8, MW-9, MW-12 and MW-17. The groundwater at these six monitoring points exceeds the EPA MCL for one or more organic target parameters.

The current stratification of the assessment monitoring well network is as follows:

CORE WELLS	BOUNDARY WELLS
MW-1	MW-4
MW-2*	MW-5
MW-3*	MW-13
MW-6 (abandoned)	MW-14
MW-7	MW-16 (abandoned)
MW-8*	MW-18
MW-9*	
MW-10	
MW-11	
MW-12*	
MW-15	
MW-17*	
MW-19	

* - core subset well

1.2 Surface Water Sampling

The goal of the surface water monitoring system at Watauga County Landfill is to provide representative surface water samples for assessing the water quality downgradient of the waste disposal area. Six surface water monitoring points serve to meet this objective.

- (S-1) The last of the series of sediment ponds is sampled to provide a representative sample for assessing the quality of the surface water originating from the landfill before the water discharges into the stream.

- (S-2) The spring capture outfall located adjacent to the last of the series of sediment ponds is sampled to provide a representative sample for assessing the quality of the water originating from the spring capture system located beneath the fill area.

- (S-3) The stream is sampled at the landfill property boundary (approximately 600 feet below the last sediment pond) to provide a representative sample for assessing the water quality of the stream below the waste disposal area. No sampling location is available upstream of the waste disposal area since the stream originates immediately below and adjacent to the disposal area.

- (S-4) The stream located below the Bolick site is sampled approximately 30 feet below the landfill property boundary to provide a representative sample for assessing the water quality of the surface water below the Bolick site. This sampling location is chosen instead of the sediment pond located on the Bolick site to provide a sample that is more representative of the potential influence of groundwater from the soil aquifer.

- (S-5) A seep, located below the waste disposal area and directly above the sediment pond, was observed flowing during the first quarter background event (June 1994). This seep is sampled in addition to the four originally proposed surface water sampling locations.

- (S-6) An additional surface water monitoring point, located approximately 800 feet below the existing surface water monitoring point S-4, was added subsequent to the first semiannual sampling event (July 1995). This monitoring point is sampled to provide a representative sample for assessing the persistence of surface water impacts observed at S-4 further downgradient along this drainage.

In addition to these six surface water sampling locations, any leachate production observed during surface water sampling events is also sampled. A grid field screening inspection of the landfill is conducted concurrent with the sampling event to verify the presence or absence of leachate production. No leachate production was observed.

1.3 Sampling and Analysis Schedule

1.3.1 Groundwater

During the first year of Assessment groundwater monitoring (1994-1995) four quarterly background sampling events were conducted on each groundwater monitoring well. Semiannual sampling is currently conducted. The seventh semiannual Assessment monitoring event was conducted on July 12-13, 1999. The groundwater Assessment monitoring schedule is outlined in Table 1.

Monitoring Parameters

The analytical scans performed on each monitoring well during the first year of assessment background monitoring were designed to analyze for all the target parameters detected and tentatively confirmed as a result of the initial comprehensive sampling event performed on the previously existing well network MW-1 through MW-7 (March 1993). The initial analytical list was comprised of the complete EPA Appendix II List of Hazardous Inorganic and Organic Parameters (40 CFR, Part 258) required for Assessment Monitoring under the NCDENR requirements for Municipal Solid Waste Landfills (15A NCAC 13B Section .1600). A summary results table of the initial March 1993 sampling event are contained in Appendix C of this report and detailed in Sections II and III of the Assessment Plan (DAA, September 3, 1993).

The complete EPA Appendix II analysis was repeated on the network of core wells during the first semiannual event (July 1995). Additional parameters detected, and verified through Quality Assurance / Quality Control (QA/QC) validation procedures as being present, that were not identified in prior Assessment monitoring events, were added to the assessment target parameter list. Target parameters not detected during all five previous assessment monitoring program events, and verified through QA/QC validation procedures as not being present, were deleted from the assessment target parameter list. As required, amendments to the existing target parameter list were evaluated and approved by the NCDENR, prior to implementation. For amended target parameters, it was proposed that four independent samples be collected and analyzed for those additional parameters during the following four semiannual sampling events at all core wells to establish background.

Revisions to the target inorganic parameter list involved adding four metal parameters (chromium, cobalt, nickel, and vanadium) and deleting two other metal parameters (cadmium and mercury). The presence of cadmium and mercury in the groundwater at the site was not supported by the analytical results of all four assessment background or the first semiannual monitoring events. Chromium, cobalt, nickel, and vanadium were observed in three or more wells, although also at levels far below EPA MCL and NC groundwater standards (NCSs), as a result of the comprehensive EPA Appendix II analytical scan performed during the first semiannual event.

As a result of four successive assessment sampling events, all the assessment target metal parameters (including chromium, cobalt, nickel, and vanadium) were observed at levels far below EPA MCL and NCSs. Subsequent to the January 1998 Assessment monitoring event NCDENR approved completing target metal analysis annually rather than semiannually.

Revisions to the target organic parameter list involved deleting trans-1,3-dichloropropene. The analytical results of the four background monitoring events and the first semiannual assessment sampling event confirmed the absence of trans-1,3-dichloropropene in the groundwater and surface waters at the site. Thus, per the decision criteria outlined in the Assessment Plan, trans-1,3-dichloropropene was removed from the target parameter list.

As approved by NCDENR, monitoring of additional EPA Appendix II parameters that have not been confirmed in any of monitoring wells to date is no longer required.

Analytical Methods

During the first year of background Assessment Monitoring (1994-1995), analyses of the core wells utilized EPA Contract Laboratory Program – Statements of Work (CLP-SOW) for all four quarterly events. Organic analyses of the boundary wells alternated between CLP and Low Level Risk Assessment (LLRA) analytical methods for each quarterly event. Metal analyses of all monitoring wells utilized CLP methods on all events.

Since completing the first year of quarterly background sampling (April 1995), the core wells have been monitored on a semiannual basis. The first semiannual assessment monitoring event analyzed for the EPA Appendix II List of Hazardous Inorganic and Organic Parameters (40 CFR Part 258), utilizing LLRA analytical methods for organic parameters and CLP analytical methods for metal parameters.

Monitoring continues to be conducted on a semiannual basis for the organic target parameters detected as a result of the complete EPA Appendix II analysis. Monitoring is conducted on an annual basis for the metal target parameters. Reevaluation of the site network and monitoring scheme is conducted after review of the results of each sampling event. The monitoring program continues to follow a two-tiered analytical approach utilizing both EPA CLP-SOW analytical methods and LLRA screening by EPA-SW846 analytical methods. The CLP-SOW are utilized to generate high-level quality data with documented QA/QC protocols. The LLRA methods (EPA-SW-846) are utilized for risk assessment screening to preliminarily identify low levels of parameters that may be present. The groundwater analysis schedule provides an outline of analytical methodology designated for each event (Table 1).

The assessment monitoring schedule alternates between CLP and LLRA analytical methods for groundwater organic analyses each semiannual event. The second, fourth and fifth semiannual assessment monitoring events analyzed groundwater using CLP-SOW for both organic and metal parameters. The third and sixth events analyzed groundwater utilizing LLRA analytical methods for organic parameters and CLP analytical methods for metal parameters. The seventh semiannual assessment monitoring event (detailed in this report) analyzed groundwater using CLP-SOW for both organic and metal parameters.

1.3.2 Surface Water

Surface water monitoring has been conducted on a semiannual basis since the initiation of the Assessment Plan monitoring program. The analytical scans that are performed on the surface water and leachate samples utilize CLP SOW and are designed to analyze for all the target parameters detected as a result of the comprehensive Appendix II analysis. The surface water assessment monitoring schedule is also outlined in Table 1.

2.0 GROUNDWATER AND SURFACE WATER SAMPLING FIELD PROCEDURES

Groundwater and surface water samples were collected according to the Watauga County Landfill Groundwater and Surface Water Monitoring Plan (DAA, September 3, 1993). Field notes, contained in Appendix B, document sample collection procedures.

2.1 Well Purging and Sample Collection

Dedicated stainless steel and TEFLON electrical submersible pumps were permanently installed in the monitoring well network subsequent to the first Assessment event. Draper Aden Associates' environmental technicians used the dedicated pumps to purge and collect groundwater samples from the well network during the July 1999 sampling event. All non-dedicated equipment was decontaminated between sampling of each monitoring well.

A minimum of three well casing volumes of groundwater was removed from each monitoring well prior to sample collection. Well casing volumes were calculated from measurements of depth to water, and total well depth taken prior to purging. Stabilization of field analyses for pH and specific conductivity were used to verify that stagnant water within the well as removed during purging, and that groundwater representative of the near-aquifer was being sampled. Field notes summarize and document well purging calculations and results (Appendix B).

2.2 Field Meter Calibration

Measurements of pH and specific conductivity were analyzed at each well by completing multiple measurements in the field, at the time of groundwater purging. Although pH and specific conductivity are not assessment monitoring parameters, the measurements were used to ensure groundwater quality and stabilization.

Hanna 9023 pH/temperature and 9033 conductivity meters were used for the field measurement of pH, and conductivity. The meter was calibrated in the field using laboratory-grade buffers for pH, and KCl solution for specific conductivity. Field notes in Appendix B document field meter calibration methods for the sampling event.

2.3 Quality Control Blank Samples

Trip blanks were utilized as part of the assessment monitoring program. Trip blanks were prepared by the analyzing laboratory to accompany the sample kits at all times. The trip blanks employed sample containers and volumes identical in physical and chemical integrity to the samples used for actual sample collection. The trip blank was analyzed for all parameters included in the sampling event. The trip blank served as a control on sample kit preparation, analysis in the laboratory, and sample kit transportation.

Field blanks were not collected, due to the use of dedicated purging/sampling equipment.

2.4 Sample Containers and Shipment

Groundwater samples were collected in U.S. EPA approved containers prepared and supplied by the analyzing laboratory. Where applicable, the analyzing laboratory prepared organic sample containers with hydrochloric acid (HCl) prior to sample collection. Total metal samples were preserved in the field using nitric acid supplied by the analyzing laboratory. All samples were placed on ice in a cooler at approximately 4°C immediately after collection. A chain of custody seal was placed on each sample and each cooler to verify samples were not disturbed during transport. The coolers were shipped to the analyzing laboratory by overnight courier service.

2.5 Chain of Custody Documentation

Chain of Custody (COC) documentation and analysis requests are contained with the comprehensive laboratory report. Laboratory analytical data summery sheets are found in Appendix E. COC forms provided by the analyzing laboratory or developed by Draper Aden Associates were used to document the custody of the samples from the time they were collected in the field to the time the custody of the samples was relinquished by Draper Aden personnel. Relinquishing custody of the samples was accomplished by shipping through an overnight carrier service. The information recorded in the COC included sampling location, sampling points, number of samples, type of sampling containers, sample preservation procedures, matrix spike samples, if any, blanks accompanying the samples, date and time of sample collection, and the date and time custody was relinquished. These COC forms were sent with the samples to the analyzing laboratory. Analysis request forms, with lists of parameters required to be analyzed for the different analytical methods to be used, were also attached along with the COC forms.

3.0. LABORATORY ANALYSIS

3.1 List of Laboratories

Volatile organic analyses by EPA CLP-SOW were performed by CompuChem Environmental Corporation, a division of Liberty Analytical Corporation of Cary, North Carolina.

3.2 Analytical Methods

All CLP analytical techniques used were in accordance with the procedures listed in the CLP-SOW Organics OLMO3.2.

3.3 Data Quality Objectives

Quality Assurance Objectives for Measurements

Data quality objectives (DQO) are established to ensure that the data collected throughout is sufficient and of adequate quality for the intended use. Overall DQO included the following:

- Precision - A measurement of the reproducibility of measurements compared to their average value. Precision is measured by the use of splits, replicate samples, or co-located samples and field audit samples.
- Accuracy - This measures the bias in a measurement system by comparing a measured value to a true or standard value. Accuracy is measured by the use of standards, spiked samples, and field audit samples.
- Representativeness - This is the degree to which a sample represents the characteristic of the population being measured. Representativeness is controlled by defining sample collection protocols and adhering to them throughout the evaluation.
- Completeness - This is the ratio of validated data points to the total samples collected. Completeness is achieved through duplicate sampling and resampling, when necessary.
- Comparability - This is the confidence that one data set can be compared to another. Comparability is achieved through the use of standard methods to control the precision and accuracy of the data sets to be compared by use of field audit samples.

The CLP-SOWs are utilized to generate a high level quality data with documented QA/QC protocols. The SW-846 methods are utilized to generate organic data for risk assessment to preliminary identify low levels of analytes that may be present. Estimated CLP SOW results are similarly provided for preliminary assessment purposes only. Estimated data is not intended for use in determining regulatory compliance issues.

Internal Quality Control

i. **Field Quality Control** - Field QC procedures are summarized in Section 2.0.

ii. **Analytical Quality Control** - Analytical QC procedures for CLP analytical techniques are guided by adherence to CLP deliverables. All QC data and records generated by the laboratory were examined for adherence to method requirements by Draper Aden Associates. A laboratory QC report generally consists of the following components:

- spikes
- blanks
- duplicates
- raw data
- surrogate parameters
- instrument adjustment
- calibration
- quantification
- chromatograms
- additional QC requirements (organic and inorganic)

For this project, QC reports are provided with the target parameter analytical results for all sampling events.

4.0. DATA VALIDATION

The CLP analyses were performed in adherence to the relevant CLP-SOW. Results of the CLP-SOW analyses were summarized and reported by the analyzing laboratory in standard CLP

reporting format. LLRA analyses were performed in adherence to relevant SW-846 method requirements and guidance. Draper Aden Associates conducted data validation of each data set. The results from each sampling event were evaluated in association with corresponding QA/QC information provided by the analyzing laboratory.

4.1 Laboratory Reporting Qualifiers

Two different types of qualifiers were associated with laboratory analyses and data validation: **laboratory reporting qualifiers** and **data validation qualifiers**. The laboratory used **laboratory reporting qualifiers** to flag sample results with reference to relevant QA/QC criteria. Laboratory reporting qualifiers were unique to the analyzing laboratory and are defined in the laboratory data package presented in Appendix E. In addition to the laboratory reporting qualifiers, project specifications required the laboratory performing the analytical services to utilize the following additional data qualifiers and definitions:

Qualifiers

D - Denotes the sample was diluted to obtain the result.
S - Method of Standard Additions was utilized to obtain the result.
E - Laboratory recoveries fell outside EPA control limits. Results are approximate.
TI - The laboratory tentatively identified the parameter.

Definitions

CRQL. Contract Required Quantitation Limit (associated with CLP organics only). Organic Data qualified with a "U", refer to CRQL.

4.2 Data Validation Qualifiers

Data validation was completed using guidance from the "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", (Document 1) USEPA, February, 1993.

Data Validation was performed on the results presented in the laboratory analysis report, and the validated results were flagged, where required, using the appropriate CLP **data validation qualifiers**. The CLP **data validation qualifiers** are different from the **laboratory reporting qualifiers**. Definitions of the nationally recognized data validation qualifiers used by Draper Aden Associates in the validation process and for the reported results are presented below.

Organic Data Validation Qualifiers

U - The parameter was analyzed for, but was not detected (the numerical value associated with the data validation qualifier is the reported sample LOQ for organics and the reported sample IDL for inorganics).

J - The parameter was positively identified; the associated numerical value is the approximate concentration of the parameter in the sample.

N - The analysis indicates the presence of a parameter for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of a parameter that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The parameter was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the parameter in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the parameter cannot be verified.

4.3 Organic Data Review

Draper Aden Associates performed a limited review of the analytical results for volatile organic parameters analyzed by EPA CLP 3/90 SOW document number OLM03.2. The reduced parameter list included dichlorodifluoromethane. Monitoring well samples were collected from monitoring well locations denoted as MW-2, MW-3, MW-8, MW-9, MW-12, MW-17, and surface water samples denoted as S-1, S-2, S-3, S-4, S-5, and S-6.

CompuChem performed the GC/MS analysis and submitted results to DAA in a final certificate of analysis which included sample analytical results as well as relevant documentation to validate and verify the analytical results.

The evaluation of CompuChem's compliance with the method was based on a limited review of the following items: QC deliverables package, case narrative, technical holding time and preservation requirements, instrument performance check, instrument calibrations, blank analysis, system monitoring recoveries, matrix spike/matrix spike duplicate (MS/MSD) analysis, internal standard requirements, laboratory control samples (LCS), and confirmation of detected parameters. Review of transcriptions from raw data to summary sheets was performed. Specific representative calculations were not performed except where noted. The following information is intended to summarize data review results and any observed significant deviations from method and/or contractual requirements.

The original certificate of analysis presented data which were of acceptable quality. The original report did not contain BFB tuning information for initial calibration analyses performed on 7/21/-22/99. CompuChem provided this data on request. It is presented in the revision section and inserted into the original report. The fourteen-day technical holding time was met for all samples. However, the analysis for sample S-2 was performed at a 1 to 1.7 dilution. Reanalysis without dilution was performed out of holding time. The diluted and undiluted sample results are consistent.

All validated sample results for S-2 were obtained from the 1 to 1.7 dilution performed within holding time. All preservation criteria were met.

All BFB tuning criteria were met. All initial calibration requirements were met. All continuing calibration requirements were met. The percent difference for tetrachloroethene was 26.7% in the CCAL analyzed on July 23, 1999. Tetrachloroethene results in samples S-2, S-3, S-4, S-5, S-6 and MW-17 were qualified as estimated as per validated guidelines. The laboratory method blanks and the trip blank contained low levels of methylene chloride. All samples also contained low levels of methylene chloride which were qualified as blank contamination. All system monitoring compound criteria were met. Matrix spike/matrix spike duplicate analyses were performed on MW-3. All MS/MSD QC requirements were met. All internal standard area and retention time requirements were fulfilled. Overall, instrument performance appeared acceptable.

Numerous target parameters were detected both above and below the contract required quantitation limit (CRQL) and are listed in Section N of this data validation report. Sample S-2 was analyzed at a 1/1.7 dilution. CRQLs were raised to 17 µg/l for all S-2 parameter results. A review of tentatively identified compound (TIC) results revealed the presence of dichlorofluoromethane and ether in several samples.

5.0 DISCUSSION OF ANALYTICAL RESULTS

Tables 2A and 2B (Appendix A) provide a summary of the target analytical results obtained from the July 1999 sampling event. A review of the concentration trends obtained from eleven total assessment events (Tables 5A-D) indicates significant decreases in target parameter concentrations have occurred over the past two years in both the groundwater and surface water across the site. These decreases are further illustrated at the conclusion of this report. Total concentration graphs (Section 7.3), target parameter delineation maps, with vertical and horizontal isopleths (Section 7.4, Appendix F), and relative concentration pie charts (Section 7.5) are provided to illustrate these decreases in terms of the site conceptual model.

These results were validated in-house by Draper Aden Associates according to the discussion provided in Sections 3.0 and 4.0 of this report. Tables 2A-C list for each parameter, as applicable, an MCL established by the USEPA and groundwater quality standard established by the state of NC, the CRQL, and the analytical method. A summary of additional non-target parameter analytical results is provided in Table 3. Estimated analytical results are provided for preliminary assessment purpose only and are not intended for use in determining regulatory compliance issues.

Target Organic Parameters

The analytical results for the eleven current target organic parameters obtained from the July 1999 assessment sampling event are summarized in Tables 2A and 2B. The analytical results obtained for each parameter are individually discussed below.

1,1-Dichloroethane (1,1-DCA)

Although 1,1-DCA is the most prevalent target parameter, significant decreases in 1,1-DCA concentrations continue to be observed in virtually all impacted monitoring wells and surface water sampling locations. 1,1-DCA was detected in all the core subset monitoring wells except MW-12. Although no EPA MCL exists for 1,1-DCA, all concentrations were considerably below the NC groundwater quality standard of 700 µg/l. Low estimated concentrations of 1,1-DCA were also observed at two surface water sampling locations (S-2 and S-4). The estimated concentrations were below the NC surface water quality standard of 42 µg/l.

Tetrachloroethene (PCE)

PCE was detected or estimated at concentrations above the EPA MCL of 5 µg/l in three monitoring wells (MW-3, MW-8 and MW-17) and estimated at concentrations above the NCS of 0.7 µg/l in two additional wells (MW-2 and MW-9). PCE was detected in one surface water sampling location (S-4) at an estimated concentration below the NC surface water quality standard of 8.84 µg/l.

Significant decreases in PCE concentrations continue to be observed in virtually all impacted monitoring wells and impacted surface water sampling locations. PCE concentrations in monitoring wells MW-2 and MW-10, located in the north drainage, have decreased to levels below the EPA MCL. Concentrations observed in the impacted surface water sampling location, S-4, which decreased to levels below the NC surface water quality standard between 1996 and 1997, also continue to meet surface water quality standards.

Trichloroethene (TCE)

TCE was detected at concentrations above the EPA MCL of 5 µg/l in three monitoring wells (MW-3, MW-8 and MW-17) and estimated at concentrations above the NCS of 2.8 µg/l in one additional wells (MW-9). TCE was estimated in one surface water sampling location (S-4) at a concentration below the NC surface water quality standard of 92.4 µg/l.

Significant decreases in TCE concentrations continue to be observed in all impacted monitoring wells as well as all impacted surface water sampling locations. TCE concentrations in two wells, MW-9, located in the southern saddle, and MW-12, located beyond the property boundary in the west drainage, have decreased to levels below the EPA MCL.

cis-1,2-Dichloroethene (cis-1,2-DCE)

CLP-SOW analytical results for cis-1,2- DCE are reported as part of a total concentration of cis- and trans- isomers of the parameter (total 1,2-DCE). Total 1,2-DCE was detected at concentrations above the EPA MCL and NCS of 70 µg/l in one well (MW-17). Total 1,2-DCE was detected at lower concentrations in three additional wells (MW-3, MW-8 and MW-9). Total 1,2-

DCE was estimated at low concentrations, considerably below the NC surface water quality standard of 140,000 µg/l, in two surface water sampling locations (S-2 and S-4).

Significant decreases in cis-1,2-DCE concentrations continue to be observed in all impacted monitoring wells and all impacted surface water sampling locations. Cis-1,2-DCE concentrations in monitoring well MW-8, located in the west drainage, have decreased to levels below the EPA MCL.

Dichlorodifluoromethane

Dichlorodifluoromethane was not detected at any monitoring wells or surface water sampling locations as a result of either the January or July 1999 events. Previously, dichlorodifluoromethane has been detected primarily along the west drainage basin adjacent to the landfill. During the June 1998 event, only estimated, low level dichlorodifluoromethane concentrations of were observed in two west drainage wells, MW-3 and MW-12.

1,1,1-Trichloroethane (1,1,1-TCA)

1,1,1-TCA was detected at concentrations below the EPA MCL and NCS of 200 µg/l in one monitoring well (MW-2). 1,1,1-TCA was estimated at lower concentrations in three additional monitoring wells (MW-3, MW-8 and MW-17). 1,1,1-TCA was not detected at any surface water sampling locations.

Significant decreases in 1,1,1-TCA concentrations continue to be observed in all impacted monitoring wells. 1,1,1-TCA concentrations in monitoring well MW-10, located in the north drainage, have decreased to levels below the EPA MCL.

1,1-Dichloroethene (1,1-DCE)

1,1-DCE was detected at concentrations above the EPA MCL and NCS of 7 µg/l in one monitoring well (MW-2). 1,1-DCE was also detected at lower concentrations in two additional monitoring wells (MW-3 and MW-8). 1,1-DCE was not detected in any of the surface water samples. Note that significant decreases in 1,1-DCE concentrations continue to be observed in all impacted monitoring wells.

Benzene

Estimated concentrations of benzene were detected below the EPA MCL of 5 µg/l and at or above the NCS of 1 µg/l in four monitoring wells (MW-3, MW-8, MW-9 and MW-17). Benzene was also estimated at a low concentration considerably below the NC surface water quality standard of 71.4 µg/l in one surface water sampling location (S-2).

Significant decreases in benzene concentrations continue to be observed in all impacted monitoring wells. Benzene concentrations, historically detected above the EPA MCL in only one monitoring well, MW-8, have only been observed at levels below the EPA MCL since 1997.

Vinyl Chloride

Estimated concentrations of vinyl chloride were observed at the EPA MCL of 2 µg/l and above the NCS of 0.015 µg/l in two monitoring wells (MW-3 and MW-17). Vinyl chloride was not detected in any surface water samples.

Significant decreases in vinyl chloride concentrations continue to be observed. Vinyl chloride concentrations in monitoring wells MW-3, MW-8, MW-12 and MW-17, all located in the west drainage, have decreased to non-detect and/or estimated levels at or below the EPA MCL.

In 1993, vinyl chloride was detected in the abandoned Carroll residence potable well, located on the property located immediately adjacent to the southern saddle. Vinyl chloride has not been detected in any additional potable wells to date.

Methylene Chloride

Methylene chloride was not detected at any monitoring wells or surface water sampling locations as a result of the July 1999 monitoring event. In January 1999, methylene chloride was detected at concentrations below the EPA MCL and NCS of 5 µg/l in two monitoring wells (MW-8 and MW-9). Significant decreases in methylene chloride concentrations continue to be observed in all impacted monitoring wells. Since 1995, concentrations of methylene chloride have been detected above groundwater standards in only in MW-9. Concentrations have only been observed at levels below the EPA MCL and NCS since January 1998.

Chloroethane

Chloroethane concentrations were estimated in two monitoring wells (MW-3 and MW-11). No EPA MCL or NCS standard exists for chloroethane. Concentrations of chloroethane considerably below the NC surface water quality standard of 860 µg/l were also observed at one surface water sampling locations (S-2).

Non-Target Organic Parameters

The analytical results of additional detected non-target organic parameters are summarized in Table 3. The analytical results obtained for non-target parameters, are provided to preliminarily identify those parameters which may need to be continually monitored. If upon continued semiannual data collection, the presence of any non-target parameters are confirmed by repeated analysis, the parameter will be added to the target parameter list.

Two additional non-target parameters, ether and dichlorofluoromethane, were tentatively identified in four monitoring wells (MW-3, MW-8 MW-9 and MW-17) and one surface water sampling location (S-2). All estimated concentrations were at levels considerably below established NC groundwater or surface water quality standards.

The June 1998 event report discussed adding ether and dichlorofluoromethane to the target parameter list due to the continued detection of these two non-target parameters. As indicated in Table 6A and 6B (Cumulative Detected Non-target Organic Parameter Analytical Results), ether and dichlorofluoromethane, although non-target parameters, have been tentatively identified in previous Assessment monitoring events, and therefore are evaluated based on these tentative detects. Note that all concentrations have been at levels considerably below established NC groundwater or surface water quality standards. Due to the fact that dichlorofluoromethane and ether are not standard target parameters and are not typically included in most laboratories analytical method standard list, these parameters will continue to evaluated based on the tentative identification provided by standard CLP analyses as non-target compounds.

Non-target parameter distribution trends will continue to be evaluated. No other non-target compounds have not been detected repeatedly in the wells as a result of previous background analyses (Table 6A and 6B, Appendix A). The isolated detection of these other non-target compounds, exclusive of ether and dichlorofluoromethane, is not indicative of a pervasive, persistent occurrence.

6.0. POTABLE WELL SAMPLING AND ANALYSIS PROGRAM

The initial domestic and commercial use potable well sampling event was developed and conducted by Draper Aden Associates on March 5, 1993 at the direction of Watauga County and approval of State officials to protect public health and welfare. The ongoing potable water well sampling and analysis program is currently being jointly conducted by the Appalachian District Health Department (ADHD) and the NC State Laboratory of Public Health.

The objective of the potable well sampling and analysis program is to investigate and evaluate the potential influence and associated risks of the landfill on neighboring groundwater resources. Potable well water samples collected by the ADHD are analyzed for volatile organic compounds by the State Laboratory utilizing EPA Method 502.2. Potable water well locations with accompanying sampled well reference number can be found on the Site Map (Figure 1). A summary of the analytical results of the potable well testing program collected to date are presented in Appendix D.

The analytical results of the domestic and commercial use potable water well sampling and analysis program previously indicated that two of the forty-five sampled potable wells neighboring the landfill were impacted by volatile organic compounds at concentrations above health based standards. These two impacted wells are the Carroll residence well (well reference no. 12) and the Nissan-Mazda Dealership well (well reference no. 4). These two potable water wells were replaced by connections to the Town of Boone's public water system in 1995 and have not been resampled since. Discussions of individual potable well analytical results obtained previously can be found in earlier Assessment reports.

At this time the cause or source of all the organics detected in the potable well sampling program cannot be determined. It should be noted that eight (8) of twenty-one (21) compounds detected in the Carroll residence well have not been detected in the landfill monitoring well network. The differences in parameter "fingerprints" in groundwater beneath these sites compared to "fingerprints" for landfill wells tends to indicate potential impacts resulting from activities specifically undertaken on these sites and/or immediately around the private well heads and/or components of the well systems.

The number of potable wells with trace levels of organics similar to those detected in the landfill groundwater monitoring well network has steadily diminished over the past several years. Trace concentrations of chlorinated organic solvent compounds were detected in only two potable wells, the BREMCO well and the Bolick rental residence well, as a result of sampling performed in 1999. The number of potable wells with trace levels of chlorinated organics is expected to continue to decline. The ongoing potable well sampling will confirm this.

Despite the absence of organics in the potable wells located south of the southern saddle, the County and the Town have arranged to provide public water to nine residences located south of the southern saddle by December 31, 1999. Trace levels of target organic compounds were previously detected in these nine wells prior to 1997. Note that the trace organic levels detected in these southern wells in 1992 and 1993 have steadily diminished to non-detect levels. Since June 1997, trace organic levels have only been detected in one well located south of the saddle, the Ward residence well, and on only one of three events.

Review of the analytical results from all the potable well sampling conducted recently, performed by the NC Department of Epidemiology, indicate that the sampled well waters are acceptable for all uses due to either non-detection or low level detection of organic analytes. Individual well analytical results obtained recently are discussed below.

6.1 June 1999 Sampling Event

Four wells were sampled in June 1999:

- Edwards residence; shared well #2 (well reference no. 14),
- Ward residence (well reference no. 24),
- Simko residence (well reference no. 20), and
- McClean residence (well reference no. 26).

No volatile organic compounds were detected in the Edwards residence and Ward residence wells. The analysis of the Simko residence's well water resulted in the detection of chloroform and t-butyl methyl ether at less than 1 ppb, and the analysis of the McClean residence's well water resulted in the detection of chloroform at less than 1 ppb. Neither chloroform nor tert-butyl methyl ether have been detected in any of the landfill assessment monitoring wells to date. Chloroform is likely a transformation product resulting from chlorination of the well systems (Sorg, 1986).

6.2 October 1999 Sampling Event

Four wells were sampled on October 12, 1999:

- Suddreth residence (well reference no. 17),
- Hodges residence (well reference no. 19),
- Rusher residence (well reference no. 22), and
- Winkler residence (well reference no. 45).

The analysis of the groundwater water obtained from all four wells resulted in the detection of chloroform at trace levels less than 1 ppb. Chloroform has not been detected in any of the landfill monitoring wells to date and is likely a transformation product resulting from chlorination of the well systems. No other volatile organic compounds were detected in all four wells.

The focus of this sampling event was to incorporate confirmational sampling of potable wells that have previously shown nondetection of target organic analytes, or have shown detections of organics dissimilar to those detected in the landfill groundwater monitoring well network. All of these wells have previously shown nondetection of target organic analytes or have not been sampled before (i.e., Winkler residence). A new well was recently drilled for a home under construction directly west of the Winkler property. This well will be sampled when the home is completed and electricity is connected to this new residential well.

6.3 November 1999 Sampling Event

Four wells were also recently sampled on November 2, 1999:

- Taylor residence (well reference no. 18),
- Johnson residence (well reference no. 23),
- Younce residence (well reference no. 25), and
- Shared Well #1 (well reference no. 13).

The November 1999 sampling event also focused on confirmational sampling of potable wells that have previously shown nondetection of target organic analytes, or have shown detections of organics dissimilar to those detected in the landfill groundwater monitoring well network. All of these wells fit into this category. Although, several organic constituents were detected at trace levels in the residential well samples, none of the detected compounds have been detected in the landfill monitoring well network to date. As discussed below, all of the detected compounds appear to not be related to the landfill.

Chloroform and styrene were detected in the Taylor residence well sample. Chloroform, a transformation product resulting from chlorination of the well systems, was also detected in two other wells sampled during this event (i.e., the Johnson residence well and Shared Well #1). Styrene was also detected in these three wells and was noted by the laboratory as possible lab contamination or background. 1,4-dichlorobenzene was detected in the Johnson residence well and

Shared Well #1, and three other BTEX constituents (toluene, ethyl benzene and xylenes) were additionally detected in the Johnson residence well as a result of this November 1999 event.

The BTEX compounds detected in the Johnson residence well are commonly associated with fuel leaks or spills. Although the BTEX concentrations in the Johnson residence well were at trace levels, it was recommended that the residents be alerted to the potential for leaking home heating tanks or improper fuel handling activities in the well head vicinity.

Tetrahydrofuran was the only constituent detected in the Younce residence well sample. Tetrahydrofuran has not been detected in the landfill monitoring network to date but has been detected in three other residential wells. In the BREMCO well, tetrahydrofuran was detected on only one of eleven sampling events; and in the Bolick rental residence well and in Shared Well #2, tetrahydrofuran was detected on only one of eight sampling events. It is suspected that tetrahydrofuran may be a byproduct of the various plumbing systems. Nonetheless, this compound does not appear to be persistent and does not appear to constitute a health risk.

6.4 Pending Potable Well Sampling

The next semiannual potable well sampling event is tentatively scheduled for January 2000. Although the sampling program has routinely involved the semiannual sampling of six to eight residences, the County proposes to increase the frequency and number of wells sampled for the next several events. The increased sampling will be completed to protect and manage potential risks posed by the continued exceedence of groundwater protection standards established by the State of North Carolina at the Watauga County landfill property line. In addition to sampling those wells that have shown trace level detections of organics similar to those detected in the landfill groundwater monitoring well network, the County will attempt to incorporate all other wells within a mile radius. Note that all of these additional wells were sampled previously and have shown nondetection of target organic analytes, or have shown detections of organics dissimilar to those detected in the landfill groundwater monitoring well network

In the event that the increased sampling continues to indicate no impact, the County proposes that the sampling program return to the semiannual sampling of six to eight residences. Semiannual sampling will concentrate those wells that exhibit trace level detections of organics similar to those detected in the landfill groundwater monitoring well network. The program also continue to incorporate periodic confirmational sampling of other potable wells that have previously shown nondetection of target organic analytes, or have shown detections of organics dissimilar to those detected in the landfill groundwater monitoring well network.

CONCLUSIONS

7.1 Additional Assessment Activities

Next Assessment Monitoring Event

The next assessment monitoring event is scheduled for January 2000. The monitoring event will comply with the following monitoring program schedule:

- Annual monitoring of the larger set of the core monitoring well network,
- Annual analysis for target metals, and
- Continued withdrawal of select non-impacted monitoring wells.

In response to NCDENR concerns over continued exceedences of North Carolina Groundwater Protection Standards at the facility property lines, additional risk management and investigative efforts are proposed for the next assessment monitoring event. To address risk, the County proposes that the next event include the expanded potable well sampling proposed in the previous section. As discussed further at the conclusion of this report, the County also proposes to sample for indicator parameters that provide evidence of the reductive processes on the next event. These additional investigative efforts should provide the data necessary to demonstrate that natural attenuation processes are active at the site and provide the information necessary to manage risk.

Additional Investigation

Recent NCDENR correspondence states that until all downgradient residences are supplied with public water, the Section will require further investigation in the area located south of the landfill. Although trace organic levels detected in select wells in this area in 1992 and 1993 have steadily diminished to non-detect levels, the County and the Town have arranged to provide public water to nine residences in this southern area. Since June 1997, trace organic levels have only been detected in one well located south of the saddle, and on only one of three events. We believe that the current potable well sampling program, conducted semiannually since 1992, adequately characterizes this area. To address risk in the area located south of the landfill, the County proposes that the next event include the expanded potable well sampling proposed in the previous section.

If VOCs are detected in potable samples (per J. Smith 3/16/00)

As discussed in previous reports, groundwater production in the area's wells typically occurs via a few discrete fractures, thereby minimizing the potential for the mixing of several groundwater production zones. If more investigation is required beyond the expanded potable well sampling, efforts will focus on determining the potential for the mixing of several groundwater production zones within individual select potable wells. The investigative techniques that were employed for the BREMCO well investigation can be used to confirm the vertical distribution of impacted groundwater in the southern area. Geophysical logging can be utilized to identify groundwater production zones and a straddle packer assembly can be used to hydraulically isolate and sample each discrete zone. If determined necessary, this strategy is considered the most effective method for confirming the vertical distribution of impacted groundwater in this area.

Source containment, implemented through a remedial cap, supplemented by risk assessment, institutional controls, natural attenuation, and continuing assessment investigation comprise the broad package of remedial actions currently being conducted at the site. The deep, low flow conditions indicated by the BREMCO investigation preclude the use of active or invasive remedial activities along the plume boundary, whereas source containment and natural attenuation appear to be effective solutions to observed environmental impact. Target parameter concentration and distribution trends indicate reducing conditions across the site. Migration of detectable concentrations of the target parameters beyond the current plume boundary is not anticipated. In fact, as illustrated by the distribution trend maps provided in the following site conceptual model, monitoring data provides numerous instances where reduction of the plume boundary is indicated.

Assessment data collected to date currently provides five years of evidence indicating plume attenuation. Ongoing monitoring will provide the temporal data necessary to comprehensively assess constituent transportation, migration, and fate trends. As plume attenuation continues to be observed at the site, source controls will continue to assist in diminishing leachate production, and thus contaminant migration. Natural attenuation processes will gradually lower plume concentrations and should provide for a continuously diminished plume boundary.

A site conceptual model was presented in the Assessment Plan, dated September 3, 1993. Specifics of the site conceptual model (i.e., geologic maps, potentiometric maps, cross-sections, boring logs, etc.) were refined in subsequent investigation reports (i.e., the Assessment Activity Report, dated July 1994; the Remedial Investigation and Alternatives Report, dated January 1996; and multiple semiannual monitoring event reports). In the following section of this report, the site conceptual model is revisited and updated. The site conceptual model was revisited to illustrate the concentration and distribution trends observed since the fall of 1996. Note that the model clearly demonstrates that significant decreases in target parameter concentrations continue to be observed across the site.

The following presentation of the site conceptual model begins by revisiting the site geologic and hydrogeologic considerations. The presentation of the site conceptual model includes descriptions of both the past and current extent of impact, with text and delineation maps (including vertical and horizontal isopleths), for select individual target parameters. The contaminant plumes inferred from four separate monitoring events are included to demonstrate the significant decreases in target parameter concentrations that have been observed. Total concentration trend graphs are provided to illustrate the reductions in target parameter concentrations observed across the site. A discussion of the relative concentrations of select target parameters, with pie charts depicting the relative concentrations for select core monitoring wells, is included to further illustrate organic parameter distribution trends and potential reduction reactions occurring across the site.

7.2 Site Conceptual Model – Geologic and Hydrologic Considerations

Site Geology

The 1993 Assessment Plan presented an overview of the geology and hydrogeology of the site. Detailed mapping compiled by Bryant and Reed was utilized for the base geology site map provided in the Assessment Plan. Bryant and Reed mapped an assemblage of a diverse group of rocks transitional between predominantly amphibolitic rocks and predominantly granitic Cranberry gneiss in the vicinity of the landfill. This assemblage is mapped and referred to by Bryant and Reed as "mixed rocks". The "mixed rocks" assemblage is a narrow band less than one half mile wide between the low grade metamorphic rocks of the layered cataclastic Cranberry gneiss and the tectonically overlying medium grade amphibolite and hornblende gneiss. These rocks are mapped as a unit, the contacts of which are drawn at the first occurrence of layers of granitic rock in the amphibolitic rock on one side, and the place where granitic layers become dominant on the other side (Bryant and Reed, 1970).

The mapped contact between the "mixed rocks" and the predominantly amphibolitic rocks is located directly beneath the Watauga County Landfill trending along a series of previously documented springs that have subsequently been buried by landfill activities. This contact trends in a northwesterly direction along the central drainage of the Bolick site and trends in a southwesterly direction along the toe of the slope of Rocky Knob, located above the Rocky Mountain Heights Subdivision. The contact along the toe of the slope of Rocky Knob is again characterized by a series of springs. The location of this contact coincides with the fracture trace illustrated on the Site Conceptual Model presented in the 1993 Assessment Plan. As discussed in the Plan, the fracture traces depicted on the 1993 Site Conceptual Model coincide with "trunk" conduits that receive flow from a network of smaller side conduits.

The attributes depicted on the original 1993 Site Conceptual Model are depicted on Figure 3 (Appendix A). A revised Geology Map, incorporating information obtained from Assessment Program drilling and site reconnaissance with information obtained from Bryant and Reed (1970) and the Watauga County Soil Survey (1944) was provided in the 1996 RIA report. The site geology map is provided in this report as Figure 4 (Appendix A). The map as well as all the other maps, graphs, charts and tables included in this report are considered supplements to the Site Conceptual Model. The comprehensive site conceptual model is composed of all these elements and consideration of all of these various facets are necessary to develop a model of the site.

Surface Hydrology

The site resides within the watershed of the South Fork of the New River. The area of the watershed potentially influenced by the site is comprised of three primary drainages that coincide with the fracture traces presented in the 1993 Site Conceptual Model. These three drainages include the unnamed tributary of Rock Branch located directly below the disposal area, the unnamed drainage located below the Bolick Site, and the unnamed tributary of Mutton Creek located within the Rocky Mountain Heights Subdivision. The unnamed tributary of Rocky Branch is the only drainage directly influenced by surface flow from the fill area. The other two drainages may only

be impacted by subsurface flow. Groundwater beneath the landfill is discharged from the fractured bedrock aquifer to the unconfined soil aquifer within these other two drainages.

Hydrogeology

Multiple interconnected aquifer systems exist in the vicinity of the site, comprised of several unconfined soil aquifers connected by a fractured bedrock aquifer. The extent of the unconfined soil aquifers are depicted on Figure 3. As noted in previous reports, the fracture system aquifer's extent is likely governed by its global geometry within the regional bedrock. The continuous nature of core fracture zones within the regional bedrock dictates the aquifer system's extent. The fractured bedrock aquifer appears to possess considerable lateral and vertical extent, although the fractures are locally concentrated in several core regions. Some of the groundwater from the fracture system is discharged to the soil at lower elevations where it eventually migrates to the South Fork of the New River and its tributaries.

Within the fractured bedrock, a succession of interconnected discontinuities supply groundwater at various depths. Wells installed within this fracture system have documented water production zones occurring at variable depths from 40 to 400 feet from the surface. The primary porosity of the unfractured metamorphic rock is likely <2%. Because of the pressures of the overlying bedrock, fracture occurrence, porosity and permeability generally decrease with depth.

A review of over sixty wells installed within the bedrock aquifer system in the vicinity of the site reveals that greater then 90% of the wells encountered sufficient water production zones before reaching depths of 200 feet from the ground surface. Although some wells were drilled to total depths of 500 to 600 feet from the surface, few wells access water production zones beyond 400 feet in depth. Attempts to install some of the wells in the vicinity of the site have not encountered sufficient water production zones after reaching depths of 500 to 600 feet from the surface. Typically groundwater production is encountered in a few discrete fracture zones rather than across numerous porous intervals.

Wells installed in both the fracture and soil aquifer systems reveal that the potentiometric surface is similar at variable aquifer depths. The shared potentiometric surface suggests that soil and fracture water production zones may be somewhat interconnected by hydraulically conductive fractures, joints, and/or shear zones. The discontinuities within the bedrock owe their origin to stresses related to thrust faulting and therefore are not likely to be horizontally oriented although they appear to have a rather continuous lateral extent. The resulting fracture flow directions are not necessarily the flow directions suggested by the potentiometric flow gradient, but rather those determined by fracture orientation. These flow patterns, can however, be generally predicted by overall drainage characteristics of the area. The shared potentiometric surface of the soil and fracture aquifer system is presented in Figure 2.

Fracture Trace Lineaments

The application of predictive contaminant transport models in fractured rock systems is hampered by the overwhelming difficulties encountered in fracture system characterization. Data collection is essential and lays the foundation for modeling the behavior of a site. Before modeling the fracture system and before being able to make even simple assumptions regarding site specific fracture flow rates immediately surrounding individual well heads, several important characteristics must first be described. Information regarding the mineral lineation, layering, and foliation trends within the host bedrock is presented below. These trends and orientations of mineral lineation, layering, and foliation relate to the nature of the discontinuities within the host bedrock.

Layering within the mixed rocks has been produced by shearing of the migmatitic layering found in the underlying Cranberry Gneiss. The most strikingly layered rocks are the most sheared and less sheared rocks are generally more granitic and have a migmatitic aspect. The mixed rocks appear to be a gradation zone between migmatitic Cranberry Gneiss and the overlying schist, gneiss, and amphibolite and as such reflect characteristics of both rock types (Bryant and Reed, 1970).

Lineation within the host bedrock is predominately formed by alignment of minerals and mineral aggregates and by elongated porphyroclasts and boundings. This lineation was formed during synkinematic recrystallization. Lineation generally trends northwest although the gradational character of the contact zone represented by the "mixed rocks" has resulted in a slightly variable or wavy lineation trend (Bryant and Reed, 1970).

Foliation, marked by aligned micas, tabular quartz-feldspar laminae, and planar arrangement of amphiboles, is well developed in most of the rocks of the Blue Ridge thrust sheet. In the Cranberry Gneiss, foliation is cataclastic and is formed primarily by planar orientation of micaceous minerals. In most of the tectonically overlying mica schist, gneiss, and amphibolite, cataclastic effects are lacking, and foliation apparently formed during synklinematic recrystallization (Bryant and Reed, 1970). Foliation generally trends northwest similar to lineation.

Cracks, fissures, fractures, joints, and shear zones within the regional bedrock interconnect to form the fracture system. The global geometry of the fracture system appears to possess both continuous and discontinuous zones. The continuous fracture zones primarily consist of conductive fractures that are very long compared to the region under study. The discontinuous fracture zones consist of dead end fractures, isolated fractures, and less conductive fracture zones.

The flow rates within specific discontinuities at site specific locations can be expected to depend on a variety of factors including the degree of interconnectedness, the frequency within single planes, the density per unit volume of rock, the effective aperture, and orientation and location in relation to gradient and relation to other discontinuities. Preliminary fracture analysis indicates that general approximations of these factors may be related to differences in metamorphic grades and to general physiographic expressions, in and surrounding the site. Preferential groundwater flow regimes interpreted within the bedrock are expressed at the surface by the evolution of topographic drainage features and springs.

Site reconnaissance and outcrop study documented the occurrence, nature, and orientations of fracture trace lineaments in local gneiss and schist bedrock assemblages. The Vicinity Geology Map (Figure 4) depicts both the microtextural and macrotextural linear features identified at the site. The microtextural linear features observed at seven bedrock exposures are represented by strike and dip symbols. The macro-textural linear features of nine physiographic features are represented by trend symbols.

Two primary lineament sets were observed at both the microtextural and macrotextural scale. The major lineament set is oriented parallel with layering, lineation, and foliation trends at approximately N55°W. Layering and foliation lineaments dip approximately 45° NE. A minor lineament set is oriented parallel to fracture and joint trends at approximately N10°E and dips almost vertically at 80° to 85°SE.

Site physiographic features (macrotextural) are directly related to the trends and orientation of mineral layering (microtextural) within the site bedrock. Layering within the "mixed rocks" was produced by shearing of the migmatitic layering found in the underlying Cranberry Gneiss. The mixed rocks appear to be a gradation zone between migmatitic Cranberry Gneiss and the overlying schist, gneiss, and amphibolite and as such reflect characteristics of both. The most strikingly layered rocks are the most sheared. Conversely, less sheared rocks are generally more granitic and have a migmatitic aspect (Bryant and Reed, 1970).

Northwest oriented site drainages developed over the most strikingly layered and sheared, schistose zones of the "mixed rocks". Northwest oriented site ridges developed over the more granitic zones of the "mixed rocks".

Layering and foliation in the metamorphic gneiss and schist bedrock assemblages occurring in the vicinity of the site are oriented parallel to, and dip away from the Grandfather Mountain window, located to the southwest. The gross structure of the Blue Ridge thrust sheet in the Grandfather Mountain area is that of an irregular dome with foliation and layering dipping away from the Grandfather Mountain window. The Linville Falls Fault separates the site bedrock assemblages of the Blue Ridge thrust sheet from the Grandfather Mountain window. Foliation and layering in bedrock near the window are generally subparallel to the Linville Falls Fault (Bryant and Reed, 1970). This alignment results in the general N55°W orientation and approximate 45°NE dip of the major lineament set in the vicinity of the site.

The northwest drainage below the Bolick site follows a path that combines both of the two primary lineament sets observed at the site. Upper reaches of the northwest drainage trend parallel to mineral layering, lineation, and foliation in the host bedrock as well as parallel to the general northwest trending contact between the amphibolite/hornblende gneiss-mica schist and gneiss and the "mixed rocks" assemblage (N55°W). Upon reaching an area where the amphibolite/hornblende gneiss is not stratigraphically overlain by the mica schist and gneiss, (inferred from the drilling of MW-18 as well as the distribution of residual soil distributions depicted on the Watauga County Soil Survey), the drainage trends N10°E, parallel to bedrock fracture and joint lineations.

The north trending portion of the northwest drainage below the Bolick site, the northern landfill drainage-Rocky Branch tributary, and the Rocky Mountain Heights-Mutton Creek tributary are all oriented approximately N10°E. The north trends of these three drainages are in contrast to the major northwest trends existing across the site described previously. Recent site reconnaissance observed microtextural expression of the north tending lineament in fractures or joints at two locations (denoted #4 and #6 on Figure 4).

The north trending fracture trace lineaments may be a result of joint-stress fracturing related to the thrust faulting. Bryant and Reed note that the majority of the discontinuities in the bedrock likely owe their origin to stresses related to thrust faulting. They suggest that all or part of the "mixed rocks", existing between the Cranberry Gneiss and the tectonically overlying amphibolite and hornblende gneiss, may be tectonic slices along a fault zone. Bryant and Reed are careful to note that local evidence of a major fault may be inconclusive particularly where digitations of amphibolite, "mixed rocks", and mica schist and gneiss project well into the Cranberry Gneiss.

Aquifer Media

Aquifer media encountered during the drilling of the assessment monitoring well network were classified into four primary categories. These four primary aquifer media are generally characterized by location, texture, and geology as follows.

Unconfined, surficial soil aquifer: residing in saprolitic silty sands and sandy silts at lower elevations, generally ranging approximately ten (10) to thirty (30) feet in depth, hydraulic conductivity variable although capable of flow rates up to 10 ft/day in developed preferential flow paths.

Unconfined, micaceous schist and gneiss bedrock aquifer: residing in a relatively porous, weathered micaceous schist and gneiss, situated above competent amphibolite/hornblende gneiss, located in the topographic low of the Rocky Branch watershed, approximate thickness likely ranges up to 100 feet (70 feet documented in MW-15), highly transmissive.

Semiconfined, amphibolite/hornblende gneiss bedrock aquifer: residing in competent, dense gneiss, characterized by small aperture, low density, infrequent fractures, located in the north-northeast portion of the site in the Rocky Branch watershed, fracture occurrence likely diminishes with depth, moderately transmissive.

Semiconfined, layered schist and gneiss bedrock aquifer: residing in a layered schist and gneiss characterized by textural contrasts, located in the central and south-southwest portion of the site, fracture occurrence likely diminishes with depth, variable transmissivities.

Potentiometric Surface

Examination of static water levels in site monitoring wells, business and domestic potable wells, piezometers, and running streams reveal that all four aquifers have a similar potentiometric surface. The similar potentiometric surface suggests the various aquifer media are interconnected by hydraulically conductive fractures. The shared potentiometric surface of the four aquifer media in the vicinity of the site is presented in Figure 2.

Groundwater elevations in the five nested well sites are higher for the deeper well relative to its shallow well, indicating an upward vertical hydraulic gradient between the deeper fractured bedrock aquifer system and the shallow soil aquifer at lower elevations. Downward vertical flow direction was observed at the contact between the micaceous schist and gneiss and the underlying amphibolite/hornblende gneiss. Static water level elevations collected from all site monitoring wells and piezometers during the background assessment monitoring events are listed in Table 4.

Recharge Sources

The upgradient recharge areas for the site aquifers are comprised of Rocky Knob (approximate elevation 4000 ft.) to the east of the site and a smaller knob (approximate elevation 3500 ft.) to the southwest. Rocky Knob is the primary recharge area in the vicinity of the site. The Rocky Branch watershed is additionally recharged from the northeast by a northwest trending ridge (approximate elevation 3500 ft.). The approximate elevations of potentiometric surface of the aquifers in the vicinity of the site range from 3100 ft. to 3305 ft.

Along the base of Rocky Knob, discharge is expressed at the surface by the presence of springs along a northwest trending contact between the amphibolite/hornblende gneiss bedrock and the zone of "mixed rock" (Figure 4). A series of previously documented springs subsequently covered by landfill activities also follows this trend to the northwest.

Recharge to the springs at the base of Rocky Knob and recharge to the Rocky Mountain Heights subdivision is provided along Rocky Knob. The primary westward groundwater flow direction from Rocky Knob, and a subjugate topographic and hydraulic divide existing south of the landfill, likely inhibit flow from the north across the ridge separating the landfill from the Rocky Mountain Heights subdivision.

Aquifer Testing

A variety of aquifer tests were performed on the assessment monitoring wells to evaluate relative flow rates of each aquifer. The approach applied to selecting appropriate aquifer test methods for various aquifers is presented in the following section. The information derived from the aquifer testing is utilized to define the rate of groundwater flow within various fracture and soil aquifers potentially impacted by landfill waste disposal activities. Aquifer test results support the flow regimes as presented previously in the discussion on site hydrogeology. A summary of aquifer test results is presented in Appendix A (Table 7).

Both slug (bail) tests and single-well recovery pump tests were performed initially. Test data and results were evaluated to determine the most appropriate method to utilize within specific aquifers accessed by individual wells. After initial aquifer testing attempts, single-well recovery pump test methods were refined by tailoring pumping rates and durations to each individual well recovery rate. Slug test methods were refined by emphasizing either early or late data collection efforts. Test method refinements attempted to produce data that was more representative of an individual aquifer for method type-curve and straight line matching.

The Bouwer and Rice slug test method (Bouwer, 1989), applicable to unconfined systems, was utilized to calculate the hydraulic conductivity (K) from slug test data obtained from wells accessing the soil aquifer. The Cooper-Bredehoeft-Papadopulos slug test method (Cooper, et al., 1967), applicable here for confined systems, was utilized to calculate the transmissivity (T) and storage coefficient (S) from slug test data obtained from wells accessing the fractured bedrock aquifer. The Theis recovery method (Theis, 1935) was utilized to calculate the transmissivity (T) and storage coefficient (S) from recovery pump test data obtained from all wells capable of sustaining sufficient pumping rates and purge durations. For the purpose of obtaining a comparative data set, transmissivity results were transformed to hydraulic conductivity (K) by dividing the transmissivity (T) by the well screen length. Aquifer thickness was taken to be the well screen length in hydraulic conductivity calculations under the assumption that the fractured bedrock production zone tapped by the well was unique, and provided all the recharge to the well.

Evaluation of initial aquifer test results indicate that the single-well recovery pump test method was most robust for application to moderate and fast recovering wells, and slug test methods were the most applicable to slow recovering wells. Table 7 provides the aquifer test results most representative of aquifer conditions, as chosen from the variety of tests performed. As previously noted, aquifer test results were chosen based on the ability of the test method to produce reliable method type-curve and straight line matching data.

The results from the conventional well-flow equations utilized for representing fracture flow rates (i.e. Cooper, Bredehoeft, Papadopulos slug test method and Theis recovery method) were developed for homogenous and isotropic aquifers and therefore may not describe fracture flow adequately. True fracture flow test methods will require prolonged (>2 days) pumping of a well and the existence and monitoring of several nearby nested well sets that also access the same fracture system. Prolonged, nested well pump tests may prove to be beneficial and cost effective after more information is attained during the plume assessment. The confined flow test methods were utilized primarily for comparison purposes and as such display the range of relative transmissivities existing within the various fracture systems.

Aquifer test method calculations were previously provided in the Watauga County Landfill Assessment Plan (September 1993) and the Watauga County Landfill Assessment Activity Report (July, 1994).

Aquifer Test Results

Soil Aquifer

Both the Bouwer and Rice slug test method and the Theis recovery method were used to obtain hydraulic conductivity or transmissivity results from the three assessment monitoring wells installed in the unconfined soil aquifer (i.e. MW-11, MW-13, and MW-16).

Well MW-13 exhibited slow recovery rates and was not capable of sustaining sufficient pumping rates and purge durations for obtaining proper, comparative recovery test data. Conversely, the recently installed soil aquifer well, MW-11, recovered too fast to provide useful slug test data with the field methods utilized. The Theis recovery method was chosen to calculate the transmissivity (T) from recovery data from both this fast recovering well, MW-11, and the moderately fast recovering well, MW-16. The Bouwer and Rice slug test method was chosen to calculate the transmissivity (T) from recovery data from MW-13.

The two methods' test results for the moderately fast recovering well MW-16 exhibit the robust nature of the Theis recovery method when compared with the Bouwer and Rice slug test method. The calculated hydraulic conductivity from the Theis recovery method result was twice as fast (11.827 ft/day) than the Bouwer and Rice slug test method result (5.131 ft/day). The discrepancy between recovery pump test and slug test results increases when comparing data generated from faster recovering wells. The increased accuracy and appropriateness of the recovery pump test method becomes apparent when necessary early-time slug test data is completely missed in the fast recovering wells and the comparative slug test result exhibit, in error, a relative decline in hydraulic conductivity.

As indicated in the aquifer test summary (Table 7), the calculated hydraulic conductivity for the slower recovering soil aquifer well (MW-13) was approximately 0.5 ft/day, compared with 6.5 ft/day (MW-11) and 15.0 ft/day (MW-16) for the faster recovering soil aquifer wells.

Amphibolite/Hornblende Gneiss Aquifer

Both the Cooper-Bredehoeft-Papadopulus (C-B-P) slug test method and the Theis recovery method were used in initial attempts to calculate comparable transmissivity (T) from slug and pump test recovery data obtained from the four assessment monitoring wells installed in the fractured amphibolite/hornblende gneiss aquifer (i.e. MW-10, MW-15, MW-17 and MW-18).

MW-10 exhibited slow recovery rates and was not capable of sustaining sufficient pumping rates and purge durations for obtaining proper, comparative recovery test data. Wells MW-15 and MW-17 exhibited slow to moderate recovery rates. Although the slug and recovery test method results compared favorably for MW-15 and MW-17, Theis single-well recovery pump test method results are presented in Table 2. It is generally recognized that the greater impact on the aquifer resulting from recovery pump test purge volumes produces more useful and accurate data for estimation pump of flow characteristics. Similarly, the Theis recovery method provided the most

accurate and applicable data for the only well installed within the amphibolite/hornblende gneiss aquifer to exhibit fast recovery rates, MW-18.

As indicated in, the final aquifer test result summary (Table 7), calculated hydraulic conductivity for the slower recovering amphibolite/hornblende gneiss aquifer well (MW-10) was approximately 0.003 ft/day, compared with 0.15 ft/day (MW-15) and 0.12 ft/day (MW-17) for the slow to moderate, and 15.9 ft/day (MW-18) for the fast recovering amphibolite/hornblende gneiss aquifer well.

Layered Schist/Gneiss Aquifer

Both the C-B-P slug test method and the Theis recovery test method were used in initial attempts to calculate comparable transmissivity (T) from slug and pump test recovery data obtained from the three assessment monitoring wells installed in the layered schist/gneiss aquifer (i.e. MW-8, MW-9, and MW-12).

All three wells installed in the layered schist/gneiss aquifer exhibited sufficient recovery rates to sustain pumping rates and purge durations necessary for obtaining proper recovery data. MW-9 exhibited slow to moderate recovery rates and the slug and recovery test method results compared rather favorably. Theis single-well recovery pump test results are presented in Table 7 in lieu of the slug test results for the reasons outlined previously. The robust nature of the Theis recovery test was increasingly apparent with the moderate to fast recovering well MW-8 and the fast recovering well MW-12. MW-12 recovered too fast to provide useful slug test data.

As indicated in the aquifer test summary (Table 7), the calculated hydraulic conductivity for the layered schist/gneiss aquifer wells ranged from 0.2 ft/day (MW-9) to 0.9 ft/day (MW-8) to 14.5 ft/day (MW-12).

Micaceous Schist/Gneiss Aquifer Medium

The Theis single-well recovery pump test method was utilized to calculate the transmissivity (T) from recovery data obtained from well MW-14, installed in the micaceous schist/gneiss aquifer medium. Recovery in well MW-14 was too fast to provide useful slug test data. As indicated in the aquifer test summary (Table 7), calculated hydraulic conductivity for MW-14 was approximately 11.8 ft/day.

Nested Well Test Observations

The following three sets of nested wells were observed during aquifer testing to determine the interconnectedness of the aquifer(s) at variable depths:

- MW-11 and MW-12
- MW-13 and MW-18
- MW-14 and MW-15

During purging of the deep well for each nested set, the water level in the adjacent shallow well was observed. Loss of groundwater elevation in the shallow well would indicate hydraulic communication in the aquifer. Recovery rates found in the shallow wells MW-11 and MW-14 were much too fast to be impacted by the relatively short duration pumping (1½ hour) of the deeper nested well. Even the deep nested wells were capable of constant flow rates approaching 7 gallons per minute. Therefore, the inference provided by this observation is not conclusive. Nonetheless, contaminant distributions indicate considerable interconnectedness of all aquifer depths.

Although the recovery rate found in the shallow nested well MW-13 was relatively slow, the recovery rate of the deeper nested well MW-18 was still too fast to significantly overcome with the relatively short duration pumping (½ hour) of the recovery test. Nonetheless, a connection between the soil and bedrock aquifer was observed at the location of this nested well set. After pumping the bedrock aquifer at 3 gallons per minute for 18 minutes, the water level in the soil aquifer dropped 0.07 feet.

As indicated in the description of hydrogeologic conditions presented in section 2.6 of the Assessment Plan, the shared potentiometric surface of the various aquifer media suggest that these aquifer zones are interconnected by hydraulically conductive fractures, joints, and/or shear zones. Comparison of the individual potentiometric surfaces of the nested wells and piezometers indicate that groundwater from the fracture system is discharged to the soil aquifer at lower elevations. Groundwater discharge to the soil aquifer and surface eventually migrates to the South Fork of the New River and its tributaries.

Comparison of the individual potentiometric surfaces within the micaceous schist/gneiss (MW-14) and the amphibolite/hornblende gneiss (MW-15), located adjacent to Rocky Branch, indicate a downward vertical flow gradient exists at the contact between these two different metamorphic grade formations.

Aquifer Flow Summary

Conservative estimates of site groundwater flow rates range from 0.01 ft/day to 10 ft/day. These findings generally agree with research provided by Zurawski (1978) that indicate hydraulic conductivity of the fractured metamorphic aquifer domain potentially ranges between 1 and 100 ft/day.

Additional observations of flow characteristics obtained from drilling and aquifer testing are summarized below.

1. Fast flow rates, comparable and even faster than flow rates observed within preferential soil flow paths, occur within portions of the fracture system.

2. The nature and flow characteristics of the various fractured bedrock aquifers can vary considerably depending on both metamorphic assemblage and physiographic location.

a. The micaceous schist/gneiss aquifer medium is a relatively porous and permeable medium that supports relatively fast flow rates.

b. The amphibolite/hornblende gneiss aquifer medium tends to be predominantly characterized by tight aperture, infrequent fractures that support relatively moderate flow rates. Fracture aperture widths, densities, and frequencies within this medium can be expected to vary considerably depending on physiographic location.

c. The layered schist/gneiss aquifer flow rates are influenced by a variety of textural bedrock features (layering, shear zones, foliation, etc.) and appear related to physiographic location. Physiographic expressions within the layered schist/gneiss are influenced by textural contrasts related to the variable metamorphic assemblages comprising this mixed unit.

1998 BREMCO Well Testing

In October 1998, the BREMCO well bore was geophysically and visually logged to identify water-producing fracture zones, and once the water-production zones were delineated, each discrete fracture zone was hydraulically isolated and sampled with an inflatable straddle packer assembly. The BREMCO Well Testing Report (March, 1999) presents the results of this investigation.

The west surface drainage below the landfill, in the vicinity of the BREMCO well, follows a path that combines both of the two primary lineament sets observed at the site. Upper reaches of the surface drainage trends parallel to mineral layering, lineation, and foliation in the host bedrock as well as parallel to the general N55°W trending contact between the amphibolite/hornblende gneiss and "mixed rocks" unit. Upon passing under Route 421, the surface drainage trends N10°E, parallel to bedrock fracture and joint lineations.

As documented in the 1994 Activity Report, two paired Assessment monitoring wells (shallow MW-13 and deep MW-18) were installed northwest of Route 421 in the west drainage. These two wells were located adjacent to and west of the west surface drainage below the landfill along the N10°E lineament. No target organic compounds have been confirmed in the groundwater at this location. As discussed previously, the flow rate in MW-18 was the fastest encountered on-site. As discussed further below, the flow rates encountered in the BREMCO well are among the slowest. It appears that most of the groundwater in the west drainage flows along the N10°E lineament and discharges to the South Fork of the New River. The absence of target organic compounds in this area is likely due to dilution resulting from the high flow rates.

The trace level detection of target organics in the BREMCO well suggested some groundwater within the west drainage continues to follow the N55°W lineament set within the west drainage rather than the N10°E lineament set that the surface drainage follows. The 1996 RIA Report proposed that an additional assessment monitoring well, MW-19, be installed adjacent to the BREMCO well in response to the trace level detection of target organic constituents in the BREMCO well.

MW-19 was installed in March 1997, approximately 50 feet north-northwest of BREMCO well, and screened at the contact between the "mixed rocks' (i.e., schist/gneiss) and the amphibolite/hornblende gneiss. This geologic contact represents a core fracture zone within the bedrock fracture system. Abundant groundwater was observed at this depth and the monitoring well was completed at 70 feet in depth and screened over the geologic contact. Subsequent samplings of MW-19 in April 1997 and January 1998 resulted in no detected organic compounds.

Impacts observed in the BREMCO well suggested that solid waste constituents were migrating in a deeper zone than that screened by monitoring well MW-19. The existing BREMCO well bore, 425 feet deep, was utilized to identify the depth of impact.

The BREMCO well bore passes the contact between the semi-porous schist/gneiss unit and the dense, discretely fractured amphibolite/hornblende gneiss unit. The bottom of the surface casing for the BREMCO well, installed at 55.5 ft in depth, appears to be at the contact of the these two rock units, therefore, groundwater residing in the schist/gneiss is effectively cased-off. Below the casing, groundwater flow was predominantly from three distinct fracture zones, typical of flow conditions commonly encountered in the amphibolite/hornblende gneiss.

The first production zone was encountered in a discrete interval from 90 feet to 91.5 feet in depth. Packer testing results indicated this shallow zone produces less than 1 gallon per hour and sampling indicated the shallow zone is not impacted. The second and third production zones were encountered in two distinct intervals, from 245 feet to 247.5 feet in depth and 322.5 feet to 325 feet in depth, respectively. Packer testing results indicated these two deeper zones both produce approximately 1.5 gallons per minute. Detected concentrations in both deeper fracture zones are at low levels below human health-based standards. The low level detections resulting from the packer testing of the two deeper fracture zones are similar to levels encountered during the previous twelve sampling and analysis events performed on the BREMCO well by the ADHD.

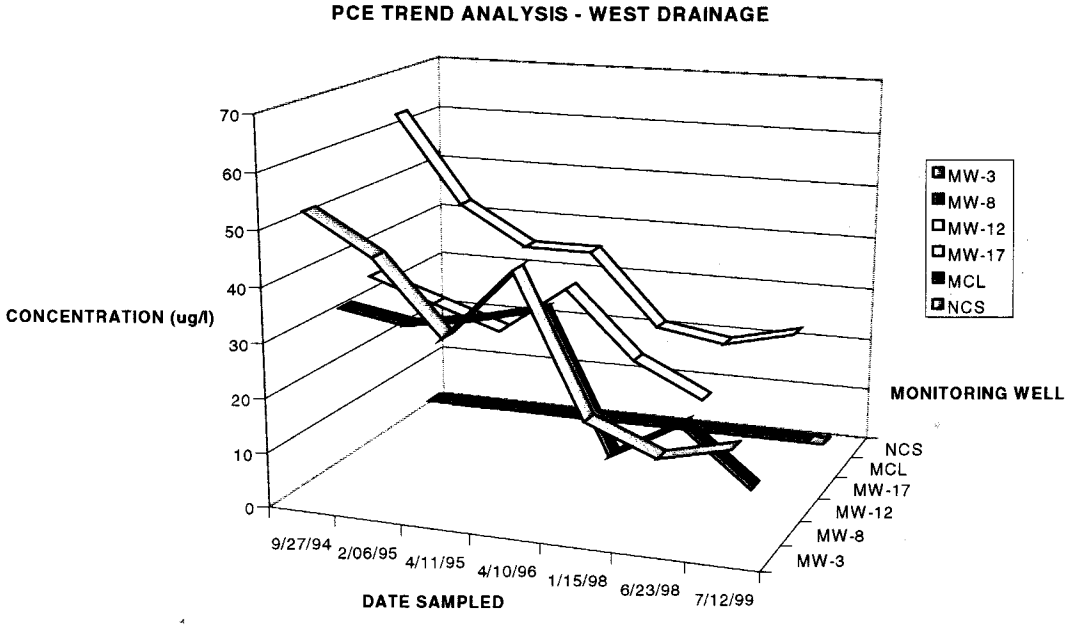
The results of the packer testing indicate impact to the BREMCO well does **not** enter the well at higher concentrations in deeper groundwater production zones than indicated by the ADHD's routine sampling at the wellhead. The results also indicate that routine ADHD sampling of the BREMCO well produces representative results of the two deeper fracture zones. In addition, the low flow rates encountered in the impacted production zones suggest that transport and migration of the constituents is slow. The low flow rates combined with the steady state, low level impacts observed since 1993 suggest that this area may represent a discontinuous, dead-end zone of the west drainage flow regime. These results indicate the risks from transport and migration of constituents beyond the currently identified area is minimal.

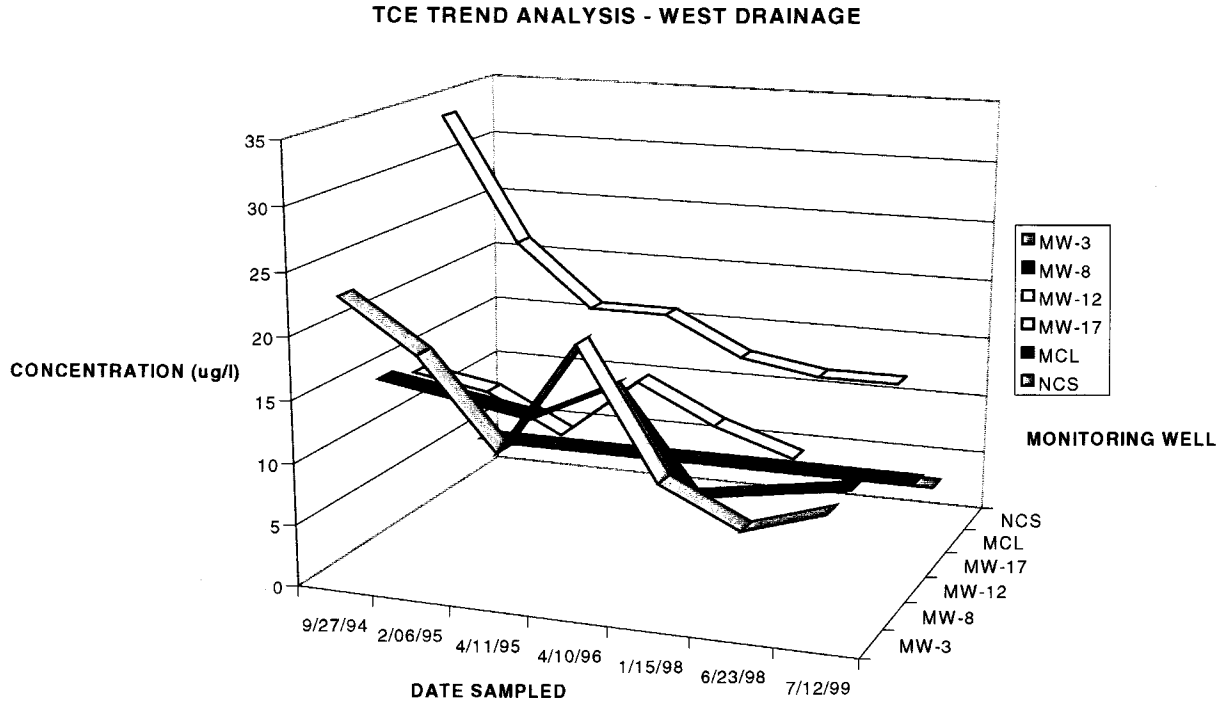
7.3 Site Conceptual Model – Parameter Concentration Trends

As presented graphically below, the analytical results indicate significant reductions in the extent and concentration of impact have occurred across the site. Although the northern edge of the occurrence of assessment target parameters in the groundwater continues to primarily exist within the construction right-of-way for the pending Route 421 bypass, reductions of concentrations and extent are observed to the south. South of the bypass, the detection of assessment target parameters continues to be concentrated between the saddle, located between the landfill and the Rocky Mountain Heights Subdivision, and the west and north drainages below the landfill. Again, note that reductions of concentrations and extent are observed.

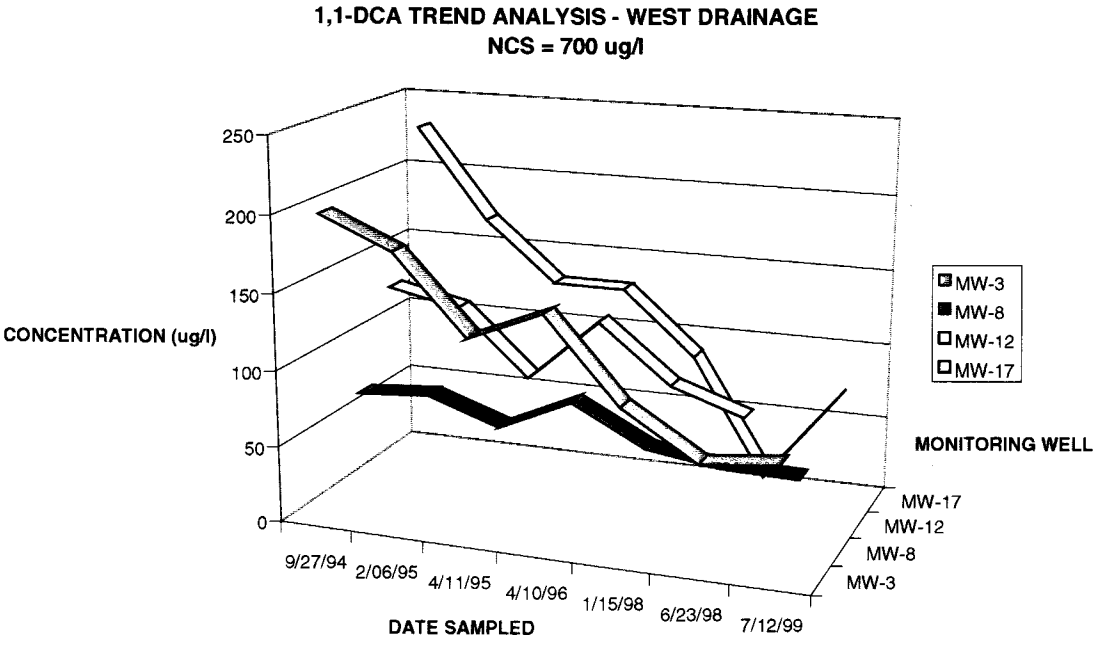
West Drainage - Historically, all eleven target parameters were detected at certian wells in the west drainage on more than half the monitoring events. PCE, TCE and vinyl chloride were typically detected above respective EPA MCLs in both the soil and bedrock aquifers in the west drainage, extending from the landfill to the bypass. As a result of the July 1999 monitoring event, nine target parameters were detected in shallow well MW-3. No target parameters were detected in deep well MW-12. This bedrock well, located beyond the property boundary in the west drainage, has historically exceeded the EPA MCL for one or more organic target parameters. This non-detect event suggests that the extent of impact in the west drainage is gradually retreating.

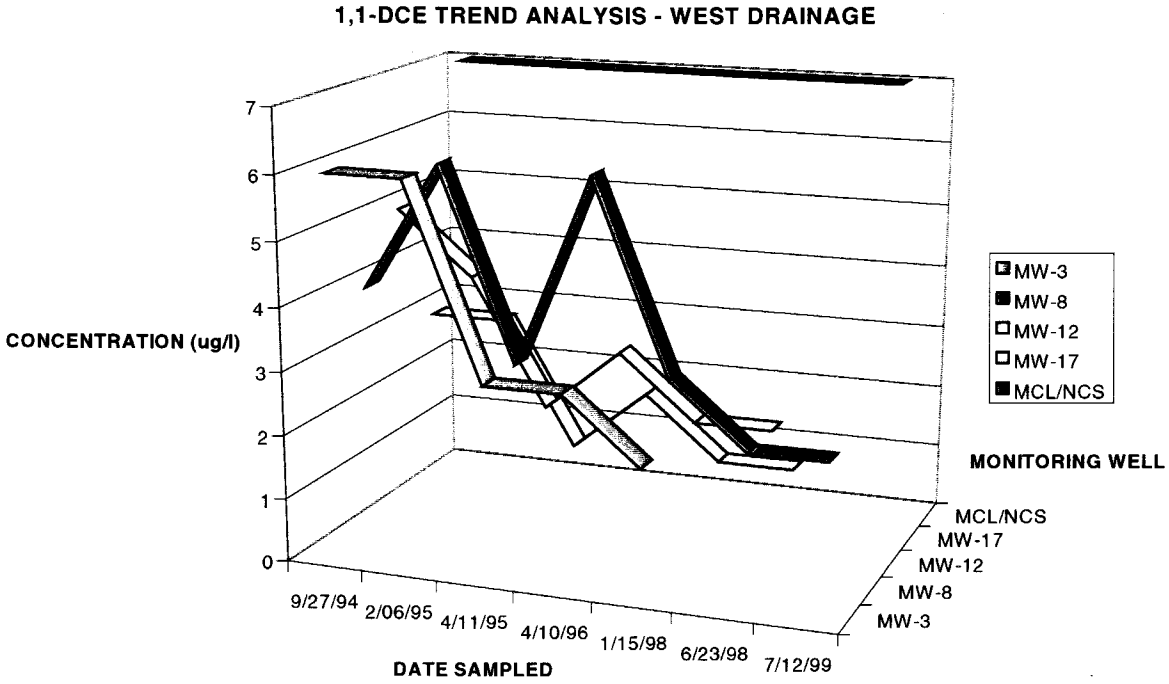
Concentrations of vinyl chloride have decreased to levels at or below the EPA MCL for all wells in July 1999. Although concentrations of PCE and TCE have not decreased to levels below the EPA MCL in the west drainage, as indicated by the following trend graphs, concentrations of these two parameters have exhibited significant decreases.





As indicated by the following 1,1-DCA and 1,1-DCE trend graphs, the concentrations of these two parameters have also exhibited general decreases in the west drainage.



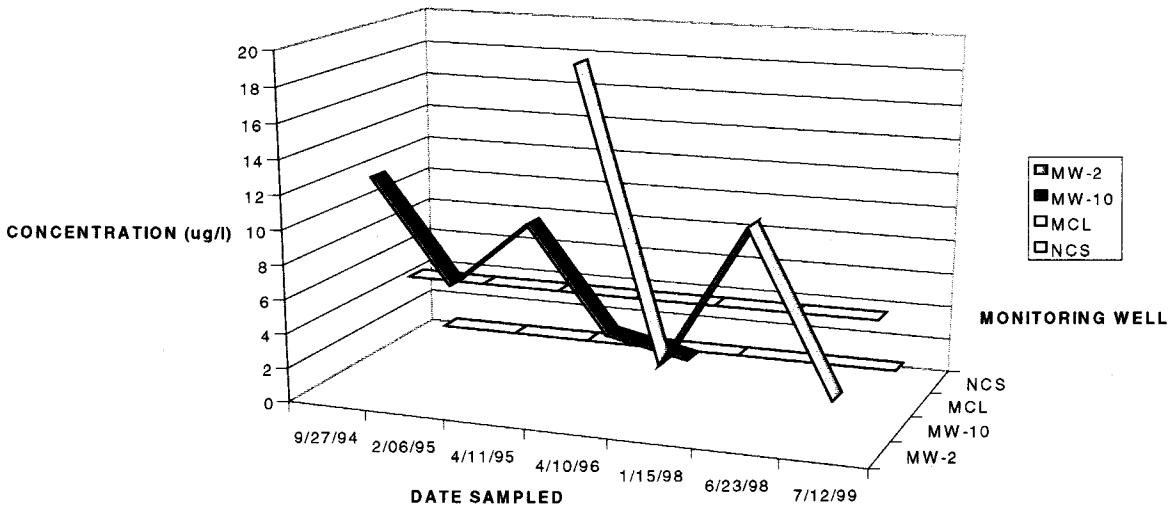


Historically, six or seven target organic parameters were typically detected at the surface water sampling location, S-4, located in the west drainage. Four organic parameters were detected at S-4 in July 1999. Sampling and analysis performed on surface water sampling location, S-6, located approximately 800 feet downstream from S-4, did not detect any organic parameters. In 1994 and 1995, two parameters, 1,1-DCA and PCE, were detected above NC surface water quality standards at S-4. The concentrations of all detected organic parameters were considerably below NC surface water quality standards in July 1999.

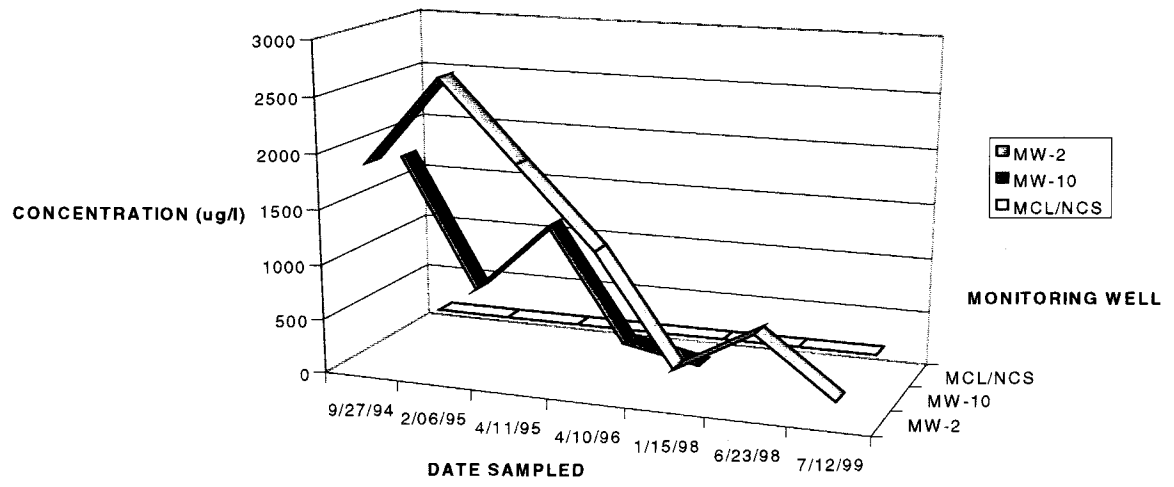
North Drainage - In the north drainage, the detection of organic parameters is confined to the bedrock aquifer. Historically, a total of four target organic parameters were typically detected in the north drainage in bedrock wells MW-2 and MW-10. As a result of the July 1999 event, these same four target organic parameters (1,1-DCA, 1,1-DCE, 1,1,1-TCA and PCE) were again detected in the north drainage.

Elevated concentrations of 1,1-DCE and 1,1,1-TCA historically observed in MW-2 indicate preferential migration to deeper fracture zones within the bedrock in the north drainage. The concentration of three parameters, 1,1-DCE, 1,1,1-TCA and PCE, historically exceeded their respective EPA MCLs in both MW-2 and MW-10. As indicated by the following 1,1,1-TCA and PCE trend graphs, in the past two years the concentrations of these parameters have decreased to levels below their respective EPA MCLs in the north drainage.

PCE TREND ANALYSIS - NORTH DRAINAGE

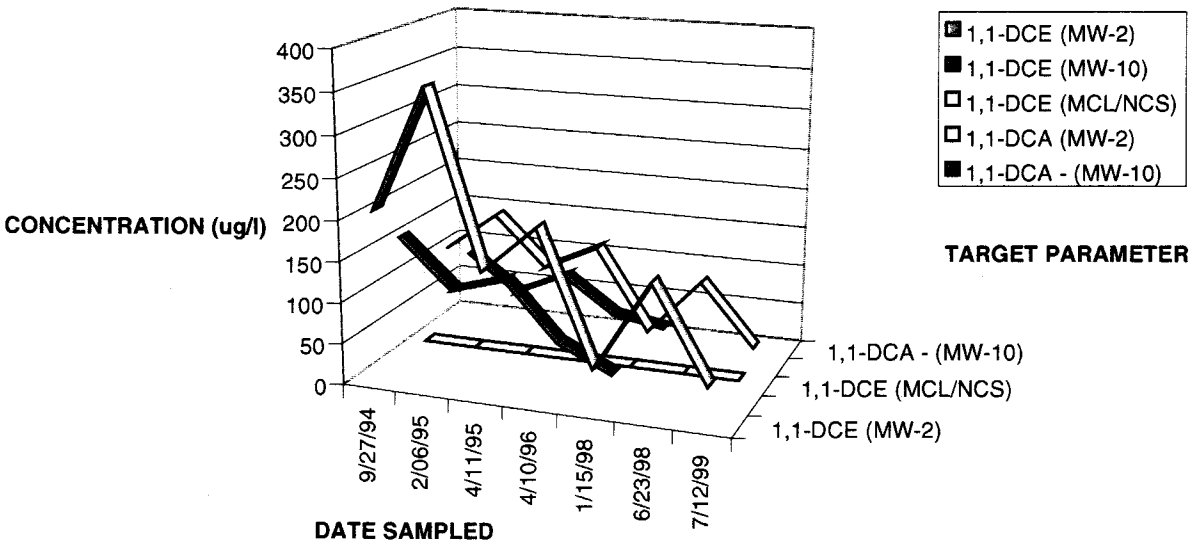


1,1,1-TCA TREND ANALYSIS - NORTH DRAINAGE



As indicated by the following trend graph, significant decreases of 1,1-DCE concentrations have also been observed, although levels have not decreased below the EPA MCL. Also represented on this graph is 1,1-DCA, the remaining parameter typically detected in the north drainage. This parameter has experienced similar concentration decreases. Note that all 1,1-DCA concentrations are considerably below the NC groundwater quality standard of 700 µg/l. No EPA MCL exists for 1,1-DCA.

1,1-DCE AND 1,1-DCA TREND ANALYSIS - NORTH DRAINAGE



Downgradient of the northern drainage, groundwater within the bedrock aquifer system discharges to the central watershed of Rocky Branch and is apparently significantly diluted. The low level detection of 1,1,1-TCA in MW-15 as a result of previous monitoring events suggests that groundwater flow continues to follow the northern drainage orientation before reaching the apex of the watershed at Rocky Branch. The Chevrolet Dealership's potable well is located downgradient within this Rocky Branch watershed. The absence of similar volatile organic parameters detected at the Chevrolet Dealership's potable well (Appendix D) suggests flow does not begin to trend parallel

to Rocky Branch prior to reaching MW-15. Note that an abandoned and an existing septic field utilized by the dealership are located near the dealership's well. Three non-landfill related organic parameters, likely originating from automotive sources near the well head, have been observed in the dealership's well.

Southern Saddle - Several organic compounds detected in monitoring well MW-9, located along the southern saddle between the landfill and the Rocky Mountain Heights subdivision, particularly methylene chloride, have been historically observed at markedly different concentrations than the levels of the organic compounds detected in the remainder of the monitoring well network. In 1993, the abandoned Carroll residence well (reference no. 12), located approximately 100 feet from MW-9, was found to be significantly impacted by many of the same organic compounds. It should be noted that eight (8) of twenty-one (21) compounds detected in the Carroll residence well have not been detected in the landfill monitoring well network (including MW-9). The cause or source of the organics detected in the Carroll well was not established, although the differences in parameter "fingerprints" in groundwater from the Carroll well compared to "fingerprints" for other landfill wells (including MW-9) tends to indicate impacts resulting from some source other than the landfill.

Trace levels of the same organic parameters detected in both the Carroll well and the landfill monitoring well network have also been previously detected in several other potable wells located south of the saddle. The frequency of detection of these trace levels has declined significantly between 1993 and 1999. Since June 1997, trace organic levels have only been detected in one well located south of the saddle (the Ward residence well) and only on one of three events.

Historically, a total of nine target organic parameters were typically detected in MW-9. As a result of the July 1999 event, five target organic parameters were detected in MW-9. The concentration of two parameters, methylene chloride and trichloroethene, historically exceeded their respective EPA MCLs in MW-9. In the past two years, the concentrations of methylene chloride and trichloroethene have decreased to levels below their respective EPA MCLs in MW-9. In fact, methylene chloride was not detected in MW-9 in July 1999. Concentrations in other detected target organic parameters have experienced similar declines.

July 1999 Event Summary - As presented throughout this report, the July 1999 monitoring event's data supports that significant decreases in target parameter concentrations continue to occur in the impacted groundwater and surface water across the site.

Three target parameters (chloroethane, methylene chloride and vinyl chloride) were only detected within the west drainage.

Three other target parameters (benzene, cis-1,2-DCE, TCE) were reported within both the west drainage and southern saddle. Note that concentrations of benzene, cis-1,2-DCE, methylene chloride, TCE and vinyl chloride have all decreased to levels below EPA MCLs at several core monitoring locations. No EPA MCL exists for chloroethane.

The detection of 1,1,1-TCA and 1,1-DCE was observed in both the west and the north drainages, although these parameters were observed at higher levels in the north drainage at the deep bedrock well MW-2. Note that concentrations of 1,1,1-TCA have decreased to levels below the EPA MCL at both MW-2 and MW-10 in the north drainage.

The detection of PCE was also observed in both the west and the north drainages, although at higher levels in the west drainage. Note that concentrations of PCE have decreased to levels below EPA MCLs at both MW-2 and MW-10 in the north drainage.

The detection of 1,1-DCA was observed at elevated concentrations in more monitoring wells throughout the site than any other target parameter. Note that although no EPA MCL exists for 1,1-DCA levels are below NC groundwater protection standards, and 1,1-DCA concentrations continue to decrease across the site.

Dichlorodifluoromethane was not detected at any monitoring wells or surface water sampling locations as a result of the July 1999 event. This is the second consecutive semiannual Assessment event that dichlorodifluoromethane was not detected.

7.4 Site Conceptual Model – Distribution Trends

The following presentation of the site conceptual model includes descriptions of both past and current extent of impact, with delineation maps including vertical and horizontal isopleths, for select individual target parameters. The contaminant plumes inferred from four separate monitoring events are included to demonstrate the significant decreases in target parameter concentrations that have been observed. The concentration trends illustrated by the maps and cross-sections are represented graphically in the previous section of this report. A narrative, briefly describing the distribution and concentration trends illustrated by the maps and cross-sections, is provided in this section of the report. The vertical and horizontal plume delineation maps are in Appendix F.

The first monitoring event represented in the set of plume delineation maps was completed on the piezometer network installed on the Bolick Site in 1992. A similar plume delineation map, based on a single distribution inferred utilizing a contaminant ranking scheme, was presented in the original report documenting the 1992 Bolick Site Investigation. Fourteen monitoring points, sampled in November 1992, were ranked according to the presence and levels of various target compounds. The mapping of this ranking delineated a plume confined along the central portion of the west drainage of the Bolick Site. Piezometers located on either side of the drainage were not impacted. This mapping is provided to illustrate the concentrations observed in 1992, and present some of the early data that is utilized in subsequent delineation maps. The data utilized for inferring the delineation is depicted in parentheses on each map.

The second monitoring event represented in the set of plume delineation maps was completed in April 1996. These concentration plots were based on distributions simulated using the computer graphing package Surfer for Windows, Version 6.0. The distribution of the sample set of data from July 1995 was simulated using the estimation procedure called *Kriging*. The simulated distribution was developed to assist in characterizing parameter transport,

migration and fate responses for the 1995 RIA Report. The April 1996 data was chosen for inclusion in this set of plume delineation maps due to the fact that it was performed immediately prior to the installation of the remedial cap at the facility. The remedial cap was installed in the Fall of 1996.

The remaining two events included in the set of plume delineation maps were completed in 1999. The delineation maps from the 1999 monitoring events illustrate the significant decreases in target parameter concentrations that have been observed since the remedial cap was installed.

The horizontal plume delineation maps combine data from various depths by weighting the distribution in favor of the more impacted zone. For example, if a deeper well suggests impact whereas a shallower well in the area suggests non-impact, the area will be depicted as impacted. Although the monitoring well data forms the foundation for the inferred distributions, knowledge of flow directions, drainage patterns, and additional sampling efforts were incorporated in each determination. Additional sampling efforts include sampling performed on the Nissan-Mazda septic field wells in February and April, 1995, as well as the considerable sampling performed semiannually on the potable well network surrounding the landfill. The primary data utilized for inferring the distribution is depicted in parentheses on each map. Additional data can also be found on the summary data tables included in Appendix A of this report.

Cross sections are also provided for the 1996 and 1999 sampling data for select target parameters. The cross-sections illustrate the vertical plume delineation along select core zones that are identified by the horizontal plume delineation maps. Note that multiple monitoring locations that exist at various depths along the edge and outside of the plume boundary have been utilized to infer the vertical distribution beyond known conditions within the core of the plume. The cross-sections acknowledge that the vertical extent within the core of the plume is not fully determined by dashing the concentration contours at the inferred greater depths.

The following provides a brief narrative describing the distribution and concentration trends illustrated by the maps and cross-sections provided for each target parameter.

1,1-Dichloroethane (1,1-DCA)

1,1-DCA is the most prevalent target parameter at the site. Nonetheless, significant decreases in 1,1-DCA concentrations are observed in all impacted monitoring wells and surface water sampling locations. 1,1-DCA concentrations observed in the fourteen piezometers and wells sampled in November 1992 during the Bolick Site investigation delineated a plume confined along the central portion of the west drainage. The April 1996 1,1-DCA results indicated areas with concentrations above 100 µg/l in both the north and west drainages. By 1999, 1,1-DCA concentrations in these core areas have reduced to less than 100 µg/l.

Although detected in all the core subset monitoring wells except MW-12 in July 1999, all concentrations of 1,1-DCA were considerably below the NC groundwater quality standard of 700 µg/l. No EPA MCL exists for 1,1-DCA. Low estimated concentrations of 1,1-DCA, below the NC

surface water quality standard of 42 µg/l, were also observed at surface water sampling locations S-2 and S-6.

1,1-DCA has previously been detected in the Rocky Mountain Heights Subdivision at the abandoned Carroll residence potable well (in 1993) and at trace levels in the active Ward and Shared Well #2 potable wells (between 1994 and 1996). Recent sampling events performed on the Ward residence and Shared Well #2 in 1997, 1998 and 1999 have not detected 1,1-DCA. 1,1-DCA has not been detected in any additional wells in the Rocky Mountain Heights Subdivision to date.

1,1-DCA has previously been detected in the west drainage at the abandoned Nissan-Mazda Dealership's potable well (in 1993), BREMCO (on all thirteen events between 1993 and 1999), and the Bolick rental residence (on six of eight events between 1993 and 1999). 1,1-DCA has not been detected in any additional potable wells to date.

cis-1,2-Dichloroethene (cis-1,2-DCE)

CLP-SOW analytical results for cis-1,2- DCE are reported as part of a total concentration of cis- and trans- isomers of the parameter (total 1,2-DCE). Cis-1,2-DCE concentrations observed in the fourteen piezometers and wells sampled in November 1992 during the Bolick Site investigation delineated a plume confined to the lower portion of the west drainage. The April 1996 results indicated areas with cis-1,2-DCE concentrations above 100 µg/l in the upper portion of the west drainage. By 1999, cis-1,2-DCE concentrations in these core areas have reduced to less than 100 µg/l.

In July 1999, total 1,2-DCE was detected at concentrations above the EPA MCL and NCS of 70 µg/l in one well (MW-17). Total 1,2-DCE was detected at lower concentrations in three additional wells (MW-3, MW-8 and MW-9). Total 1,2-DCE was estimated at low concentrations, considerably below the NC surface water quality standard of 140,000 µg/l, in two surface water sampling locations (S-2 and S-4).

Significant decreases in cis-1,2-DCE concentrations continue to be observed in all impacted monitoring wells and all impacted surface water sampling locations. Cis-1,2-DCE concentrations in monitoring well MW-8, located in the west drainage, have decreased to levels below the EPA MCL.

In 1993, cis-1,2-DCE was detected in the abandoned Carroll residence potable well, located on the property located immediately adjacent to MW-9. Cis-1,2-DCE has not been detected in any additional wells in the Rocky Mountain Heights Subdivision to date.

Cis-1,2-DCE has previously been detected in the west drainage at the abandoned Nissan-Mazda Dealership's potable well (in 1993 and 1994) and BREMCO's well (on ten events between 1993 and 1999). Cis-1,2-DCE has not been detected in any additional potable wells to date.

Tetrachloroethene (PCE)

Significant decreases in PCE concentrations continue to be observed in virtually all impacted monitoring wells and impacted surface water sampling locations. PCE concentrations observed in the fourteen piezometers and wells sampled in November 1992 during the Bolick Site investigation delineated a plume with PCE concentrations above 50 µg/l confined to the lower portion of the west drainage. The April 1996 results indicated PCE concentrations had already diminished to less than 50 µg/l, and by 1999, PCE concentrations in these core areas have reduced to less than 20 µg/l.

PCE concentrations in monitoring wells MW-2 and MW-10, located in the north drainage, have decreased to levels below the EPA MCL. Concentrations observed in the impacted surface water sampling location, S-4, which decreased to levels below the NC surface water quality standard between 1996 and 1997, also continue to meet surface water quality standards. In July 1999, PCE was detected or estimated at concentrations above the EPA MCL of 5 µg/l in three monitoring wells (MW-3, MW-8 and MW-17) and estimated at concentrations above the NCS of 0.7 µg/l in two additional wells (MW-2 and MW-9). PCE was detected in one surface water sampling location (S-4) at an estimated concentration below the NC surface water quality standard of 8.84 µg/l.

PCE has previously been detected in the Rocky Mountain Heights Subdivision at the abandoned Carroll residence potable well (in 1993) and at trace levels in the Ward residence potable well (between 1993 and 1996). The most recent sampling of the Ward residence in 1998 and 1999 did not detect PCE. PCE has not been detected in any additional wells in the Rocky Mountain Heights Subdivision to date.

PCE has previously been detected in the west drainage at the abandoned Nissan-Mazda Dealership's potable well (in 1993), BREMCO (on eleven events between 1994 and 1999), and the Greer residence (in 1994). A subsequent sampling event performed on the Greer residence in 1994 did not detect PCE. PCE has not been detected in any additional potable wells to date.

Trichloroethene (TCE)

Significant decreases in TCE concentrations continue to be observed in all impacted monitoring wells as well as all impacted surface water sampling locations. TCE concentrations observed in the fourteen piezometers and wells sampled in November 1992 during the Bolick Site investigation delineated a plume with TCE concentrations above 100 µg/l confined to the upper portion of the west drainage. The April 1996 results indicated TCE concentrations had already diminished to less than 30 µg/l, and by July 1999, TCE concentrations in these core areas have reduced to less than 16 µg/l. TCE concentrations in two wells, MW-9, located in the southern saddle, and MW-12, located beyond the property boundary in the west drainage, have decreased to levels below the EPA MCL.

In July 1999, TCE was detected at concentrations above the EPA MCL of 5 µg/l in three monitoring wells (MW-3, MW-8 and MW-17) and estimated at concentrations above the NCS of 2.8 µg/l in one additional well (MW-9). TCE was estimated in one surface water sampling location (S-4) at a concentration below the NC surface water quality standard of 92.4 µg/l.

TCE has previously been detected in the Rocky Mountain Heights Subdivision at the abandoned Carroll residence potable well (in 1993) and at trace levels in the Ward residence potable well (in 1993 and 1994). Six subsequent sampling events performed on the Ward residence between 1995 and 1998 did not detect TCE. TCE has not been detected in any additional wells in the Rocky Mountain Heights Subdivision to date.

TCE has previously been detected in the west drainage at the abandoned Nissan-Mazda Dealership's potable well (in 1993 and 1994), BREMCO's well (on twelve events between 1993 and 1999), and the Bolick rental residence (in 1993). Seven subsequent sampling events performed on the Bolick rental residence between 1994 and 1998 did not detect TCE. TCE has not been detected in any additional potable wells to date.

1,1,1-Trichloroethane (1,1,1-TCA)

Significant decreases in 1,1,1-TCA concentrations continue to be observed in all impacted monitoring wells. The April 1996 results indicated areas with 1,1,1-TCA concentrations above 1000 µg/l in the north drainage. By July 1999, 1,1,1-TCA concentrations in the north drainage have reduced to less than 200 µg/l, below the EPA MCL and NCS. In July 1999, 1,1,1-TCA was estimated at much lower concentrations in three additional monitoring wells (MW-3, MW-8 and MW-17). 1,1,1-TCA was not detected at any surface water sampling locations.

1,1,1-TCA has previously been detected in the Rocky Mountain Heights Subdivision at the abandoned Carroll residence potable well (in 1993) and at trace levels in the Ward residence well (between 1993 and 1994). Seven subsequent sampling events performed at the Ward residence between 1995 and 1999 did not detect 1,1,1-TCA. 1,1,1-TCA has also been detected in three additional potable wells in the Rocky Mountain Heights Subdivision; the Simko residence well (on four sampling events performed between 1993 and 1997), the Shared Well #2 (on two of eight sampling events performed between 1993 and 1998), and a Meadowridge condominium well (on one event performed in 1993).

1,1,1-TCA has previously been detected in the west drainage at the abandoned Nissan-Mazda Dealership's potable well (in 1993) and BREMCO (on twelve events between 1993 and 1999). 1,1,1-TCA has not been detected in any additional potable wells in the west drainage to date.

Vinyl Chloride

The last set of distribution maps included in Appendix F is for vinyl chloride. Vinyl chloride concentrations observed in the fourteen piezometers and wells sampled in November 1992 during the Bolick Site investigation delineated a plume with vinyl chloride concentrations above 10 µg/l

in both the upper and lower portions of the west drainage. The April 1996 results indicated vinyl chloride concentrations had not significantly diminished, although by 1999, vinyl chloride concentrations in these core areas have reduced. In July 1999, estimated concentrations of vinyl chloride were observed at the EPA MCL of 2 µg/l and above the NCS of 0.015 µg/l in only two monitoring wells (MW-3 and MW-17). Vinyl chloride was not detected in the surface water.

In 1993, vinyl chloride was detected in the abandoned Carroll residence potable well, located on the property located immediately adjacent to the southern saddle. Vinyl chloride has not been detected in any additional potable wells to date.

1,1-Dichloroethene (1,1-DCE)

Although no distribution maps are provided for 1,1-DCE, note that significant decreases in 1,1-DCE concentrations continue to be observed in all impacted monitoring wells. In July 1999, 1,1-DCE was detected at concentrations above the EPA MCL and NCS of 7 µg/l in two monitoring wells (MW-2 and MW-10). 1,1,1-TCA was also detected at lower concentrations in four additional monitoring wells (MW-3, MW-8, MW-12 and MW-17). 1,1-DCE was not detected in any of the surface water samples.

1,1-DCE has previously been detected in the Rocky Mountain Heights Subdivision at the abandoned Carroll residence potable well (in 1993) and at trace levels in Shared Well #2 (in 1994 and 1995). Six subsequent sampling events performed on Shared Well #2 between 1995 and 1999 did not detect 1,1-DCE. 1,1-DCE has not been detected in any additional potable wells in the Rocky Mountain Heights Subdivision to date.

1,1-DCE has previously been detected in the west drainage at the abandoned Nissan-Mazda Dealership's potable well (in 1993), BREMCO (on ten events between 1994 and 1998) and at trace levels in the Bolick rental residence (on three out of four events between 1994 and 1996). Two recent sampling events performed on BREMCO in 1999 and three subsequent sampling events performed on the Bolick rental residence in 1997 and 1999 did not detect 1,1-DCE. 1,1-DCE has not been detected in any additional potable wells in the west or north drainages to date.

Dichlorodifluoromethane

No distribution maps are provided for dichlorodifluoromethane. Dichlorodifluoromethane was not detected at any monitoring wells or surface water sampling locations as a result of either the January or July 1999 events. Previously, dichlorodifluoromethane has been detected primarily along the west drainage basin adjacent to the landfill. During the June 1998 event, estimated, only low level dichlorodifluoromethane concentrations of were observed in two west drainage wells, MW-3 and MW-12.

In 1993, dichlorodifluoromethane was detected in the abandoned Carroll and the active Perry residence potable wells located on the properties immediately adjacent to MW-9. Dichlorodifluoromethane has not been detected in any additional potable wells in the Rocky Mountain Heights Subdivision to date. Dichlorodifluoromethane has previously been detected in

the west drainage at the abandoned Nissan-Mazda Dealership's potable well (in 1993). Dichlorodifluoromethane has not been detected in any additional potable wells to date.

Benzene

Although no distribution maps are provided for benzene, note that significant decreases in benzene concentrations continue to be observed in all impacted monitoring wells. Benzene concentrations, historically detected above the EPA MCL in only one monitoring well, MW-8, have only been observed at levels below the EPA MCL since 1997.

In July 1999, estimated concentrations of benzene were detected below the EPA MCL of 5 µg/l and at or above the NCS of 1 µg/l in four monitoring wells (MW-3, MW-8, MW-9 and MW-17). Benzene was also estimated at a low concentration considerably below the NC surface water quality standard of 71.4 µg/l in one surface water sampling location (S-2).

In 1993, benzene was detected in the abandoned Carroll residence potable well, located on the property located immediately adjacent to MW-9. Benzene has not been detected in any additional wells in the Rocky Mountain Heights Subdivision to date.

Benzene has been detected in two potable wells located in the west and north drainages. Benzene has been detected in three recent events performed on the BREMCO well in 1998 and 1999, and detected on one out of three events performed on the Greer well.

Methylene Chloride

No distribution maps are provided for methylene chloride. Methylene chloride was not detected at any monitoring wells or surface water sampling locations as a result of the July 1999 monitoring event. In January 1999, methylene chloride was detected at concentrations below the EPA MCL and NCS of 5 µg/l in two monitoring wells (MW-8 and MW-9). Significant decreases in methylene chloride concentrations continue to be observed in all impacted monitoring wells. Since 1995, concentrations of methylene chloride have been detected above groundwater standards in only in MW-9. Concentrations have only been observed at levels below the EPA MCL and NCS since January 1998.

In 1993, methylene chloride was detected in the Rocky Mountain Heights Subdivision in four wells: the abandoned Carroll residence potable well, Shared Well #1, and the Ward and Perry residences potable wells. Multiple subsequent sampling events performed Shared Well #1, and the Ward and Perry residences potable wells have not detected methylene chloride. Methylene chloride has not been detected in any additional potable wells to date.

Chloroethane

No distribution maps are provided for chloroethane. In July 1999, chloroethane concentrations were estimated in two monitoring wells (MW-7 and MW-11). No EPA MCL or NCS standard exists for chloroethane. Concentrations of chloroethane considerably below the NC

surface water quality standard of 860 µg/l were also observed at one surface water sampling location (S-2).

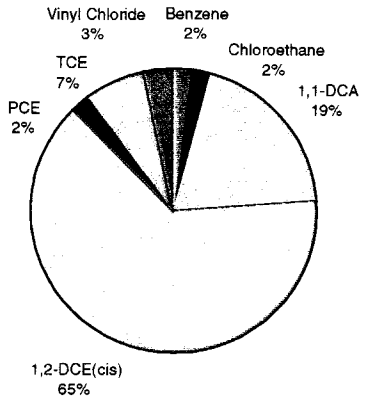
In 1993, chloroethane was detected in the abandoned Carroll residence and the abandoned Nissan-Mazda Dealership's potable wells. Chloroethane has not been detected in any additional potable wells to date.

4.5 Site Conceptual Model - Relative Concentration Trends

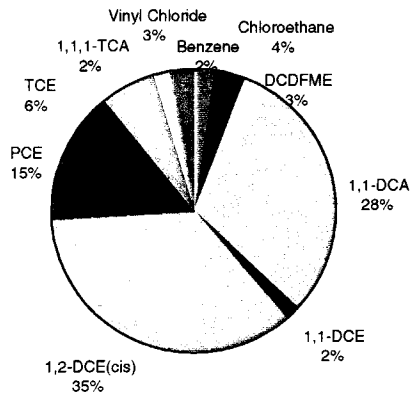
The site conceptual model included in the 1993 Assessment Plan presented three primary flow paths at the site. The organic parameter distributions included in subsequent monitoring reports were presented in terms of these primary flow paths. The 1996 RIA Report included pie charts depicting relative organic parameter concentrations for each individual core assessment monitoring well. The RIA Report noted that the organic parameters were primarily distributed into three different areas, the west drainage, the north drainage and the southern saddle, with predominant organic parameters varying by location. The relative concentration pie charts were utilized in the RIA report to illustrate organic parameter distribution trends and potential reduction reactions that appeared to be occurring at various locations on-site in 1995. The following discussion revisits the observations provided in the RIA Report and provides updated relative concentration pie charts to illustrate the changes that have occurred at the site.

As shown below by the 1995 relative concentration pie charts for MW-6 and MW-8, the chlorinated ethenes (PCE, TCE, 1,2-DCE) predominated in the upper portion of the west drainage in 1995.

MW-6 (1995)

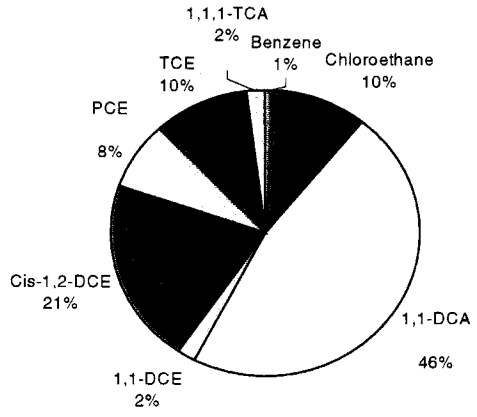


MW-8 (1995)



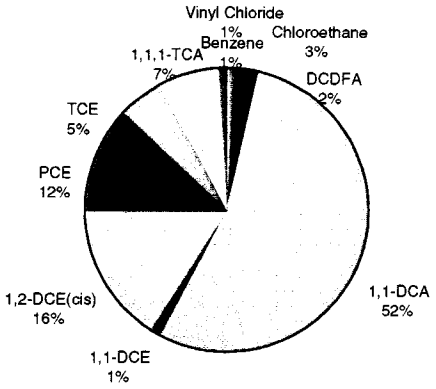
As shown below by the relative concentration pie chart for MW-8 in June 1999, the chlorinated ethane 1,1-DCA is now predominant. This shift from ethenes to ethanes that has occurred since 1995 illustrates the role of reductive reactions in the natural attenuation processes active in the area adjacent to the waste. Note that although the ethenes continue to persist, a comparison of past and present relative concentrations also indicates a shift from more highly chlorinated ethenes to less chlorinated ethenes. Of course, significant decreases in total organic concentrations have also occurred across the site. These total concentration trends are illustrated in the trend graphs and concentration distribution maps also provided in this report.

MW-8
1999

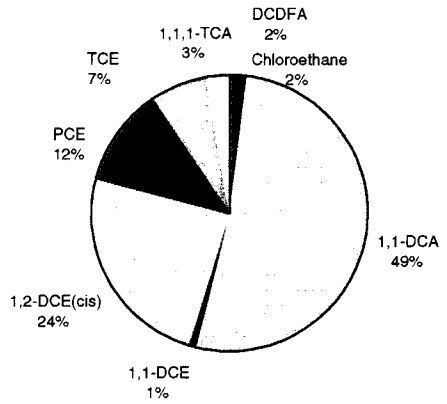


As shown below by the 1995 relative concentration pie charts for MW-3 and MW-17, 1,1-DCA was prevalent downgradient along the west drainage. Note that the ethenes continued to persist in this area along the property boundary.

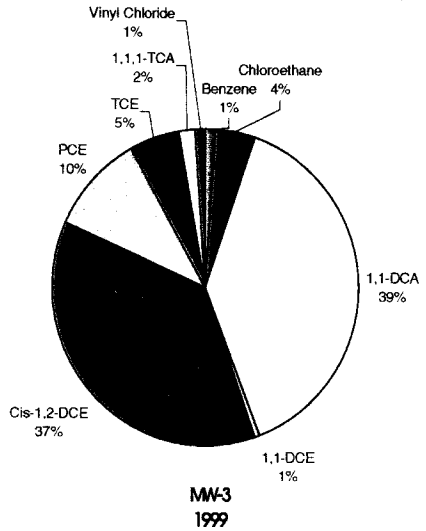
MW-3 (1995)

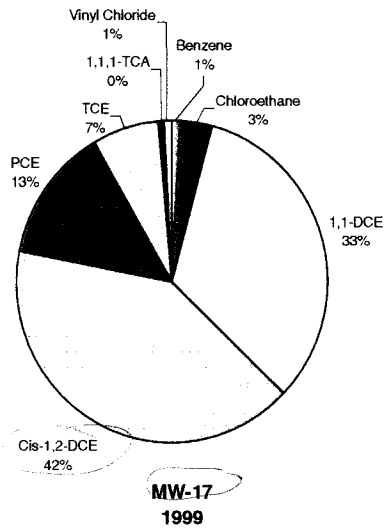


MW-17 (1995)



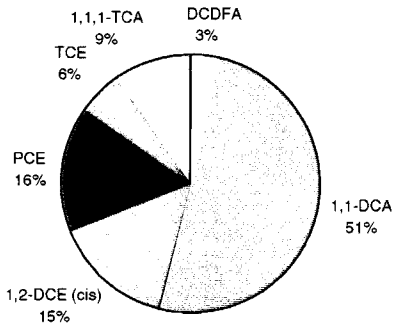
As shown below by the relative concentration pie charts for MW-3 and MW-17 in June 1999, a shift in relative concentrations from 1,1-DCA to cis-1,2-DCE appears to have occurred since 1995. A primary daughter product of the anaerobic degradation of the more highly chlorinated ethenes is cis-1,2-DCE, therefore, its increased presence may be the result of reductive processes naturally attenuating the organic parameters at this location. Note that although the shift in relative concentrations from 1,1-DCA to cis-1,2-DCE may suggest that the system at this location is not reducing cis-1,2-DCE, significant decreases in the concentrations of all the ethenes and ethanes are observed across the site, including this location.



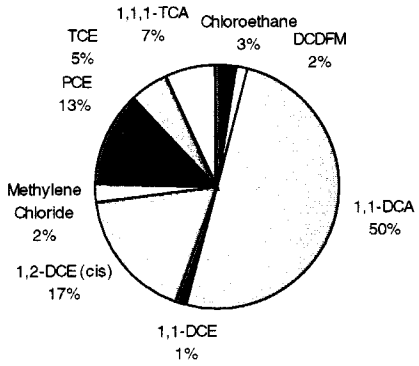


The relative concentration pie charts presented below illustrate that in 1995 1,1-DCA constituted greater than 50% of the organic parameters present at MW-11 and MW-12, located further downgradient along the west drainage. **No organic parameters were detected at this location in June 1999.**

MW-11 (1995)

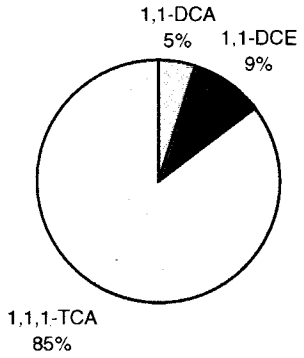


MW-12 (1995)

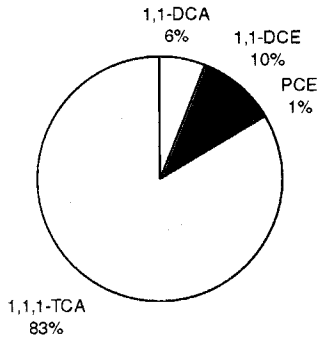


The 1995 relative concentration pie charts presented below illustrate that the ethanes constituted approximately 90% of the organic parameters present in the north drainage at MW-2 and MW-10 in 1995. Note that in 1995, the tri-chlorinated organic parameter 1,1,1-TCA constituted greater than 50% of the organic parameters present.

MW-2 (1995)

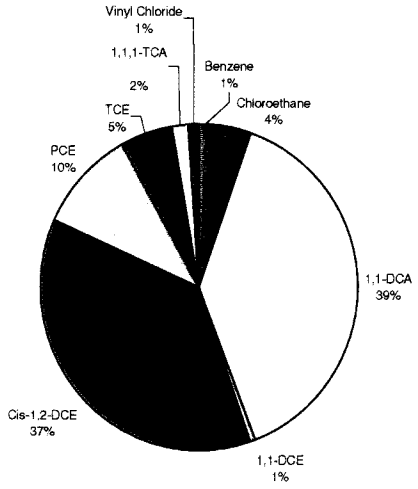


MW-10 (1995)



As shown by the following relative concentration pie chart for MW-2 in June 1999, a shift in relative concentrations from 1,1,1-TCA to cis-1,2-DCE and 1,1-DCA appears to have

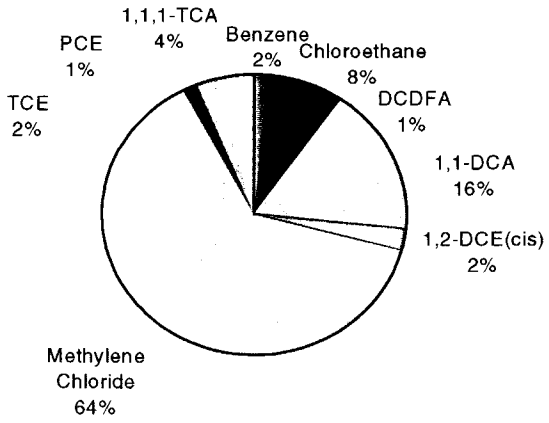
occurred since 1995. This comparison of past and present relative concentrations indicates a shift from a more highly chlorinated ethane (i.e., 1,1,1-TCA) to less chlorinated ethanes and ethenes. This shift illustrates the role of reductive reactions in the natural attenuation processes active in the north drainage.



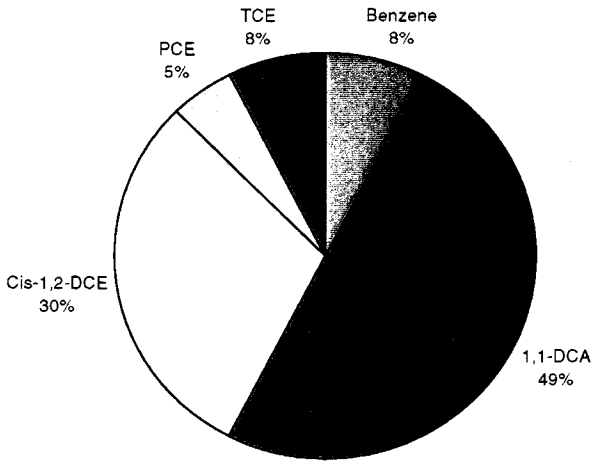
MW-2
1999

The 1995 relative concentration pie chart for MW-9 presented below illustrated that methylene chloride constituted approximately 64% of the organic parameters present at the southern saddle in 1995.

MW-9
1995



Concentrations of methylene chloride have consistently decreased since 1995. In fact, methylene chloride was not detected at MW-9 in July 1999. As shown below by the relative concentration pie chart for MW-9 in June 1999, a shift in relative concentrations to cis-1,2-DCE and 1,1-DCA also appears to have occurred at the southern saddle since 1995. This shift in relative concentrations to cis-1,2-DCE and 1,1-DCA is observed in all the impacted areas across the site. This shift further illustrates the role of reductive reactions in the natural attenuation processes active across the site.



MW-9
1999

Anaerobic conditions most likely are present close to the fill. These oxygen-scarce conditions may also persist further downgradient in the most impacted zones. As discussed above, the transformation of PCE and TCE is likely a major factor in the shift in relative concentrations to cis-1,2-DCE and 1,1-DCA. PCE and TCE have a high degradation potential under anaerobic conditions. A primary daughter product of this anaerobic degradation is cis-1,2-DCE. Once this reaction occurs, further degradation requires the presence of oxygen and therefore is favored in an aerobic zone. The persistence of cis-1,2-DCE indicates that the reduction of this parameter may be limited by the amount of oxygen available.

1,1,1-TCA, which occurred at elevated concentrations in the north drainage in 1996, also appears to have been reduced by anaerobic degradation. Under anaerobic conditions, 1,1,1-TCA is known to degrade abiotically to 1,1-DCE and biotically to 1,1-DCA (EPA/540/R-92/042. March 1992). Both abiotic and biotic anaerobic reduction mechanisms may be contributing to the 1,1-DCE and 1,1-DCA currently found in the north drainage.

1,1-DCA appears to be the most widespread contaminant at the site. Although not determined to be a health hazard, 1,1-DCA is reported as a fairly recalcitrant compound, with a low degradation rate in an anaerobic zone and an even lower degradation rate in an aerobic zone.

These comparisons of relative concentrations over time demonstrate the role of reductive reactions in the natural attenuation processes active across the site. Note that this discussion infers the present of aerobic and anaerobic conditions based on parameter distributions and proximity to the source and impacted area. Additional data could be collected to further investigate the role of these natural attenuation reactions within various locations within the aquifer system. Although the continued collection of data over a longer length of time should continue to demonstrate the natural attenuation processes active across the site, the collection of data relating to redox conditions would assist to defining the characteristics of the aerobic/anaerobic systems existing at the site. Information concerning other factors that may also limit degradation, including nutrient limitations, substrate availability, toxicity, pH, etc. would also assist in characterizing the state of the aerobic/anaerobic systems existing at the site

Total residual Chlorine

4.6 Closing

The three lines of evidence that can be used to support the biological, chemical and physical degradation (i.e., natural attenuation) of chlorinated solvents include:

- a reduction in concentrations along flow paths,
- a loss of total mass at the field scale, and
- field data that support the occurrence of degradation and provide the data necessary to determine rates of degradation.

The preceding presentation of the site conceptual model examined each of these lines of evidence utilizing the existing data base generated at the site since 1992. Ideally, the first two lines of evidence should be used in a natural attenuation demonstration. The parameter concentration trend analysis and distribution trend analysis discussed in the preceding site conceptual model documents these first two lines of evidence. The relative concentration trend analysis provides information that supports one element of the third line of evidence, the occurrence of degradation. Note that it is recognized that demonstrating field-scale degradation rates at sites with complex hydrogeology may not be possible (Draft Natural Attenuation Guidance Document. EPA Region 4, November, 1997).

The most important process for the natural attenuation of the more highly chlorinated solvents is reductive dechlorination. The relative concentration trend analysis illustrates the role of reductive reactions in the natural attenuation processes active across the site. In order to provide the data necessary to demonstrate specific site conditions affecting reductive dechlorination, It is proposed that the core well network be sampled for indicator parameters that provide evidence of the natural attenuation mechanisms. Reductive dechlorination of solvent compounds is associated with accumulation of all daughter products and an increase in the concentration of chloride ions. Reductive dechlorination has been demonstrated under nitrate-reducing and sulfate-reducing conditions, with the most rapid degradation rates occurring under methanogenic conditions.

A list of reductive indicator parameters that we are considering to analyze for during the next semiannual Assessment monitoring event include:

- the target list of metals and chlorinated organic parameters,
- dissolved oxygen,
- oxidation reduction potential,
- nitrate,
- sulfate,
- sulfide,
- iron (II),
- methane,
- pH,
- total organic carbon,
- temperature,
- carbon dioxide,
- alkalinity,
- chloride,
- hydrogen, and
- volatile fatty acids.

The site conceptual model, as presented graphically with both concentration trend graphs and chronological delineation maps, indicates significant reductions in the extent and concentration of impact have occurred across the site. Comparisons of relative concentrations over time demonstrate the role of reductive reactions in the natural attenuation processes active across the site. The testing of reductive indicator parameters proposed in the conclusion of this report will enable the identification of favorable and unfavorable conditions existing at various impacted locations across the site. By identifying site conditions that may be limiting natural attenuation processes, we may be able to positively influence limiting factors and promote intrinsic reductive reactions.

LIST OF ACRONYMS

Acronyms and Terms

ADHD	Appalachian District Health Department
BREMCO	Blue Ridge Electric Membership Company
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of Custody
CRQL	Contract Required Quantitation Limit
CVAA	Cold Vapor Atomic Absorption
DAA	Draper Aden Associates
DQO	Data Quality Objectives
EPA	Environmental Protection Agency
EQL	Estimated Quantitation Limit
GC	Gas Chromatography
GC/MS	Gas Chromatography with Mass Spectrometry
GFAA	Graphite Furnace Atomic Absorption
GMP	Groundwater Monitoring Program
IDL	Instrument Detection Level (IDL)
ICP	Inductively Coupled Plasma
LLRA	Low Level Risk Assessment
LOD	Limit of Detection
LOQ	Limit of Quantitation
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MW	Monitoring Well
NCDENR	North Carolina Department of Environment and Natural Resources
NCS	North Carolina groundwater standard
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance / Quality Control
SOW	Statements of Work
SW-846	USEPA Solid Waste document 846
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

Units of Measure

µ	micron (10^{-6} meters)
ml	milliliter (0.001 liter)
l	liter
µg/l	microgram per liter (equivalent to parts per billion - ppb)
µS/cm	microsiemens per centimeter
°C	degrees Celsius

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"Geotechnical and Hydrogeologic Investigation of the Bolick Site at the Watauga County Landfill," dated March 1, 1993. DAA JN 6520-02

30 pages text, 6 tables, 9 figures and 6 appendices.

Purpose: Results of the Bolick Site geotechnical and hydrogeological investigation conducted by DAA between August 1992 and February 1993.

"Watauga County Landfill Permit No. 95-02 Assessment Plan," dated September 3, 1993. DAA JN 6520-13

110 pages text, 11 tables, 11 figures and 4 appendices (SAP and HASP included as separate).

Purpose: Assessment Plan drafted pursuant to July 1993 Watauga Co./NCDEHNR Consent Agreement.

"Watauga County Landfill Permit No. 95-02 Assessment Plan Activity Report," dated July 29, 1994. DAA JN 6520-14

55 pages text, 5 tables, 6 figures and 7 appendices (as separate).

Purpose: Initial Assessment Plan field activities (well installation, aquifer testing, lab procurement, etc.).

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, Initial Background Data Set, First Quarter Event," dated November 2, 1994. DAA JN 6520-20

Vol. I (34 pages text, 6 tables, 2 figures and 4 appendices), Vol. II (data documentation, 3 books).

Purpose: Results of first Assessment monitoring event sampled on June 20-23, 1994.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, Initial Background Data Set, Second Quarter Event," dated February 17, 1995. DAA JN 6520-20

Vol. I (36 pages text, 10 tables, 2 figures and 4 appendices), Vol. II (data documentation, 3 books).

Purpose: Results of second Assessment monitoring event sampled on September 27-30, 1994.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, Initial Background Data Set, Third Quarter Event," dated August 3, 1995. DAA JN 6520-20

Vol. I (39 pages text, 12 tables, 2 figures and 4 appendices), Vol. II (data documentation, 3 books).

Purpose: Results of third Assessment monitoring event sampled on February 6-10, 1995.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, Initial Background Data Set, Fourth Quarter Event," dated October 10, 1995. DAA JN 6520-20

Vol. I (38 pages text, 12 tables, 2 figures and 4 appendices), Vol. II (data documentation, 3 books).

Purpose: Results of fourth Assessment monitoring event sampled on April 11-13, 1995.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, First Semiannual Event," dated January 12, 1996. DAA JN 6520-21

Vol. I (52 pages text, 13 tables, 2 figures and 4 appendices), Vol. II (data documentation, 9 books).

Purpose: Results of fifth Assessment monitoring event sampled on July 10-13, 1995.

"Watauga County Landfill Permit No. 95-02 Remedial Investigation and Alternatives Report," dated January 2, 1996. DAA JN 6520-18

94 pages text, 15 tables, 5 figures and 7 appendices (4 appendices included as separate).

Purpose: Summary of assessment and remedial investigation activities performed to date, including remedial alternative review and proposed immediate remedial action responses appropriate at this time.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, Second Semiannual Event," dated June 3, 1996. DAA JN 6520-21

Vol. I (39 pages text, 11 tables, 2 figures and 4 appendices), Vol. II (data documentation, 3 books).

Purpose: Results of sixth Assessment monitoring event sampled on April 9-10, 1996.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results,
April 8-9, 1997 Event," dated June 19, 1997. DAA JN 6520-21

40 pages text, 12 tables, 2 figures and 5 appendices, Appendix E (data documentation) on CD-ROM.

Purpose: Results of seventh Assessment monitoring event sampled on April 8-9, 1997.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, January 14-15, 1998 Event," dated May 6, 1998. DAA JN 6520-21

34 pages text, 14 tables, 2 figures and 5 appendices, Appendix E (data documentation) on CD-ROM.

Purpose: Results of eighth Assessment monitoring event sampled on January 14-15, 1998.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, June 23-24, 1998 Event," dated September 10, 1998. DAA JN 6520-21

26 pages text, 14 tables, 2 figures and 5 appendices, Appendix E (data documentation) as separate Book.

Purpose: Results of ninth Assessment monitoring event sampled on June 23-24, 1998.

"Blue Ridge Electric Membership Company October 1988 Potable Well Testing Report of Investigation," dated March 1, 1999. DAA JN 6520-24

20 pages text, 3 tables, 4 figures and 4 appendices.

Purpose: Results of October 1998 investigation of the BREMCO well.

"Watauga County Landfill Permit No. 95-02 Groundwater and Surface Water Assessment Monitoring Results, January 11-12, 1999 Event," dated April 19, 1999. DAA JN 6520-21

29 pages text, 13 tables, 2 figures and 5 appendices, Appendix E (data documentation) as separate Book

Purpose: Results of tenth Assessment monitoring event sampled on June 23-24, 1998.

APPENDIX A

TABLES AND FIGURES

Table 1

Watauga County Landfill
Groundwater and Surface Water
Assessment Monitoring Schedule

GROUNDWATER MONITORING	1st Year (94/95) Quarterly Sampling Events				Subsequent Semiannual Sampling Events*	
"CORE" ASSESSMENT WELLS						
Target Parameter Monitoring Parameters*	CLP Methods	CLP Methods	CLP Methods	CLP Methods	Low Level Risk Assessment Screening Methods	CLP Methods
"BOUNDARY" ASSESSMENT WELLS***						
Target Parameter Monitoring Parameters*	LLRA Methods	CLP Methods	LLRA Methods	CLP Methods	LLRA Methods	-
SURFACE WATER MONITORING						
Target Parameter Monitoring Parameters*	CLP Methods	-	CLP Methods	-	CLP Methods	CLP Methods

CLP - EPA Contract Laboratory Program Methods
LLRA - Low Level Risk Assessment Screening Methods (EPA SW-846)

* - semiannual analysis for target organics; annual analysis for target metals.
** - semiannual monitoring of a subset of the core monitoring well network (MW-2, MW-3, MW-6, MW-9, MW-12 and MW-17). The groundwater at these six monitoring points has historically exceeded the EPA MCL for one or more organic target parameters;. annual monitoring of the existing twelve core monitoring well network for semiannual monitoring.
*** - withdrawal of non-impacted wells for monitoring year 1998-1999.

Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1

11/01/99

Table 2A
July 12-13, 1999
Semi-Annual Assessment Monitoring Event
Assessment Target Parameter Analytical Results
Core Subset Groundwater Monitoring Wells

Parameters	Event	MW-2		MW-3		MW-8		MW-9		MW-12		MW-17		NCS (ug/L)	MCL (ug/L)
Benzene	7/12-13/99	10	U	2	J	1	J	3	J	10	U	2	J	1	5
Chloroethane	7/12-13/99	10	U	8	J	10		10	U	10	U	7	J	-	-
Dichlorodifluoromethane	7/12-13/99	10	U	10	U	10	U	10	U	10	U	10	U	0.19	-
1,1-Dichloroethane	7/12-13/99	24		72		47		20		10	U	71		700	-
1,1-Dichloroethene	7/12-13/99	47		1	J	2	J	10	U	10	U	10	U	7	7
Cis-1,2-Dichloroethene	7/12-13/99	10	U	69		21		12		10	U	88		70	70
Methylene Chloride	7/12-13/99	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	5	5
Tetrachloroethene	7/12-13/99	3	J	19		8	J	2	J	10	U	29	J	0.7	5
Trichloroethene	7/12-13/99	10	U	10		10		3	J	10	U	15		2.8	5
1,1,1-Trichloroethane	7/12-13/99	190		3	J	2	J	10	U	10	U	1	J	200	200
Vinyl Chloride	7/12-13/99	10	U	2	J	10	U	10	U	10	U	2	J	0.015	2

Notes:
U Denotes not detected. (the associated numerical value is the Limit of Quantitation (LOQ))
J Denotes an estimated value.
NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
- Denotes not established.
Shading Denotes parameter results that exceed U.S. EPA MCLs.
Organic parameters were analyzed in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.2.

Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1

11/01/99

Table 2B
July 12-13, 1999
Semi-Annual Assessment Monitoring Event
Assessment Target Parameter Analytical Results
Surface Water Monitoring Locations

Parameters	Sampling Date	Results ug/L(ppb)												WQS (ug/L)
		S-1		S-2		S-3		S-4		S-5		S-6		
ORGANICS														
Benzene	7/12-13/99	10	U	2	J	10	U	10	U	10	U	10	U	71.4
Chloroethane	7/12-13/99	10	U	58		10	U	10	U	10	U	10	U	860
Dichlorodifluoromethane	7/12-13/99	10	U	17	U	10	U	10	U	10	U	10	U	570000
1,1-Dichloroethane	7/12-13/99	10	U	11	J	10	U	5	J	10	U	10	U	42
1,1-Dichloroethene	7/12-13/99	10	U	17	U	10	U	10	U	10	U	10	U	3.2
1,2-Dichloroethene (total)	7/12-13/99	10	U	5	J	10	U	8	J	10	U	10	U	140000
Methylene Chloride	7/12-13/99	10	UJ	17	UJ	10	UJ	10	UJ	10	UJ	10	UJ	1600
Tetrachloroethene	7/12-13/99	10	U	17	UJ	10	UJ	2	J	10	UJ	10	UJ	8.84
Trichloroethene	7/12-13/99	10	U	17	U	10	U	1	J	10	U	10	U	92.4
1,1,1-Trichloroethane	7/12-13/99	10	U	17	U	10	U	10	U	10	U	10	U	555
Vinyl Chloride	7/12-13/99	10	U	17	U	10	U	10	U	10	U	10	U	525

Notes:

WQS Denotes North Carolina Surface Water Quality Standard (T15A: 02L .0200)

U Denotes not detected. (the associated numerical value is the Limit of Quantitation (LOQ))

J Denotes an estimated value.

- Denotes not established.

Organic parameters were analyzed in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.2.

Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1
11/15/99

Table 3
July 12-13, 1999
Semi-Annual Assessment Monitoring Event
Detected Non-Target Organic Parameters

Tentatively Identified Compounds													
Parameter	Event	S-2		MW-3		MW-8		MW-9		MW-17		WQS (ug/L)	NCS (ug/L)
Ether	7/12-13/1999	14	NJ	18	NJ	12	NJ	22	NJ	12	NJ	50000	-
Dichlorofluoromethane	7/12-13/1999	10	NJ	8	NJ	6	NJ	5	NJ	7	NJ	-	1400

Notes:

WQS Denotes North Carolina Surface Water Quality Standard (T15A: 02B .0200)
NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
~ Denotes Not Detected
- Denotes Not Available
J Denotes an estimated value
N Denotes tentatively identified
Organic parameters were analyzed in accordance with USEPA CLP SOW OLMO 3.2.

Watauga County Landfill

Watauga County, North Carolina

Upgradient Well: MW-1

01-Nov-99

TABLE 4

GROUNDWATER LEVEL DATA

MONITORING WELLS

	REFERENCE ELEVATION								
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9
GROUND	3339.03	3151.24	3182.25	3150.06	3263.81	3262.55	3270.56	3235.39	3356.65
MEASURING POINT	3341.80	3152.94	3183.12	3152.52	3267.69	3266.04	3273.53	3239.77	3359.23
DATE	STATIC WATER LEVEL								
6/20/94	38.00	7.88	18.43	13.48	NM	44.12	23.03	17.68	59.35
9/27/94	39.69	7.51	17.42	10.45	NM	43.99	30.73	17.38	57.79
2/6/95	37.57	5.58	16.20	8.18	50.39	42.85	45.88	15.41	59.54
4/11/95	37.94	6.46	16.85	9.22	48.95	42.81	49.11	16.05	59.30
7/10/95	41.20	6.60	17.43	8.94	50.29	43.73	48.98	17.42	80.17
4/9/96	38.71	5.85	7.01	8.40	49.87	42.87	44.32	16.80	61.28
4/8/97	38.30	5.59	16.35	NM	NM	ABANDON	40.50	17.43	62.47
1/13/98	43.71	7.00	17.51	8.54	55.46	ABANDON	44.18	20.32	63.56
6/23/98	36.84	5.94	14.01	7.98	46.82	ABANDON	43.07	16.92	62.15
1/11/99	44.56	7.66	18.87	8.85	55.11	ABANDON	37.89	22.83	64.39
7/12/99	42.87	6.78	15.16	8.18	53.26	ABANDON	45.79	19.92	64.05
DATE	GROUNDWATER ELEVATION								
6/20/94	3303.80	3145.06	3164.69	3139.04	NM	3221.92	3250.50	3222.09	3299.88
9/27/94	3302.11	3145.43	3165.70	3142.07	NM	3222.05	3242.80	3222.39	3301.44
2/6/95	3304.23	3147.36	3166.92	3144.34	3217.30	3223.19	3227.65	3224.36	3299.69
4/11/95	3303.86	3146.48	3166.27	3143.30	3218.74	3223.23	3224.42	3223.72	3299.93
7/10/95	3300.60	3146.34	3165.69	3143.58	3217.40	3222.31	3224.55	3222.35	3279.06
4/9/96	3303.09	3147.09	3176.11	3144.12	3217.82	3223.17	3229.21	3222.97	3297.95
4/8/97	3303.50	3147.35	3166.77	NM	NM	ABANDON	3233.03	3222.34	3296.76
1/13/98	3298.09	3145.94	3165.61	3143.98	3212.23	ABANDON	3229.35	3219.45	3295.67
6/23/98	3304.96	3147.00	3169.11	3144.54	3220.87	ABANDON	3230.46	3222.85	3297.08
1/11/99	3297.24	3145.28	3164.25	3143.67	3212.58	ABANDON	3235.64	3216.94	3294.84
7/12/99	3298.93	3146.16	3167.96	3144.34	3214.43	ABANDON	3227.74	3219.85	3295.18

	REFERENCE ELEVATION									
	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19
GROUND	3202.18	3156.44	3156.82	3117.39	3117	3117.15	3141.42	3181.14	3117.12	3125
MEASURING POINT	3203.87	3159.6	3159.15	3119.72	3120	3120.65	3142.72	3183.62	3119.63	3125
DATE	STATIC WATER LEVEL									
6/20/94	8.18	13.35	11.04	19.66	7.94	11.92	5.32	17.93	17.93	-
9/27/94	8.09	13.22	10.78	19.57	7.89	11.82	5.68	17.83	17.86	-
2/6/95	7.73	13.22	10.61	19.39	7.52	11.55	4.61	17.05	17.58	-
4/11/95	7.90	13.00	10.58	19.53	7.75	11.87	5.11	17.48	17.65	-
7/10/95	7.91	12.53	10.48	19.62	7.74	11.96	4.54	18.11	17.94	-
4/9/96	7.67	12.73	10.38	19.56	7.59	11.85	4.67	17.78	17.81	-
4/8/97	7.67	12.28	9.48	NM	NM	11.91	ABANDON	17.17	NM	4.85
1/13/98	8.25	12.48	9.65	19.75	7.44	11.74	ABANDON	18.60	18.32	10.21
6/23/98	7.32	11.82	9.11	NM	7.49	11.79	ABANDON	14.83	17.53	2.67
1/11/99	8.68	12.41	9.46	20.05	7.19	11.79	ABANDON	19.84	18.56	9.34
7/12/99	8.25	11.37	8.75	19.64	NM	NM	ABANDON	17.08	18.1	9.75
DATE	GROUNDWATER ELEVATION									
6/20/94	3195.69	3146.25	3148.11	3100.06	3112.06	3108.73	3137.40	3165.69	3101.70	-
9/27/94	3195.78	3146.38	3148.37	3100.15	3112.11	3108.83	3137.04	3165.79	3101.77	-
2/6/95	3196.14	3146.38	3148.54	3100.33	3112.48	3109.10	3138.11	3166.57	3102.05	-
4/11/95	3195.97	3146.60	3148.57	3100.19	3112.25	3108.78	3137.61	3166.14	3101.98	-
7/10/95	3195.96	3147.07	3148.67	3100.10	3112.26	3108.69	3138.18	3165.51	3101.69	-
4/9/96	3196.20	3146.87	3148.77	3100.16	3112.41	3108.80	3138.05	3165.84	3101.82	-
4/8/97	3196.20	3147.32	3149.67	NM	NM	3108.74	ABANDON	3166.45	NM	3120.15
1/13/98	3195.62	3147.12	3149.50	3099.97	3112.56	3108.91	ABANDON	3165.02	3101.31	3114.79
6/23/98	3196.55	3147.78	3150.04	NM	3112.51	3108.86	ABANDON	3168.79	3102.10	3122.33
1/11/99	3195.19	3147.19	3149.69	3099.67	3112.81	3108.86	ABANDON	3163.78	3101.07	3115.66
7/12/99	3195.62	3148.23	3150.40	3100.08	NM	NM	ABANDON	3166.54	3101.53	3115.25

1) ALL MEASUREMENTS IN FEET.
2) ALL ELEVATIONS REFERENCE MEAN SEA LEVEL.
3) MEASURING POINT (M.P.) IS FROM THE TOP OF WELL CASING.
4) NM - NOT MEASURED

Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1
11/01/99

Table 5A
Background Assessment Organic Target Parameter Analytical Results
Core Groundwater Monitoring Wells

Parameter	Event	Results ug/l (ppb)																										Analysis Type
		MW-1		MW-2		MW-3		MW-6		MW-7		MW-8		MW-9		MW-10		MW-11		MW-12		MW-15		MW-17				
Organics																												
Benzene	6/20/94	10	U	120	U	10	U	9	J	0.42	J	0.72	J	0.4	J	5.3	U	5.3	U	5.3	U	5.30	U	5.3	U			CLP/8021
	9/27/94	10	U	8	J	2	J	12	J	3	J	5	J	4	J	10	U	10	U	10	U	10	U	2	J			CLP
MCL= 5 ug/l	2/06/95	10	U	150	U	2	J	12	J	3.6		5	J	2	J	50	U	10	U	10	U	1.0	U	10	U			CLP
NCS = 1 ug/l	4/11/95	10	U	200	U	1	J	10	J	3	J	6	J	3	J	71	U	10	U	10	U	10	U	10	U			CLP
	7/10/95	2	U	2	U	2.3		14		2.2		5.2		4		2	U	2	U	2	U	10	U	2	U			8021
	7/10/95	5	U	5	U	2.6	J	13		2.7	J	5.5		3.8	J	5	U	5	U	5	U	-		5	U			8260
	4/10/96	1	J	91	U	2	J	11	J	5	J	5		4	J	23	U	10	U	1	J	10	U	10	U			CLP
	4/8/97	1	U	100	U	2		-		4.8		2.3		3.9		100	U	1	U	1.4		1	U	1				8021
	1/15/98	10	U	20	U	3	J	-		2	J	2	J	3	J	14	U	10	U	2	J	10	U	2	J			CLP
	6/23/98	-		25	UJ	1	J	-		-		3	J	3	J	-		-		2	J	-		2	J			CLP
	1/12/99	1	U	1	U	3.6		-		2.4		2		3.2		1	U	1	U	2.5		1	U	1.4				8021B
	7/12/99	-		10	U	2	J	-		-		1	J	2	J	-		-		10	U	-		2	J			CLP
Chloroethane	6/20/94	10	U	120	U	6	J	8	J	7.33	J	9.44		56.78	J	9.29	U	1.16	J	20.23		9.29	U	28.21				CLP/8021
	9/27/94	10	U	170	U	8	J	10	J	16		7	J	18		10	U	10	U	5	J	10	U	7	J			CLP
no MCL or NCS established	2/06/95	10	U	150	U	7	J	11	J	28		7	J	17		50	U	10	U	4	J	1.0	U	5	J			CLP
	4/11/95	10	U	200	U	6	J	8	J	16		7	J	15		71	U	10	U	2	J	10	U	4	J			CLP
	7/10/95	2	U	2	U	10	U	15	U	9.2		10	U	20	U	2	U	2	U	5	U	10	U	5	U			8021
	7/10/95	5	U	5	U	8.7		16		22		9.3		21		5	U	5	U	6.4		-		4.9	J			8260
	4/10/96	10	U	91	U	8	J	14	J	41		10	J	16		23	U	10	U	5	J	10	U	5	J			CLP
	4/8/97	1	U	1	U	46		-		58		38		110		1	U	12		40		1	U	30				8021
	1/15/98	10	U	20	U	10		-		19		12		12		20		10	U	5	J	10	U	9	J			CLP
	6/23/98	-		25	UJ	5	J	-		-		11	J	8	J	-		-		5	J	-		6	J			CLP
	1/12/99	2	U	2	U	100	U	-		43		40	U	60	U	2	U	25		50	U	2	U	40	U			8021B
	7/12/99	-		10	U	8	J	-		-		10	U	10	U	-		-		10	U	-		7	J			CLP
Dichlorodifluoromethane	6/20/94	10	U	120	U	7	J	25	U	46.64	U	2.26	J	13.92	J	46.64	U	1.88	J	9.83	J	46.64	U	1.44	J			CLP/8021
	9/27/94	10	U	10	J	4	J	25	U	10	U	2	J	9	J	10	U	10	U	4	J	10	U	4	J			CLP
no MCL established	2/06/95	10	U	150	U	10	U	25	U	1	U	14		27		50	U	2	J	10	U	1.0	U	12				CLP
NCS = 0.19 ug/l	4/11/95	10	U	200	U	10	U	25	U	10	U	7	J	9	J	71	U	10	U	4	J	10	UJ	3	J			CLP
	7/10/95	2	UJ	2	UJ	6.9	J	2	UJ	2	UJ	16	J	2	UJ	2	UJ	2	UJ	5.7	J	10	U	5.3	J			8021
	7/10/95	5	U	5	U	7.2		2.2	J	5	U	6.7		2.8	J	5	U	1.7	J	4	J	-		4.2	J			8260
	4/10/96	10	U	91	U	10	U	25	U	10	U	10	U	10	U	23	U	10	U	10	U	10	U	10	U			CLP
	4/8/97	1	U	1	U	6.4		-		1	U	17		11		1	U	3		10		1	U	1	U			8021
	1/15/98	10	U	20	U	11		-		10	U	12		10	U	14	U	10	U	10	U	10	U	10	U			CLP
	6/23/98	-		25	UJ	3	J	-		-		10	UJ	10	UJ	-		-		3	J	-		10	UJ			CLP
	1/12/99	1	U	1	U	1	U	-		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U			8021B
	7/12/99	-		10	U	10	U	-		-		10	U	10	U	-		-		10	U	-		10	U			CLP
1,1-Dichloroethane	6/20/94	10	U	75	J	160		97		10.42	J	35.33	J	13.63	J	28.62	J	25.23	J	82.77	J	0.26	J	105.03	J			CLP/8021
	9/27/94	10	U	110	J	200		110		1	J	70		23		84		27		130		10	U	230				CLP
no MCL established	2/06/95	10	U	160		180		140		2.9		74		30		37	J	28		120		1.0	U	170				CLP
NCS = 700 ug/l	4/11/95	10	U	98	J	130		94		4	J	58		35		67	J	18		77		10	U	130				CLP
	7/10/95	2	U	81		130		100	J	4.8		60	J	36		58	J	22		100		10	U	102	J			8021
	7/10/95	5	U	94		160		130		6.8		71		40		55		26		120		-		130				8260
	4/10/96	10	U	130		150		120		5	J	80		36		22	J	26		120		10	U	130				CLP
	4/8/97	1	U	84		90		-		9.4		52		28		27		26		82		1	U	76				8021
	1/15/98	10	U	29		97		-		13		55		27		11	J	30		82		10	U	88				CLP
	6/23/98	-		100	J	67	J	-		-		48	J	24	J	-		-		66	J	-		10	UJ			CLP
	1/12/99	1	U	36		92		-		13		35		22		16		27		70		1	U	65				8021B
	7/12/99	-		24		72		-		-		47		20		-		-		10	U	-		71				CLP
1,1-Dichloroethene	6/20/94	10	U	160		5	J	25	U	9.75	U	0.3	J	9.75	U	32.29		9.75	U	1.15	J	9.75	U	1.09	J			CLP/8021
	9/27/94	10	U	210		6	J	25	U	10	U	4	J	10	U	160		10	U	5	J	10	U	3	J			CLP
MCL= 7 ug/l	2/06/95	10	U	160		6	J	25	U	1	U	6	J	10	U	100		10	U	4	J	1.0	U	3	J			CLP
NCS = 7 ug/l	4/11/95	10	U	150	J	3	J	25	U	10	U	3	J	10	U	120		10	U	2	J	10	U	1	J			CLP
	7/10/95	2	U	170		4		2	U	2	U	5.7		2	U	160	J	0.86	J	3.9		10	U	1.8	J			8021
	7/10/95	5	U	170	J	3.7	J	1.3	J	5	U	4.1	J	5	U	88		5	U	3.6	J	-		1.6	J			8260
	4/10/96	10	U	210		3	J	25	U	10	U	6	J	10	U	51		10	U	3	J	10	U	2	J			CLP
	4/8/97	1	U	160		1.9		-		1	U	4.9		0.54	J	84		1.1		2.7		0.77	J	1.2				8021
	1/15/98	10	U	30		2	J	-		10	U	3	J	10	U	20		10	U	2	J	10	U	1	J			CLP
	6/23/98	-		160	J	10	UJ	-		-		2	J	10	UJ	-		-		2	J	-		1	J			CLP
	1/12/99	1	U	77		1.9		-		1	U	3.2		1	U	26		1.2		1.9		1	U	1	U			8021B
	7/12/99	-		47		1	J	-		-		2	J	10	U	-		-		10	U	-		10	U			CLP

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Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1
11/01/99

Table 5A
Background Assessment Organic Target Parameter Analytical Results
Core Groundwater Monitoring Wells

Parameter	Event	Results ug/l(ppb)																										Analysis Type
		MW-1		MW-2		MW-3		MW-6		MW-7		MW-8		MW-9		MW-10		MW-11		MW-12		MW-15		MW-17		
cis 1,2-Dichloroethene(2)	6/20/94	10	U	120	U	37		330		0.97	J	28.9		0.95	J	9.49	U	5.05	J	28.13		9.49	U	60.79	J	CLP/8021
	9/27/94	10	U	170	U	61		380		3	J	93		2	J	10	U	8	J	47		10	U	120		CLP
MCL= 70 ug/l	2/06/95	10	U	150	U	54		370		7.2		91		2	J	50	U	8	J	37		1.0	U	80		CLP
NCS = 70 ug/l	4/11/95	10	U	200	U	44		330		9	J	100		4	J	71	U	6	J	30		10	U	70		CLP
	7/10/95	2	U	2	U	65		440	J	4.4		110	J	7.4		2	U	11		37		10	U	72	J	8021
	7/10/95	5	U	5	U	50		430		7.9		89		6.2		5	U	7.6		42		-		63		8260
	4/10/96	10	U	91	U	64		420		6	J	78		11		23	U	11		54		10	U	87		CLP
	4/8/97	1	U	1	U	58		-		4.4		34		13		1	U	17		60		1	U	100		8021
	1/15/98	10	U	20	U	62		-		11		29		14		14	U	18		56		10	U	87		CLP
	6/23/98	-		25	UJ	50	J	-		-		43	J	12	J	-		-		52	J	-		79	J	CLP
	1/12/99	1	U	1	U	90		-		7.1		20		14		1	U	19		63		1	U	89		8021B
	7/12/99	-		10	U	69		-		-		21		12		-		-		10	U	-		88		CLP
trans-1,3-Dichloropropene	6/20/94	10	U	120	U	10	U	25	U	24.49	U	24.49	U	24.49	U	24.49	U	24.49	U	24.49	U	24.49	U	24.49	U	CLP/8021
	9/27/94	10	U	170	U	10	U	25	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	14	U	CLP
no MCL or NCS established	2/06/95	10	U	150	U	10	U	25	U	1	U	10	U	10	U	50	U	10	U	10	U	1.0	U	10	U	CLP
	4/11/95	10	U	200	U	10	U	25	U	10	U	10	U	10	U	71	U	10	U	10	U	10	U	10	U	CLP
	7/10/95	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	10	U	2	U	8021
	7/10/95	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	-		5	U	8260
Methylene Chloride	6/20/94	8	J	120	U	6	J	11	J	36.2	UJ	36.2	UJ	140.1	J	36.2	UJ	36.2	UJ	8.58	J	36.20	UJ	36.2	UJ	CLP/8021
	9/27/94	10	U	430		14	U	25	U	10	U	4	J	73		180		10	U	28	U	10	U	58	U	CLP
MCL= 5 ug/l	2/06/95	10	U	150	U	10	U	25	U	1.5		10	U	93		50	U	10	U	10	U	1.0	U	10	U	CLP
NCS = 5 ug/l	4/11/95	10	U	200	U	10	U	25	U	10	U	10	U	120		71	U	10	U	10	U	10	U	10	U	CLP
	7/10/95	2	U	2	U	2.4		1.2	J	2	U	4.7		89		2	U	2.9		3.3		10	U	2.2		8021
	7/10/95	5	U	5	U	5	U	5	U	5	U	5	U	160		5	U	5	U	5.9	U	-		5	U	8260
	4/10/96	10	U	91	U	10	U	25	U	10	U	10	U	120		23	U	10	U	10	U	10	U	10	U	CLP
	4/8/97	1	U	1	U	0.71	J	-		1.4		1.6		100		1	U	0.7	J	1.1		0.656	J	0.63	J	8021
	1/15/98	1	J	20	U	2	J	-		2	J	3	J	90		4	J	1	J	2	J	1	J	2	J	CLP
	6/23/98	-		25	UJ	10	UJ	-		-		10	UJ	10	UJ	-		-		10	UJ	-		10	UJ	CLP
	1/12/99	1	U	1	U	1	U	-		1	U	1.8		2.3		1	U	1	U	1	U	1	U	1	U	8021B
	7/12/99	-		10	UJ	10	UJ	-		-		10	UJ	10	UJ	-		-		10	UJ	-		10	UJ	CLP
Tetrachloroethene	6/20/94	10	U	120	U	44		6	J	0.88	J	7.55	J	2.15	J	1.3	J	7.47	J	22.78		7.84	U	17.43		CLP/8021
	9/27/94	10	U	170	U	53		26		10	U	33		5	J	12	J	9	J	36		10	U	64		CLP
MCL= 5 ug/l	2/06/95	10	U	18	J	46		33		1	U	31		4	J	6	J	8	J	32		1.0	U	48		CLP
NCS = 0.7 ug/l	4/11/95	10	U	200	U	33		13	J	10	U	33		5	J	10	J	7	J	28		10	U	41		CLP
	7/10/95	2	U	13		31		13		2	U	42	J	5		13		10		27		10	U	40		8021
	7/10/95	5	U	9.9		37		14		5	U	38		3.6	J	5.7		8.1		31		-		30		8260
	4/10/96	10	U	20	J	46		10	J	10	U	36		4	J	4	J	12		37		10	U	41		CLP
	4/8/97	1	U	11		31		-		1	U	13		3.4		4.4		11		23		1	U	21		8021
	1/15/98	10	U	4	J	21		-		10	U	11		3	J	3	J	10		25		10	U	28		CLP
	6/23/98	-		12	J	16	J	-		-		18	J	3	J	-		-		19	J	-		26	J	CLP
	1/12/99	1	U	4.2		19		-		1	U	7.6		1.9		2.6		7		13		1	U	16		8021B
	7/12/99	-		10	U	19		-		-		8	J	2	J	-		-		10	U	-		29	J	CLP
Trichloroethene	6/20/94	10	U	120	U	15		21	J	21.2	U	21.2	U	21.2	U	21.2	U	21.2	U	5.74	J	21.20	U	15.7	J	CLP/8021
	9/27/94	10	U	170	U	23		71		10	U	15		6	J	10	U	3	J	14		10	U	34		CLP
MCL= 5 ug/l	2/06/95	10	U	150	U	19		88		2.5	U	14		6	J	50	U	3	J	13		2.5	U	24		CLP
NCS = 2.8 ug/l	4/11/95	10	U	200	U	14		53		1	J	13		5	J	71	U	2	J	10		10	U	19		CLP
	7/10/95	2	U	1.2	J	28		67	J	1.6	J	28		8.5		2	U	5.8		16		10	U	21	J	8021
	7/10/95	5	U	5	U	16		47		1.2	J	15		6		5	U	3.1	J	13		-		17		8260
	4/10/96	10	U	91	U	21		28		10	U	16		6	J	23	U	4	J	15		10	U	19		CLP
	4/8/97	1	U	1.9		12		-		53	U	11		5.1		1.2		6		14		1	U	16		8021
	1/15/98	10	U	20	U	11		-		1	J	8	J	4	J	14	U	5	J	12		10	U	16		CLP
	6/23/98	-		25	UJ	8	J	-		-		9	J	3	J	-		-		18	J	-		15	J	CLP
	1/12/99	1	U	1	U	14		-		1	U	6.9		3.1		1	U	5		9.5		1	U	13		8021B
	7/12/99	-		3	J	10		-		-		10		3	J	-		-		10	U	-		15		CLP

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Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1
11/01/99

Table 5A
Background Assessment Organic Target Parameter Analytical Results
Core Groundwater Monitoring Wells

Parameter	Event	Results ug/l(ppb)																												Analysis Type
		MW-1		MW-2		MW-3		MW-6		MW-7		MW-8		MW-9		MW-10		MW-11		MW-12		MW-15		MW-17								
1,1,1-Trichloroethane	6/20/94	10	U	1800		31		25	U	30.11	U	2.42	J	11.89	J	130.14	J	4.83	J	16.79	J	0.08	J	13.39	J							CLP/8021
	9/27/94	10	U	1900		35		25	U	10	U	6	J	18		1810		5	J	24		5	J	16								CLP
MCL= 200 ug/l	2/06/95	10	U	1700		31		25	U	1	U	6	J	14		650		5	J	18		2.5		14								CLP
NCS = 200 ug/l	4/11/95	10	U	2000		21		25	U	10	U	5	J	16		1300		5	J	17		3	J	10								CLP
	7/10/95	2	U	1600		26		2	U	2	U	6		12		990		5.9		17		10	U	7.8								8021
	7/10/95	5	U	1600		21		5	U	5	U	4.9	J	9.8		740		4.8	J	16		-		7								8260
	4/10/96	10	U	1300		21		25	U	10	U	8	J	8	J	250		6	J	15		4	J	7	J							CLP
	4/8/97	1	U	770		8.2		-		1	U	4.5		1.5		570		6.1		11		4.1		2.9								8021
	1/15/98	10	U	320		7	J	-		10	U	4	J	10	U	150		7	J	9	J	5	J	3	J							CLP
	6/23/98	-		710	J	3	J	-		-		3	J	10	UJ	-		-		6	J	-		3	J							CLP
	1/12/99	1	U	310		4.7		-		1	U	2.5		1	U	170		6.3		5.4		3.4		1.2								8021B
	7/12/99	-		190		3	J	-		-		2	J	10	U	-		-		10	U	-		1	J							CLP
Vinyl Chloride	6/20/94	10	U	120	U	10	U	10	J	6.6	UJ	6.6	UJ	6.6	UJ	6.6	UJ	6.6	UJ	6.6	UJ	6.60	UJ	6.6	UJ							CLP/8021
	9/27/94	10	U	170	U	1	J	10	J	10	U	5	J	10	U	10	U	10	U	10	U	10	U	14	U							CLP
MCL= 2 ug/l	2/06/95	10	U	150	U	2	J	20	J	2.6		6	J	10	U	50	U	10	U	10	U	1.0	U	10	U							CLP
NCS = 0.15 ug/l	4/11/95	10	U	200	U	10	U	10	J	2	J	6	J	10	UJ	71	U	10	U	10	UJ	10	UJ	10	U							CLP
	7/10/95	2	U	2	U	2.9	J	12	J	2	U	11	J	2	U	2	U	2	U	2.3		10	U	0.94	J							8021
	7/10/95	5	U	5	U	1.1	J	33		5	U	7.2		5	U	5	U	5	U	5	U	-		5	U							8260
	4/10/96	10	U	91	U	2	J	14	J	10	U	5	J	10	U	23	U	10	U	10	U	10	U	10	U							CLP
	4/8/97	1	U	1	U	0.98		-		1	U	3	J	1	U	1	U	2.1	J	1	U	1	U	4	J							8021
	1/15/98	10	U	20	U	10	U	-		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U							CLP
	6/23/98	-		25	UJ	10	UJ	-		-		2	J	10	UJ	-		-		2	J	-		2	J							CLP
	1/12/99	1	U	1	U	5		-		1	U	1.8		2		1	U	1	U	2.8		1	U	3.3								8021B
	7/12/99	-		10	U	2	J	-		-		10	U	10	U	-		-		10	U	-		2	J							CLP

TABLE 5A NOTES:

U Denotes not detected (the associated numerical value is the CRQL/LOQ).
J Denotes an estimated value
CRQL Contract Required Quantification Limit (CLP Methods)
LOQ Limit of Quantitation (SW-846 Methods)
- Denotes Not Avaliable or Not Sampled
Shading - denotes Parameter results that exceed U.S. EPA Maximum Contaminant Levels.

NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)

ANALYSIS TYPE:

1) Organic parameters were analyzed utilizing CLP Statement of Work OLMO1.9(3/90), SW-846 Method #8260 and/or #8021, as noted.
2) For CLP analyses, 1,2-Dichloroethene was reported as total concentration; for 8021/8260 concentration was reported for cis-isomer.
3) For the 6/20/94 event, monitoring wells MW-8, MW-9, MW-10, MW-11, MW-12, MW-15 and MW-17, SW-846 anlytical method #8021 analysis was performed. Other monitoring locations were analyzed using CLP analytical methods.

j:\6520-21\CORRESP\REPORTS\TABLE5A3.XLS

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Watauga County, North Carolina
Upgradient Well: MW-1
03/29/99

Table 5B
Background Assessment Organic Target Parameter Analytical Results
Boundary Groundwater Monitoring Wells
Results ug/l(ppb)

Parameter	Event	MW-4		MW-5		MW-13		MW-14		MW-16		MW-18		Analysis Type	NCS (ug/L	MCL (ug/L)
Benzene	6/20/94	10	U	-		5.30	U	5.30	U	5.30	U	5.30	U	8021	1	5
	9/27/94	2	J	-		10	U	10	U	2	J	1	J	CLP	1	5
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	1	5
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	1	5
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	1	5
	4/10/96	-		-		-		-		-		-		CLP	1	5
	4/8/97	-		-		-		-		-		-		8021	1	5
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	1	5
Chloroethane	6/20/94	10	U	-		9.29	U	9.29	U	9.29	U	9.29	U	8021	-	-
	9/27/94	18		-		10	U	10	U	10	U	10	U	CLP	-	-
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	-	-
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	-	-
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	-	-
	4/10/96	-		-		-		-		-		-		CLP	-	-
	4/8/97	-		-		-		-		-		-		8021	-	-
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	-	-
Dichlorodifluoromethane	6/20/94	10	U	-		46.64	U	46.64	U	46.64	U	46.64	U	8021	0.19	-
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	0.19	-
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	0.19	-
	4/11/95	10	U	10	U	10	U	10	UJ	10	UJ	10	UJ	CLP	0.19	-
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	0.19	-
	4/10/96	-		-		-		-		-		-		CLP	0.19	-
	4/8/97	-		-		-		-		-		-		8021	0.19	-
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	0.19	-
1,1-Dichloroethane	6/20/94	10	U	-		0.99	J	43.10	U	43.10	U	43.10	U	8021	700	-
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	700	-
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	700	-
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	700	-
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	700	-
	4/10/96	-		-		-		-		-		-		CLP	700	-
	4/8/97	-		-		-		-		-		-		8021	700	-
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	700	-
1,1-Dichloroethene	6/20/94	10	U	-		9.75	U	9.75	U	9.75	U	9.75	U	8021	7	7
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	7	7
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	7	7
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	7	7
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	7	7
	4/10/96	-		-		-		-		-		-		CLP	7	7
	4/8/97	-		-		-		-		-		-		8021	7	7
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	7	7
cis-1,2-Dichloroethene(2)	6/20/94	10	U	-		9.49	U	9.49	U	9.49	U	9.49	U	8021	70	70
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	70	70
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	70	70
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	70	70
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	70	70
	4/10/96	-		-		-		-		-		-		CLP	70	70
	4/8/97	-		-		-		-		-		-		8021	70	70
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	70	70
trans-1,3-Dichloropropene	6/20/94	10	U	-		24.49	U	24.49	U	24.49	U	24.49	U	8021	-	-
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	-	-
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	-	-
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	-	-
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	-	-
Methylene Chloride	6/20/94	10	U	-		36.20	UJ	36.20	UJ	36.20	UJ	36.20	U	8021	5	5
	9/27/94	13	U	-		10	U	10	U	33		27		CLP	5	5
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	5	5
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	5	5
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	5	5
	4/10/96	-		-		-		-		-		-		CLP	5	5
	4/8/97	-		-		-		-		-		-		8021	5	5
	1/15/98	-		-		-		-		-		-		CLP	5	5
Tetrachloroethene	6/20/94	10	U	-		7.84	U	0.24	J	7.84	U	7.84	U	8021	0.7	5
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	0.7	5
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	0.7	5
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	0.7	5
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	0.7	5
	4/10/96	-		-		-		-		-		-		CLP	0.7	5
	4/8/97	-		-		-		-		-		-		8021	0.7	5
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	0.7	5
Trichloroethene	6/20/94	10	U	-		21.20	U	21.20	U	21.20	U	21.20	U	8021	2.8	5
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	2.8	5
	2/06/95	10	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	8021	2.8	5
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	CLP	2.8	5
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	2.8	5
	4/10/96	-		-		-		-		-		-		CLP	2.8	5
	4/8/97	-		-		-		-		-		1		8021	2.8	5
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	2.8	5

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1,1,1-Trichloroethane	6/20/94	10	U	-		30.11	U	30.11	U	30.11	U	30.11	U	8021	200	200
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	200	200
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	200	200
	4/11/95	10	U	10	U	10	U	1	J	10	U	10	U	CLP	200	200
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	200	200
	4/10/96	-		-		-		-		-		-		CLP	200	200
	4/8/97	-		-		-		-		-		-		8021	200	200
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	200	200
Vinyl Chloride	6/20/94	10	U	-		6.60	UJ	6.60	UJ	6.60	UJ	6.60	U	8021	0.02	2
	9/27/94	10	U	-		10	U	10	U	10	U	10	U	CLP	0.02	2
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	8021	0.02	2
	4/11/95	10	UJ	10	U	10	U	10	UJ	10	UJ	10	UJ	CLP	0.02	2
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	8021	0.02	2
	4/10/96	-		-		-		-		-		-		CLP	0.02	2
	4/8/97	-		-		-		-		-		-		8021	0.02	2
	1/15/98	10	U	10	U	10	U	10	U	-		10	U	CLP	0.02	2

TABLE 5B NOTES:

U Denotes not detected (the associated numerical value is the CRQL/LOQ).
J Denotes an estimated value.
CRQL Contract Required Quantification Limit (CLP Methods)
LOQ Limit of Quantitation (SW-846 Methods)
- Denotes Not Available or Not Sampled.
Shading - denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.
NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200).
MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001).

ANALYSIS TYPE:

1) For the 9/27/94, 4/11/95, 4/10/96 and 1/15/98 events, boundary monitoring well analyses were performed utilizing CLP Statement of Work OLMO3.2, SW-846 Method #8260 and/or #8021, as noted.
2) For CLP, 1,2-Dichloroethene was reported as total concentration; for 8021/8260 concentration was reported for cis-isomer.
3) For the 6/20/94, 2/6/95, 7/10/95 and 4/8/97 events, boundary monitoring well analyses were performed utilizing SW-846 Method #8021.

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Watauga County, North Carolina
Upgradient Well: MW-1
11/01/99

Table 5C
Background Assessment Organic Target Parameter Analytical Results
Surface Water Sampling Locations
Results ug/l(ppb)

Parameter	Event	S1		S2		S3		S4		S5		S6		L1		Mt. Spring	
ORGANICS																	
Benzene	6/20/94	10	U	3	J	10	U	1	J	10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 71.4 ug/l	2/06/95	10	U	10	U	10	U	10	U	10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	U	10	U	10	U	10	U	10	U	-		-		-	
	4/10/96	10	U	2	J	10	U	10	U	10	U	10	U	-		-	
	4/8/97	10	U	2	J	10	U	10	U	10	U	10	U	-		-	
	1/15/98	10	U	3	J	10	U	10	U	10	U	10	U	-		-	
	6/23/98	10	UJ	1	J	10	UJ	10	UJ	10	UJ	10	UJ	-		-	
	1/12/99	10	U	2	J	10	U	10	U	10	U	10	U	-		-	
	7/12/99	10	U	2	J	10	U	10	U	10	U	10	U	-		-	
Chloroethane	6/20/94	10	U	56		10	U	10	U	11		-		-		-	
	9/27/94	-		-		-		-		-		-		13		10	U
WQS = 860 ug/l	2/06/95	10	U	26		10	U	2	J	7	J	-		6	J	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	15		10	U	10	U	4	J	10	U	-		-		-	
	4/10/96	8	J	46		10	U	3	J	5	J	10	U	-		-	
	4/8/97	10	U	50		10	U	1	J	23		10	U	-		-	
	1/15/98	10	U	56		10	U	10	U	10	U	10	U	-		-	
	6/23/98	2	J	26	J	10	UJ	1	J	4	J	10	UJ	-		-	
	1/12/99	10	U	71		10	U	3	J	10	U	10	U	-		-	
	7/12/99	10	U	58		10	U	10	U	10	U	10	U	-		-	
Dichlorodifluoromethane	6/20/94	10	U	4	J	10	U	10	U	10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 570000 ug/l	2/06/95	10	U	10	U	10	U	10	U	10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	-		-		-	
	4/10/96	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	4/8/97	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	1/15/98	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	6/23/98	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	-		-	
	1/12/99	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	7/12/99	10	U	17	U	10	U	10	U	10	U	10	U	-		-	
1,1-Dichloroethane	6/20/94	1	J	23		10	U	59		2	J	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 42 ug/l	2/06/95	10	U	10	U	10	U	45		10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	6	J	20		10	U	41		2	J	-		-		-	
	4/10/96	3	J	15		10	U	30		2	J	14		-		-	
	4/8/97	10	U	14		10	U	12		10	U	14		-		-	
	1/15/98	10	U	15		10	U	10	U	10	U	10	U	-		-	
	6/23/98	10	UJ	8	J	10	UJ	15	J	10	UJ	10	UJ	-		-	
	1/12/99	10	U	12		10	U	14		10	U	1	J	-		-	
	7/12/99	10	U	11	J	10	U	5	J	10	U	10	U	-		-	
1,1-Dichloroethene	6/20/94	10	U	10	U	10	U	10	U	10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 3.2 ug/l	2/06/95	10	U	10	U	10	U	10	U	10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	U	10	U	10	U	10	U	10	U	-		-		-	
	4/10/96	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	4/8/97	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	1/15/98	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	6/23/98	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	-		-	
	1/12/99	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	7/12/99	10	U	17	U	10	U	10	U	10	U	10	U	-		-	
cis-1,2-Dichloroethene(2)	6/20/94	10	U	4	J	10	U	58		10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 140000 ug/l	2/06/95	10	U	10	U	10	U	42		10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	1	J	3	J	10	U	42		10	U	-		-		-	
	4/10/96	10	U	5	J	10	U	35		10	U	16		-		-	
	4/8/97	10	U	6	J	10	U	15		10	U	16		-		-	
	1/15/98	10	U	5	J	10	U	1	J	10	U	10	U	-		-	
	6/23/98	10	UJ	4	J	10	UJ	21	J	10	UJ	10	UJ	-		-	
	1/12/99	10	U	4	J	10	U	30		10	U	2	J	-		-	
	7/12/99	10	U	5	J	10	U	8	J	10	U	10	U	-		-	
trans-1,3-Dichloropropene	6/20/94	10	U	10	U	10	U	10	U	10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
	2/06/95	10	U	10	U	10	U	10	U	10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	U	10	U	10	U	10	U	10	U	-		-		-	
Methylene Chloride	6/20/94	6	J	9	J	3	J	1	J	8	J	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 1600 ug/l	2/06/95	10	U	2	J	3	J	1	J	10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	U	10	U	10	U	10	U	10	U	-		-		-	
	4/10/96	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	4/8/97	10	U	3	J	1	J	10	U	10	U	10	U	-		-	
	1/15/98	1	J	4	J	4	J	1	J	2	J	2	J	-		-	
	6/23/98	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	-		-	
	1/12/99	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	7/12/99	10	U	17	U	10	U	10	U	10	U	10	U	-		-	

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Watauga County, North Carolina
Upgradient Well: MW-1
11/01/99

Table 5C
Background Assessment Organic Target Parameter Analytical Results
Surface Water Sampling Locations
Results ug/l(ppb)

Parameter	Event	S1		S2		S3		S4		S5		S6		L1		Mt. Spring	
Tetrachloroethene	6/20/94	10	U	10	U	10	U	18		10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 8.84 ug/l	2/06/95	10	U	10	U	10	U	12		10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	U	10	U	10	U	11		10	U	-		-		-	
	4/10/96	10	U	10	U	10	U	9	J	1	J	4	J	-		-	
	4/8/97	10	U	10	U	10	U	4	J	10	U	4	J	-		-	
	1/15/98	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	6/23/98	10	UJ	10	UJ	10	UJ	5	J	10	UJ	10	UJ	-		-	
	1/12/99	10	U	10	U	10	U	6	J	10	U	10	U	-		-	
	7/12/99	10	U	17	U	10	U	2	J	10	U	10	U	-		-	
Trichloroethene	6/20/94	10	U	1	J	10	U	13		10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 92.4 ug/l	2/06/95	10	U	10	U	10	U	8	J	10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	U	1	J	10	U	8	J	10	U	-		-	-	-	-
	4/10/96	10	U	1	J	10	U	6	J	1	J	3	J	-		-	
	4/8/97	10	U	1	J	10	U	3	J	10	U	3	J	-		-	
	1/15/98	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	6/23/98	10	UJ	10	UJ	10	UJ	3	J	10	UJ	10	UJ	-		-	
	1/12/99	10	U	10	U	10	U	4	J	10	U	10	U	-		-	
	7/12/99	10	U	17	U	10	U	1	J	10	U	10	U	-		-	
1,1,1-Trichloroethane	6/20/94	10	U	2	J	10	U	3	J	10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 555 ug/l	2/06/95	10	U	10	U	10	U	2	J	10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	U	1	J	10	U	2	J	10	U	-		-		-	
	4/10/96	10	U	10	U	10	U	2	J	2	J	1	J	-		-	
	4/8/97	10	U	10	U	10	U	10	U	10	U	1	J	-		-	
	1/15/98	10	U	10	U	10	U	10	U	2	J	10	U	-		-	
	6/23/98	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	-		-	
	1/12/99	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	7/12/99	10	U	17	U	10	U	10	U	10	U	10	U	-		-	
Vinyl Chloride	6/20/94	10	U	10	U	10	U	10	U	10	U	-		-		-	
	9/27/94	-		-		-		-		-		-		10	U	10	U
WQS = 525 ug/l	2/06/95	10	U	10	U	10	U	2	J	10	U	-		10	U	-	
	4/11/95	-		-		-		-		-		-		-		-	
	7/10/95	10	U	10	U	10	U	3	J	10	U	-		-		-	
	4/10/96	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	4/8/97	10	U	2	J	10	U	10	U	10	U	10	U	-		-	
	1/15/98	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	6/23/98	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	-		-	
	1/12/99	10	U	10	U	10	U	10	U	10	U	10	U	-		-	
	7/12/99	10	U	17	U	10	U	10	U	10	U	10	U	-		-	

TABLE 5B NOTES:
U Denotes not detected (the associated numerical value is the CRQL).
J Denotes an estimated value
CRQL Contract Required Quantification Limit (CLP Methods)
- Denotes Not Avaliable or Not Sampled
WQS Denotes North Carolina Surface Water Quality Standard (T15A: 02B .0200)
Shading Denotes parameter results that exceed North Carolina Surface Water Quality Standard.

ANALYSIS TYPE:
1) Organic parameters were analyzed utilizing CLP Statement of Work OLMO3.2.
2) For CLP analyses, 1,2-Dichloroethene is reported as total concentration.

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Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1
03/29/99

Table 5D
Background Assessment Metal Target Parameter Analytical Results
Core Groundwater Monitoring Wells

Parameter	Event	Results ug/l(ppb)																								Analysis Type	NCS (ug/L)	MCL (ug/L)
		MW-1		MW-2		MW-3		MW-4		MW-6		MW-8		MW-9		MW-10		MW-11		MW-12		MW-17						
		METALS, TOTAL																										
Barium, Total	6/20/94	203		199		123		24.2		652		281		710		109		117		101		117				CLP	2000	2000
	9/27/94	149		204		119		23.5		502		86.9		632		113		153		101		90.4				CLP	2000	2000
	2/06/95	157		192		109		27.2		418		70.4		615		94.8		176		104		87.2				CLP	2000	2000
	4/11/95	143		212	J	82		23.2	J	477		65		628	J	93.1		295		97.7	J	77.3				CLP	2000	2000
	7/10/95	125		210	J	94.5		23.8		499		70.6		612		103		199		110		79				CLP	2000	2000
	4/10/96	144		178		142		-		570		63.5		507		105		268		119		75.7				CLP	2000	2000
	4/8/97	171		219		97		-		-		259		659		83		137		145		106				CLP	2000	2000
Iron, Total	6/20/94	409		24.4	U	9950		24.4	U	24900		16100	J	7060		5460		337	J	1800	J	3220				CLP	300	300*
	9/27/94	1390		140		9320		71.8		9170		418		42		3100		3.8	U	16		149				CLP	300	300*
	2/06/95	2830		46		6610		552		5930		368		735		2240		296		61.3		260				CLP	300	300*
	4/11/95	2490	J	245	J	3600	J	54.4	UJ	8300	J	149	J	81.7	UJ	234	J	15.7	U	54.4	UJ	63.7	J			CLP	300*	300*
	7/10/95	646		U*		4480		U*		7980		455		U*		508		9.7	U	U*		48.5				CLP	300*	300*
	4/10/96	1660		257		8550		-		9760	J	334		348	J	3340		13.3	U	13.3	U	53.5				CLP	300*	300*
	4/8/97	8760		U*		4480		-		-		11500		U*		U*		U*		U*		U*				CLP	300*	300*
Cadmium, Total	6/20/94	6.0		4.5	UJ	5.5		4.5	UJ	4.5	UJ	4.6	UJ	4.5	UJ	4.5	UJ	4.6	UJ	4.6	UJ	4.5	UJ			CLP	5	5
	9/27/94	4.3	U	4.6	U	4.6	U	4.6	U	4.3	U	4.3	U	4.6	U	4.6	U	4.3	U	4.6	U	4.6	U			CLP	5	5
	2/06/95	0.5	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U			CLP	5	5
	4/11/95	0.3	U	4.4	UJ	0.3	U	4.4	UJ	0.3	U	0.3	U	4.4	UJ	0.3	U	0.3	U	4.4	UJ	0.3	U			CLP	5	5
	7/10/95	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U			CLP	5	5
	4/10/96	-		-		-		-		-		-		-		-		-		-		-				CLP	5	5
	4/8/97	-		-		-		-		-		-		-		-		-		-		-				CLP	5	5
Mercury, Total	6/20/94	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U			CLP	1.1	2
	9/27/94	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U			CLP	1.1	2
	2/06/95	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U			CLP	1.1	2
	4/11/95	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U			CLP	1.1	2
	7/10/95	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U			CLP	1.1	2
	4/10/96	-		-		-		-		-		-		-		-		-		-		-				CLP	1.1	2
	4/8/97	-		-		-		-		-		-		-		-		-		-		-				CLP	1.1	2

TABLE 5D NOTES:
NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
U Denotes not detected (the associated numerical value is the Instrument Detection Level (IDL)).
U* Denotes result less than 5X method blank concentration.
J Denotes an estimated value
* Denotes a Secondary Maximum Contaminant Level (SMCL) for Total Iron
- Denotes Not Avaliable or Not Sampled
Shading - denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.

ANALYSIS TYPE:
CLP analytical methods utilize relevant Atomic Adsorption technique and Inductively Coupled Plasma (ICP) method, in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.0 for metal analysis.

P:\06\5\20\06520-21\CORRESP\REPORTS\Jan99tables\[TABLE5C4.XLS]TABLE5E

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Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1
03/29/99

Table 5E
Background Assessment Metal Target Parameter Analytical Results
Boundary Groundwater Monitoring Wells and Surface Water Sampling Locations

Parameter	Event	Results ug/l(ppb)																																Analysis Type	NCS (ug/L)	MCL (ug/L)
		MW-5		MW-7		MW-13		MW-14		MW-15		MW-16		MW-18		S1		S2		S3		S4		S5		L1		Mt. Spring										
METALS, TOTAL																																				
Barium, Total	6/20/94	-		439		54.2		18.4		94.9		66.8		73.6		133		755		366		94.1		197		-		-								CLP	2000	2000
	9/27/94	-		698		59.7		17.4		79		70.6		78.7		-		-		-		-		-		-		5.5								CLP	2000	2000
	2/06/95	710		743		79.4		16.3		82.3		72.5		67.9		86.8	J	350	J	235	J	82.5	J	472	J	2240	J	-								CLP	2000	2000
	4/11/95	591		426		54.4		16.4	J	78.4	J	70.3	J	83	J	-		-		-		-		-		-		-								CLP	2000	2000
	7/10/95	700		-		116		19.5		73.6		67		90		502		592		277		861		310		-		-								CLP	2000	2000
	4/10/96	-		612		-		-		56.3	J	-		-		346	J	427	J	182	J	68.5	J	113	J	-		-								CLP	2000	2000
	4/8/97	-		10300		-		-		77.3		-		-		122		732		253		72		11500		-		-								CLP	2000	2000
Iron, Total	6/20/94	-		15200		283		100	U	2110		78.6		24.4		11300		30800		8600		1040		26400		-		-								CLP	300	300*
	9/27/94	-		19200		450		3.8		554		117		12.2		-		-		-		-		-		-		31.4								CLP	300	300*
	2/06/95	475		26400		2370		61.3		975		490		61.3		13200	J	42000	J	8790	J	3110	J	90300	J	255000	J	-								CLP	300	300*
	4/11/95	15.7	U	5180	J	131	J	40.8	UJ	490	J	331	J	40.8	UJ	-		-		-		-		-		-		-								CLP	300*	300*
	7/10/95	9.7	U	-		3960		9.7	U*	21.2		9.7	U*	9.7	U*	19400		36100		5740		1290		87900		-		-								CLP	300*	300*
	4/10/96	-		12000	J	-		-		194	J	-		-		503	J	4390	J	1260	J	285	J	688	J	-		-								CLP	300*	300*
	4/8/97	-		10300		-		-		U*		-		-		7480		29100		5300		529		2000000		-		-								CLP	300*	300*
Cadmium, Total	6/20/94	-		4.5	UJ	4.5	UJ	4.5	UJ	4.5	UJ	4.5	UJ	4.5	UJ	4.5	U	4.5	U	4.5	U	4.5	U	4.5	U	-		-								CLP	5	5
	9/27/94	-		4.3	U	4.3	U	4.3	U	4.6	U	4.6	U	4.6	U	-		-		-		-		-		-		4.3	U							CLP	5	5
	2/06/95	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	-								CLP	5	5
	4/11/95	0.3	U	12.3		0.3	U	4.4	UJ	4.4	UJ	4.4	UJ	4.4	UJ	-		-		-		-		-		-		-								CLP	5	5
	7/10/95	0.5	U	-		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	4.2	U	4.2	U	4.2	U	4.2	U	4.2	U	-		-								CLP	5	5
	4/10/96	-		-		-		-		-		-		-		-		-		-		-		-		-								CLP	5	5
	4/8/97	-		-		-		-		-		-		-		-		-		-		-		-		-								CLP	5	5
Mercury, Total	6/20/94	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	-		-								CLP	1.1	2
	9/27/94	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	-		-		-		-		-		-		0.2	U							CLP	1.1	2
	2/06/95	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	-								CLP	1.1	2
	4/11/95	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	-		-		-		-		-		-		-								CLP	1.1	2
	7/10/95	0.2	U	-		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	-		-								CLP	1.1	2
	4/10/96	-		-		-		-		-		-		-		-		-		-		-		-		-								CLP	1.1	2
	4/8/97	-		-		-		-		-		-		-		-		-		-		-		-		-								CLP	1.1	2

TABLE 5E NOTES:
NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
U Denotes not detected (the associated numerical value is the Instrument Detection Level (IDL)).
U* Denotes result less than 5X method blank concentration.
J Denotes an estimated value
* Denotes a Secondary Maximum Contaminant Level (SMCL) for Total Iron
- Denotes Not Avaliable or Not Sampled
Shading - denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.

ANALYSIS TYPE:
CLP analytical methods utilize relevant Atomic Adsorption technique and Inductively Coupled Plasma (ICP) method, in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.0 for metal analysis.

P:\06\5\20\06520-21\CORRESP\REPORTS\Jan99tables\[TABLE5C4.XLS]TABLE5E

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Watauga County Landfill

Watauga County, North Carolina
Upgradient Well: MW-1
11/01/99

Table 6A

Cumulative Detected Non-Target Organic Parameter Analytical Results
Contract Laboratory Program (CLP) Statement of Work (SOW) - Organics

Parameter	Event	Results ug/L(ppb)																														NCS (ug/L)	MCL (ug/L)
		MW-1		MW-3		MW-4		MW-7		MW-8		MW-9		MW-10		MW-11		MW-12		MW-17		S1		S2		S3		S5							
Acetone	6/20/94	61		-		-		-		-		-		-		-		-		-		-		-		-		-				700	-
	9/27/94	-		-		-		-		-		-		40	J	-		-		-		-		-		-		-				700	-
	4/11/95	-		-		-		15	J	-		-		-		-		-		-		-		-		-		-				700	-
	4/8/97	-		-		-		-		-		-		-		-		-		-		-		-		9	J	-				700	-
2-Butanone	9/27/94	-		-		-		19		-		-		-		-		-		-		-		-		-		-				170	-
	7/10/95	-		-		-		-		-		-		-		-		-		-		-		5	J	-		-				170	-
	4/8/97	-		-		-		-		-		-		-		-		-		-		-		3	J	-		-				170	-
Carbon Tetrachloride	4/11/95	-		-		2	J	-		-		-		-		-		1	J	2	J	-		-		-		-				0.3	5
1,2-Dichloroethane	4/8/97	-		-		-		-		-		-		-		-		-		-		-		1	J	-		-				0.36	-
1,2-Dichloropropene	1/15/98	-		-		-		-		-		-		-		-		-		-		-		1	J	-		-				-	-
1,2-Dichloropropane	4/11/95	-		-		-		-		1	J	-		-		-		-		2	J	-		-		-		-				0.56	5
	2/6/95	-		1	J	-		-		1	J	-		-		-		-		1	J	-		-		-		-				0.56	5
	4/8/97	-		-		-		-		-		-		-		-		-		-		-		-		-		-				0.56	5
2-methyl-2-pentanone	6/20/94	24		-		-		-		-		-		-		-		-		-		-		6		-		-				-	-
,1,2,2-Tetrachloroetha	6/20/94	2	J	-		-		-		-		-		-		-		-		-		-		-		-		-				-	-
Ethylbenzene	6/20/94	10		-		-		-		-		-		-		-		-		-		-		6		-		-				29	700
	7/10/95	-		-		-		-		-		-		-		-		-		-		-		3	J	-		-				29	700
	4/8/97	-		-		-		-		-		-		-		-		-		-		-		2	J	-		-				29	700
	1/15/98	-		-		-		-		-		-		-		-		-		-		-		2	J	-		-				29	700
Toluene	6/20/94	2	J	-		-		-		-		-		-		-		-		-		-		7		-		-				1000	1000
	4/11/95	-		-		2	J	-		-		-		-		-		1	J	4	J	-		-		-		-				1000	1000
	7/10/95	-		-		-		-		-		-		-		-		-		-		-		2	J	-		-				1000	1000
	4/8/97	-		-		-		-		-		-		-		-		-		-		-		2	J	-		-				1000	1000
	1/15/98	-		-		-		-		-		-		-		-		-		-		-		2	J	-		-				1000	1000
Xylene (total)	6/20/94	64		-		-		-		-		-		-		-		-		-		-		20		-		-				530	10000
	9/27/94	-		-		-		1	J	-		3	J	-		-		-		-		-		-		-		-				530	10000
	4/11/95	-		-		-		-		-		3	J	-		-		-		-		-		-		-		-				530	10000
	7/10/95	-		-		-		-		-		-		-		-		-		-		1	J	6	J	-		2	J			530	10000
	4/8/97	-		-		-		-		-		-		-		-		-		-		-		6	J	-		-				530	10000
	1/15/98	-		-		-		-		-		-		-		-		-		-		-		6	J	-		-				530	10000

Tentatively Identified Compounds

Parameter	Event	Results ug/L(ppb)																															
		S-2		MW-3		MW-6		MW-8		MW-9		MW-11		MW-12		MW-16		MW-17		MW-18													
Hexane	4/11/95	-		-		-		-		-		-		-		7	NJ	-		-													
Ether	1/15/98	7	NJ	-		-		-		-		-		-		-		-		-													
	6/24/98	7	NJ	-		-		12	NJ	6	NJ	-		-		-		10	NJ	-													
	1/12/99	7	NJ	-		-		-		-		-		-		-		-		-													
	7/12-13/9	14	NJ	18	NJ	-		12	NJ	22	NJ	-		-		-		12	NJ	-													
Trichlorofluoromethane	4/11/95	-		-		-		-		200	NJ	-		-		-		-		-													
Dichlorofluoromethane	1/15/98	-		14	NJ	-		9	NJ	22	NJ	-		9	NJ	-		10	NJ	-													
	6/24/98	-		-		-		12	NJ	29	NJ	-		-		-		14	NJ	-													
	7/12-13/9	10	NJ	8	NJ	-		6	NJ	5	NJ	-		-		-		7	NJ	-													
Chlorofluoromethane	6/24/98	-		-		-		-		10	NJ	-		-		-		-		-													
Trimethylsilanol	1/15/98	-		7	NJ	-		-		-		-		-		-		-		-													
Unknown Alkane	4/11/95	-		-		-		-		-		6	NJ	-		-		-		-													
	4/11/95	-		-		-		-		-		9	NJ	-		-		-		-													
	4/11/95	-		-		-		-		-		6	NJ	-		-		-		-													
Unknown Cycloalkane	4/11/95	-		-		-		-		-		12	NJ	-		-		-		-													
	4/11/95	-		-		-		-		-		28	NJ	-		-		-		-													
Unknown Hydrocarbon	4/11/95	-		-		-		-		-		10	NJ	-		10	NJ	7	NJ	7	NJ												
	4/11/95	-		-		-		-		-		5	NJ	-		7	NJ	37	NJ	-													
	4/11/95	-		-		-		-		-		13	NJ	-		18	NJ	9	NJ	-													
	4/11/95	-		-		-		-		-		-		-		9	NJ	-		-													
Unknown Unsaturated Hydrocarbon	4/11/95	-		-		-		-		-		7	NJ	-		-		-		-													
	7/10/95	-		-		-		-		-		-		-		-		-		-													
Unknown Ketone	4/11/95	-		-		50	NJ	-		-		8	NJ	-		-		-		-													

Notes:

NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
~ Denotes Not Detected
- Denotes Not Available
J Denotes an estimated value
N Denotes tentatively identified
Parameters were analyzed in accordance with USEPA CLP SOW OLMO3.2.

P:\06\06520-21\CORRESP\REPORTS\June99rpt\[TABLE6A4.XLS]TABLE6A

Watauga County Landfill

Watauga County, North Carolina
Upgradient Well: MW-1

03/29/99

Table 6B

Cumulative Detected Non-Target Organic Parameter Analytical Results

Low Level Risk Assessment (LLRA) Analytical Methods

Parameter	Event	Method	Results ug/L (ppb)																														NCS (ug/L)	MCL (ug/L)
			MW-3		MW-6		MW-7		MW-8		MW-9		MW-10		MW-12		MW-13		MW-14		MW-16		MW-17		MW-18		Trip Blank							
1,2,3-Trichlorobenzene	6/20/94	8021	~		~		~		~		~		~		0.32	J	0.47	J	~		~		~		~		~						-	-
1,4-Dichlorobenzene	7/10/95	8260	~		~		~		1.1	J	~		~		~		~		~		~		~		~		~						75	100
	4/8/97	8021	~		-		2.6		~		~		~		~		~		~		~		~		~		~						75	100
	1/12/99	8021B	2.2		-		~		~		~		~		~		~		~		~		~		~		~						75	100
1,3,5-Trimethylbenzene	6/20/94	8021	~		~		~		~		0.17	J	~		~		~		~		~		~		~		~						-	-
Isopropylbenzene	6/20/94	8021	~		~		~		~		0.41	JB	~		1.06	JB	~		~		1.67	JB	~	JB	0.50	JB	0.36	JB					-	-
n-Propylbenzene	6/20/94	8021	~		~		~		~		0.50	J	~		0.33	J	~		~		0.66	J	~		~		~						-	-
Trichlorofluoromethane	6/20/94	8021	~		~		~		~		20.50	J	~		~		~		~		~		~		~		~						2,100	-
	7/10/95	8260	1.1	J	~		~		~		~		~		~		~		~		~		~		~		~						2100	-
	4/8/97	8021	1.02		-		~		~		1.38		~		1.29		~		~		~		~		~		~						2100	-
Styrene	6/20/94	8021	~		~		~		~		0.94	J	~		0.65	J	~		~		~		~		~		~						100	100
Napthylene	6/20/94	8021	~		~		0.33	J	~		0.69	J	~		0.74	J	7.07	J	~		0.62	J	~		~		~						-	-
o-Xylene	6/20/94	8021	~		~		0.83	J	~		~		~		~		~		~		~		~		~		~						530	10,000
	2/6/95	8021	~		~		0.6		~		~		~		~		~		~		~		~		~		~						530	10,000
	7/10/95	8260	~		~		~		~		3.0	J	~		~		~		~		-		~		~		~						530	10000
t-bb+tmb+s-bb	6/20/94	8021	~		~		44.97	J	8.91	J	~		~		0.83		~		~		~		~		~		~						-	-
trans-1,2-Dichloroethene	6/20/94	8021	~		~		1.53	J	2.03	J	~		~		1.47	J	~		~		~		1.31		~		~						70	100
	2/6/95	8021	~		~		2.6		~		~		~		~		~		~		~		~		~		~						70	100
	7/10/95	8260	1.6	J	5.7		1.6	J	1.4	J	~		~		~		~		~		~		~		~		~						70	100
	1/123/99	8021B	~		-		2.2		~		~		~		~		~		~		~		~		~		~						70	100
1,2,-Dichloroethane	7/10/95	8260	1.8	J	~		~		~		~		~		~		~		~		~		1.8	J	~		~						0.36	-
	7/10/95	8021	1.8	J	~		~		0.89	J	~		~		~		~		~		~		1.7	J	~		~						0.36	-
	4/8/97	8021	1.52		-		~		0.89	J	~		~		1.09		~		~		-		1.76		~		~						0.36	-
	1/12/99	8021B	2.6		-		~		~		~		~		~		~		~		-		~		~		~						0.36	-
Dibromochloromethane	2/6/95	8021	~		~		~		~		~		~		~		~		0.6	J	~		~		~		~						-	100
Bromomethane	2/6/95	8021	~		~		5.8		~		~		~		~		~		~		~		~		~		~						0.30	-
	7/10/95	8260	2.4	J	~		~		~		~		~		~		~		~		~		~		~		~						0.30	-
1,2-Dichloropropane	2/6/95	8021	~		~		1.6	J	~		~		~		~		~		~		~		~		~		~						0.56	5
	7/10/95	8260	1	J	1	J	1.6	J	~		~		~		~		~		~		~		~		~		~						0.56	5
	7/10/95	8021	~		~		1.4	J	0.87	J	~		~		~		~		~		~		0.80		~		~						0.56	5
	4/8/97	8021	0.689	J	-		1.4	J	0.87	J	~		~		0.657	J	~		~		-		0.97	J	~		~						0.56	5
	4/8/97	8021	~		-		2.2		~		~		~		~		~		~		-		~		~		~						0.56	5
2-Butanone	7/10/95	8021	~		~		15		4.9	J	~		3.1	J	~		~		~		~		~		~		~						170	-

Notes:

NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)

MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)

~ Denotes not detected

- Denotes Not Available

J Denotes an estimated value

B Denotes present in blank

Shading Denotes Parameter results that meet or exceed U.S. EPA Maximum Contaminant Levels

t-bb+tmb+s-bb: tert-Butylbenzene + 1,2,4-Trimethylbenzene + sec-Butylbenzene

TABLE 7
WATAUGA COUNTY LANDFILL ASSESSMENT
AQUIFER FLOW TESTING RESULTS SUMMARY

Monitoring Well	Filter Pack * Depth Interval (ft)	Aquifer Medium	Bouwer-Rice Slug Test	Cooper, Bredehoeft, Papadopulos Slug Test	Theis Recovery Test
MW-8	63.0 - 51.0	Layered Schist/Gneiss			T = 10.531 ft^2/day K = 0.877 ft/day
MW-9	84.0 - 72.0	Layered Schist/Gneiss			T = 2.379 ft^2/day K = 0.198 ft/day
MW-10	63.0 - 56.0	Amphibolite/ Hornblende Gneiss		T = 0.0322 ft^2/day K = 0.00268 ft/day	
MW-11	23.0 - 11.0	Soil			T = 78.235 ft^2/day K = 6.520 ft/day
MW-12	70.0 - 58.0	Layered Schist/Gneiss			T = 173.232 ft^2/day K = 14.436 ft/day
MW-13	29.0 - 17.0	Soil	K = 1.57E-04 cm/sec = 0.445 ft/day		
MW-14	69.0 - 57.0	Micaceous Schist/Gneiss			T = 141.926 ft^2/day K = 11.827 ft/day
MW-15	176.0 - 163.0	Amphibolite/ Hornblende Gneiss			T = 2.007 ft^2/day K = 0.154 ft/day
MW-16	24.0 - 12.0	Soil			T = 181.152 ft^2/day K = 15.096 ft/day
MW-17	93.0 - 81.0	Amphibolite/ Hornblende/Gneiss			T = 1.395 ft^2/day K = 0.116 ft/day
MW-18	70.0 - 58.0	Amphibolite/ Hornblende Gneiss			T = 190.656 ft^2/day K = 15.888 ft/day

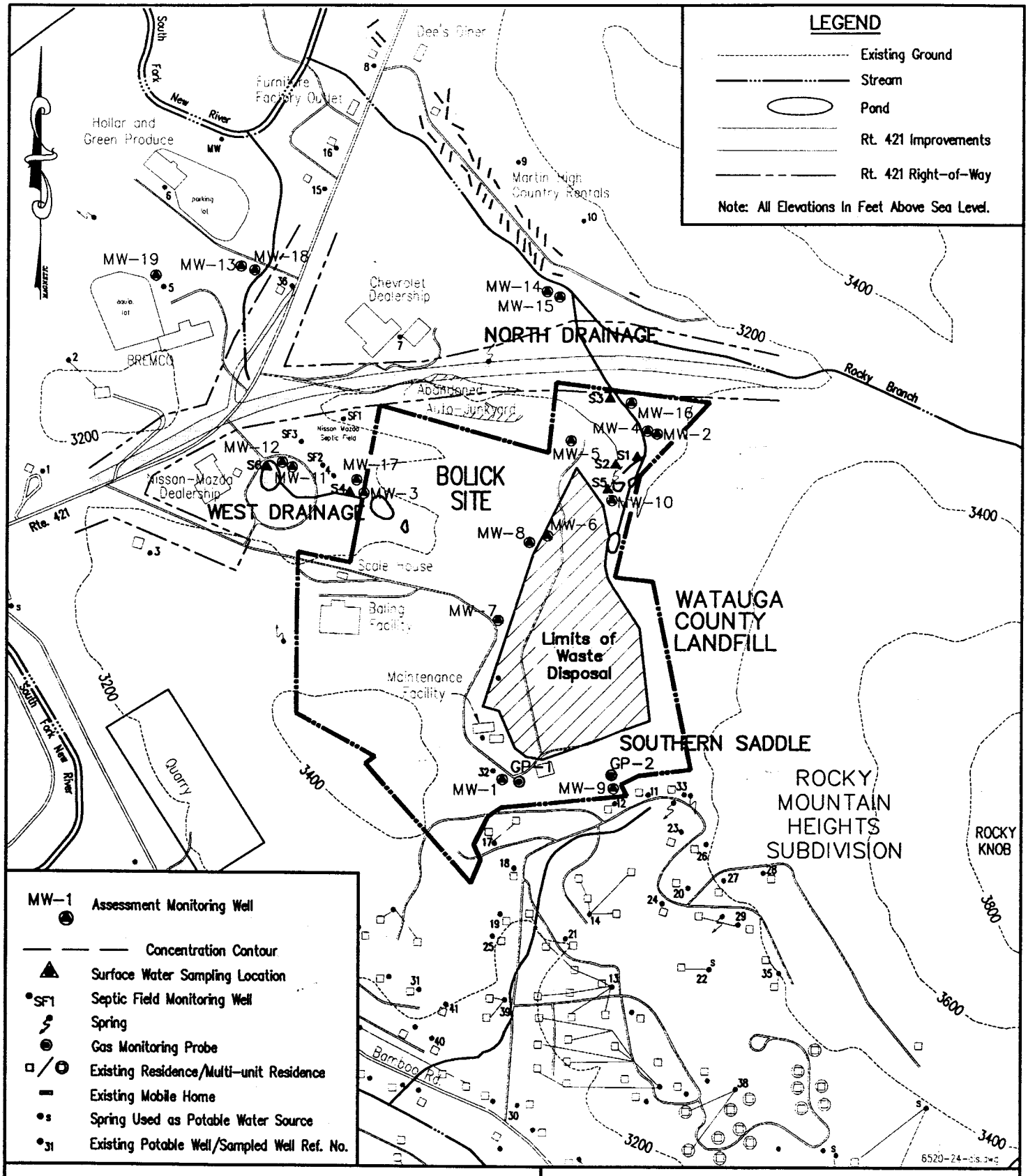
T = Transmissivity; K = Hydraulic Conductivity

* as recorded from ground elevation

TABLE 7
WATAUGA COUNTY LANDFILL ASSESSMENT - AQUIFER FLOW TESTING RESULTS SUMMARY

Observation Well	Filter Pack* Depth Interval	Aquifer Medium	Bower - Rice Slug Test	Cooper, Bredehoeft, Papadopulos Slug Test	Theis Recovery Test
MW-1	85.0 - 48.0	Layered Schist/Gneiss			T = 27.36 ft^2/day K = 0.739 ft/day
MW-2	185.0 - 168.0	Amphibolite/ Hornblende Gneiss			T = 6.624 ft^2/day K = 0.390 ft/day
MW-3	42.0 - 30.0	Soil			T = 116.64 ft^2/day K = 9.72 ft/day
MW-4	32.0 - 21.0	Soil			T = 112.32 ft^2/day K = 10.21 ft/day
MW-5	73.0 - 61.0	Layered Schist/Gneiss			T = 1.28 ft^2/day K = 0.1445 ft/day
MW-6	58.0 - 46.0	Layered Schist/Gneiss			T = 1.872 ft^2/day K = 0.156 ft/day
MW-7	50.0 - 38.0	Layered Schist/Gneiss		T = 0.0086 ft^2/day K = .0007 ft/day	
PZ-13	26.0 - 19.0	Soil	K = 8.0222 ft/day		
PZ-14	25.5 - 18.5	Soil	K = 7.4557 ft/day		
PZ-17	20.5 - 13.5	Soil	K = 5.585 ft/day		
PZ-18	50.0 - 33.0	Layered Schist/Gneiss		T = 10.368 ft^2/day K = 0.610 ft/day	
PZ-18A	25.0 - 18.0	Soil	K = 0.165 ft/day		
PZ-22	26.0 - 19.0	Soil	K = 0.089 ft/day		
PZ-23	36.5 - 28.5	Layered Schist/Gneiss		T = 3.456 ft^2/day K = 0.432 ft/day	

T = Transmissivity; K = Hydraulic Conductivity * as recorded from ground elevation

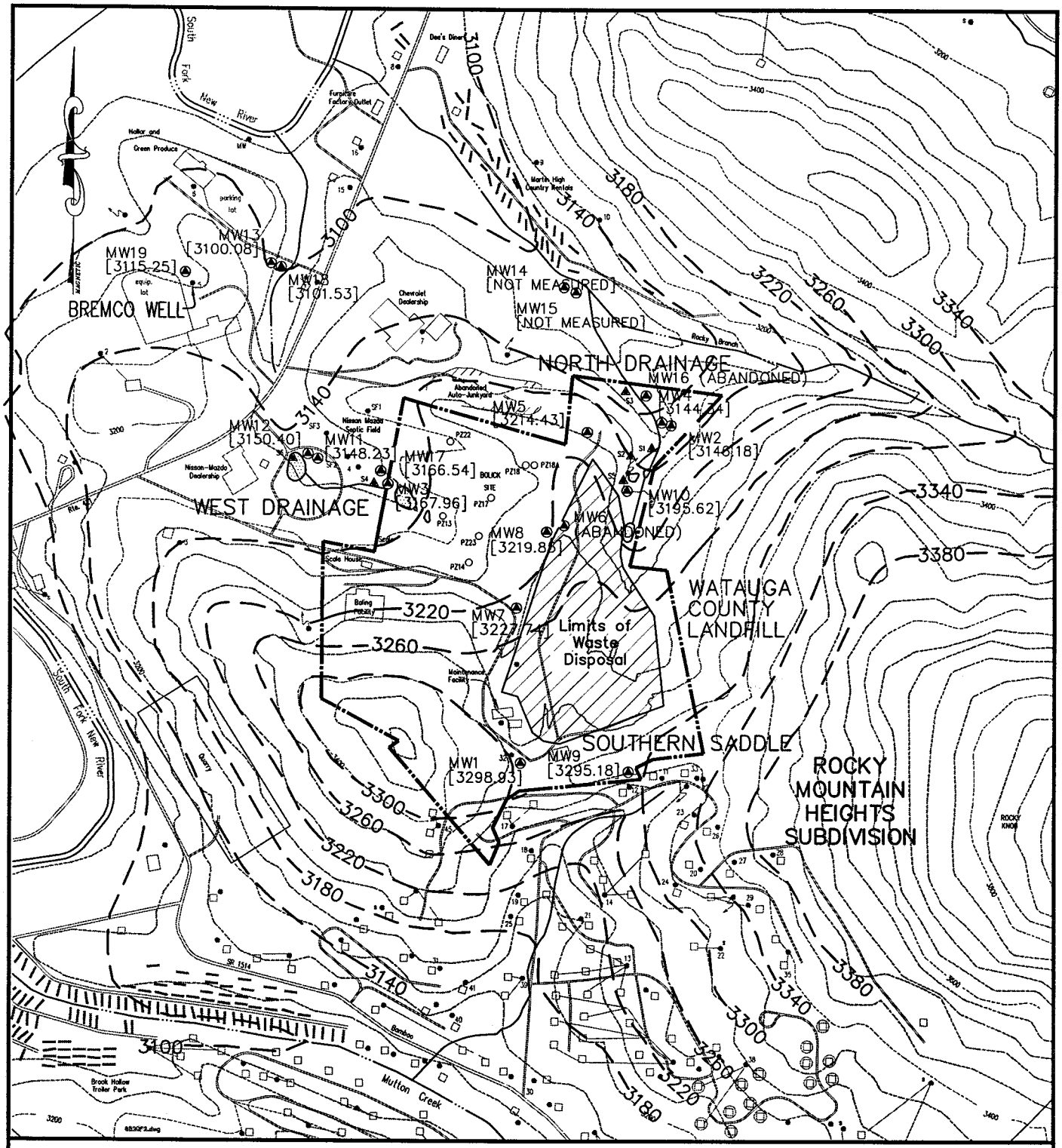


SITE MAP
FIGURE 1

WATAUGA COUNTY LANDFILL
WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



LEGEND

- Stream
- Overhead Power
- 3600 Existing Ground (Elevation in Feet Above MSL)
- Pond
- Existing Residence/Multi-unit Residence
- Existing Mobile Home
- Assessment Monitoring Wells With Groundwater Elevation in Feet Above MSL
- SS Surface Water Sampling Locations
- 3100 Groundwater Potentiometric Elevation (Inferred from static water level data obtained on January 11, 1999) contour interval 40 feet
- SF1 Septic Field Monitoring Wells
- Spring
- S Spring Used as Potable Water Source
- 2 Existing Potable Well/Sampled Well Ref. No.

GROUNDWATER AND SURFACE WATER MONITORING PROGRAM MAP
WATAUGA COUNTY LANDFILL
WATAUGA COUNTY, NORTH CAROLINA

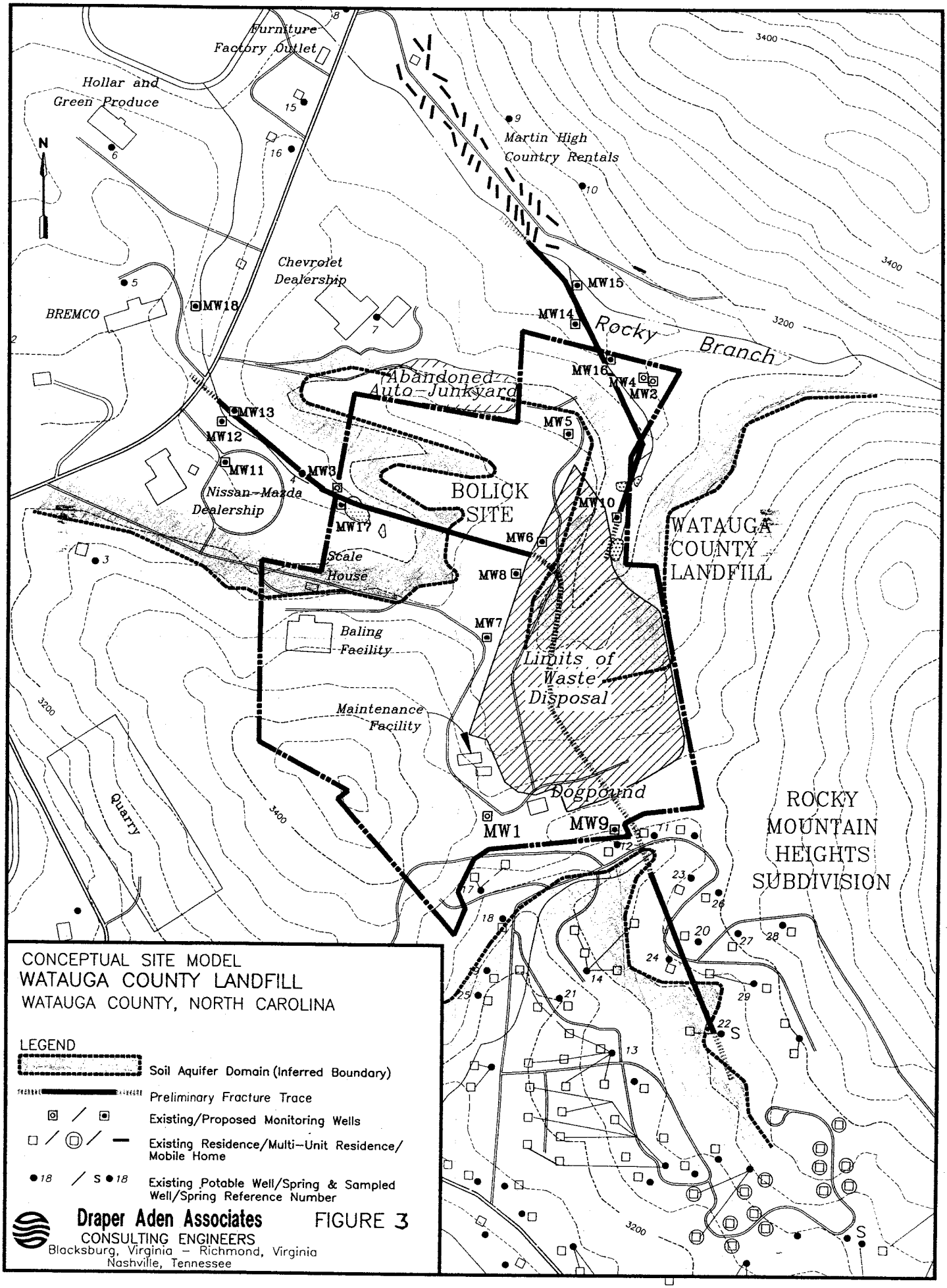
Job No.: 6520-21
Scale: 1" =755'±
Date: JANUARY 3, 2000

FIGURE 2

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

Drawing Under Seperate Cover

Drawing Under Seperate Cover

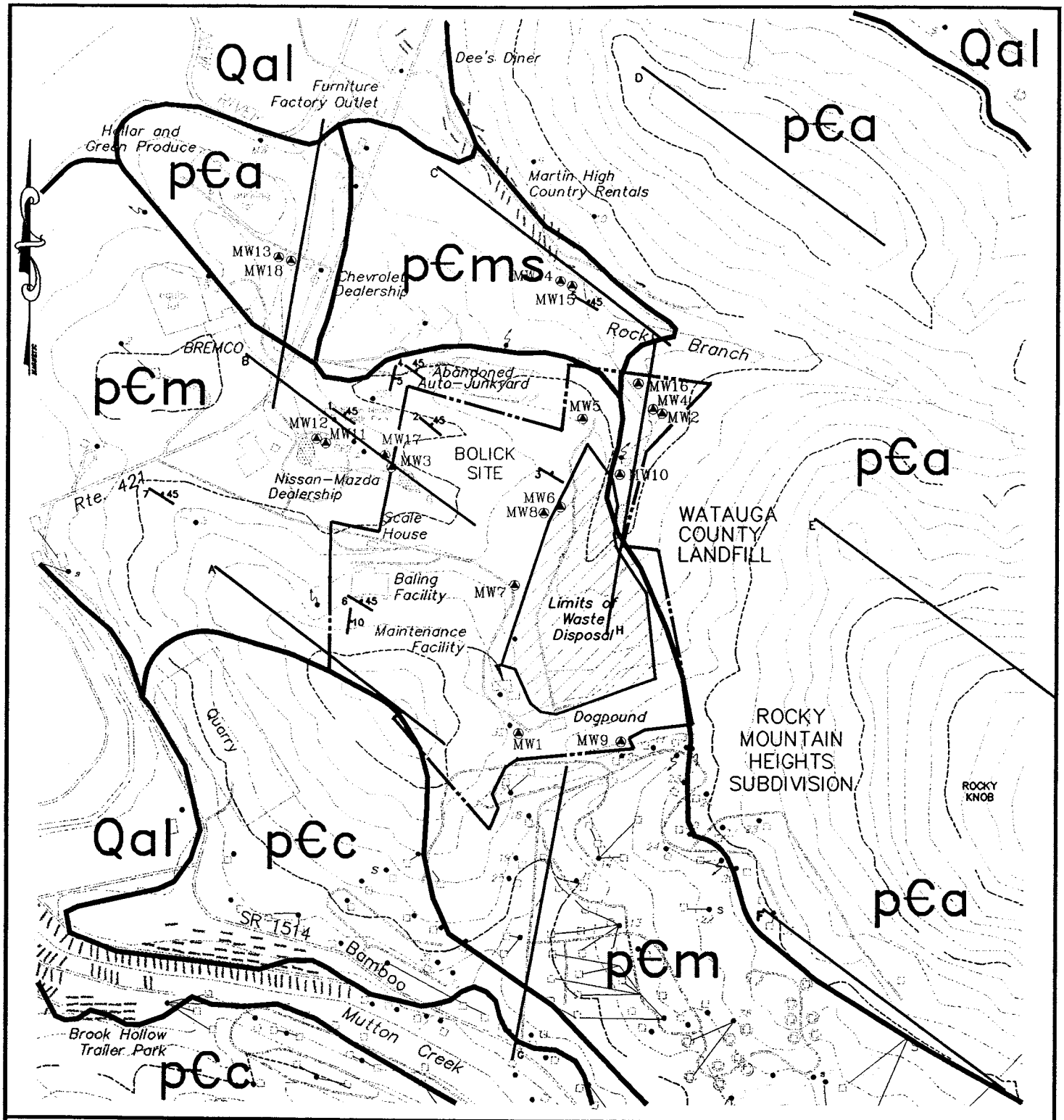


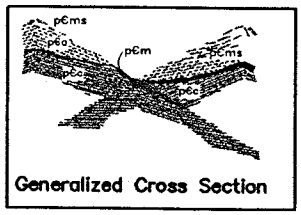
CONCEPTUAL SITE MODEL
WATAUGA COUNTY LANDFILL
WATAUGA COUNTY, NORTH CAROLINA

LEGEND

- Soil Aquifer Domain (Inferred Boundary)
- Preliminary Fracture Trace
- Existing/Proposed Monitoring Wells
- Existing Residence/Multi-Unit Residence/ Mobile Home
- ●18 / S ●18 Existing Potable Well/Spring & Sampled Well/Spring Reference Number

Draper Aden Associates FIGURE 3
CONSULTING ENGINEERS
Blacksburg, Virginia – Richmond, Virginia
Nashville, Tennessee





Generalized Cross Section

N 10° E
A
A
N 58° W

Macroscopic Linear Features A–I

1 45

Microscopic Linear Features 1–7 (Layering, Foliation, Joints)

pCms Lower Precambrian biotite–muscovite schist and gneiss
pCa Lower Precambrian amphibolite and hornblende gneiss
pCm Lower Precambrian "mixed rock" containing interlayered and intergrading amphibolite calc–silicate granofels, biotite–hornblende gneiss, hornblende–epidote–biotite gneiss, biotite–hornblende–plagioclase schist and gneiss, epidote–biotite–plagioclase schist and gneiss, and granite gneiss
pCc Lower Precambrian Cranberry gneiss "layered cataclastic gneiss"
Qal Flood–Plain Alluvium

COMPILED FROM: BRYANT & REED (1970), THE WATAUGA COUNTY SOIL SURVEY (1994), AND FIELD OBSERVATIONS

REVISED GEOLOGY MAP
WATAUGA COUNTY LANDFILL
WATAUGA COUNTY, NORTH CAROLINA

Job No.: 6520–14
Scale: NOT TO SCALE
Date: 10 JUN 94

FIGURE 4

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA – Nashville, TN

6520C.DWG

APPENDIX B

FIELD NOTES

MEMORANDUM

MEMO TO: Jeff Smith

FROM: Len DiIoia

DATE: September 15, 1999

RE: July 1999 Semiannual Assessment Groundwater Sampling Event at the Watauga County Landfill DAA JN: 6520-21

On July 12-13, 1999 DAA personnel Ric Rogers and Len DiIoia completed the July 1999 semiannual Assessment Groundwater Sampling Event at the Watauga County Landfill. The following is a summary of this event.

- All monitoring wells were purged and sampled using dedicated Grundfos impeller driven pumps.
- Monitoring well MW-3 was the QA/QC well for this sampling event.
- A Hanna 9023 pH/temp and 9033 conductivity meters were used to record indicator parameters in the field.
- CompuChem laboratories performed the CLP metals and CLP volatile analysis for this sampling event.

Cc: LLD, File 6520-21

WATAUGA Co. LF
7-12-99 LLD/RDZ

1141 ARRIVED ON SITE RAIN 60°F

Static Water Levels

Well	Depth To Water	Notes
MW-1	42.87'	
MW-2	6.78'	
MW-3	15.16'	
MW-4	8.18'	
MW-5	53.26'	
~~MW-6~~	45.79'	
MW-8	19.92'	
MW-9	64.05'	
MW-10	8.25'	
MW-11	11.37'	
MW-12	8.75'	
MW-13	19.64'	
MW-14		
MW-15		
MW-17	17.08'	
MW-18	18.10'	
MW-19	9.75'	
PZ-13	18.17	
PZ-14	18.09	

1230 - Sampled Surface #3 (S-3)
only 2 Bottles Collected

1240 - Sampled Surface #1 (S1)

1250 - Sampled Surface #2 (S2)

1300 - Sampled Surface #5 (S5)

MW-8 TD 67.00
WL 19.92
47.08 x .163 = 7.7 x 3 = 23 Gals

1345 - Started Purging MW-8
Water Slightly Silty

Time	Temp	pH	Cond	Rate	Gals	Descrip
1345	13.5	6.78	866uS/cm	1GPM	-	Sl. Silty
1352	14.3	6.49	841uS/cm	1GPM	7Gals	Clear
1359	15.1	6.78	827uS/cm	1GPM	14Gals	Clear
1406						

1405 MW-8 went Dry water Clear
20+ Gals Purged
Left Remarks.

1415 - Sampled MW-8 water clear

MW-9 89.40
64.05
22.35 x .163 = 3.64 x 3 = 11 Gals

Time	Temp °C	pH	Cond	Rate	Gals	Descrip
1440	14.0	6.63	563uS/cm	1GPM	-	Clear
1452	14.3	6.29	512uS/cm	1GPM	4Gals	Clear
1455	14.9	6.32	533uS/cm	"	7Gals	Clear
1500	15.6	6.29	522uS/cm	"	12Gals	Clear

1501 - Slowed Purge Rate water clear

1510 - Sampled MW-9

1515 - 1655 Water Levels

1655 - Sampled S4 (Surface Location 4)

1620 - Sampled S6 (Surface Location 6)

1700 - Left Site

Watauga LF
7.13.99 LLD/RDR

7:30 Arrived on Site Cloudy - Overcast 66°F

MW-12 TD: 72.75
WL: 8.75
64 x .163 = 10.4 x 3 = 31 Gals.

0740 - Started Purging MW-12 @ 1.5 GPM

Time	Temp'c	pH	Cond	Rate	Vol	Descrip
0740	13.2	6.42	317uS/cm	1.5GPM	-	Clear
0747	13.2	6.37	319uS/cm	"	10.5	Clear
0754	13.3	6.34	313uS/cm	"	21.0	Clear
0801	13.2	6.31	309uS/cm	"	28.5	Clear

0802 - Slowed Purge Rate

0815 - Sampled MW-12 water clear

MW-17 TD 94.54 WL 17.08
77.46 x .163 = 12.6 x 3 = 38 gals

0826 - Started Purging MW-17 @ 1.5 gpm
water clear

Time	Temp °C	pH	Cond	Vol	Rate	Descrip
0827	13.2	6.16	281 uS/cm	1.5	1.5	Clear
0836	14.2	6.15	277 uS/cm	10.5	1.5	Clear
0845	14.5	6.06	269 uS/cm	24.0	1.5	Clear
0854	14.6	5.96	264 uS/cm	37.5	1.5	Clear

0855 - Slowed Purge Rate

0910 - Sampled MW-17

MW-3 TD = 39.60 WL: 15.16
24.44 x .163 = 3.9 x 3 = 12 gals

0914 Started Purging MW-3 (Quick Sweep)

Time	Temp °C	pH	Cond	Vol	Rate	Descrip
0914	13.8	6.01	258 uS/cm	1	1 GPM	SL Silty
0917	14.3	6.00	251 uS/cm	3	"	"
0920	14.4	5.97	253 uS/cm	6	"	"
0925	14.4	5.94	256 uS/cm	9.11	"	"

0929 - Slowed Purge Rate water slightly silty

MW-2 WL 6.78 17.50
~~170.72 x .103 = 27.8 x 3 = 83~~
170.72 x .65 = 111 x 3 = 333

1112 - Started Purging MW-2 @ 4 GPM

Time	Temp °C	pH	Cond	Vol	Rate	Description
1113	~~13.1~~ 12.9	7.67	270 uS/cm	4 cm	4 GPM	Clear
1122	13.0 ~~14.2~~	7.65	272 uS/cm	40	"	Clear
1131	13.1	7.67	266 uS/cm	76	"	Clear
1140	13.3	7.72	267 uS/cm	112	"	Clear

1140 Shut Down

1200 - Sampled MW-2 water clear

1208 - Returned Keys to JV @ Maintenance Shop

1222 - Left Site

APPENDIX C

Previous Landfill Groundwater Organic Analysis
Summary Table

[redacted] COUNTY LANDFILL GROUNDWATER
ORGANIC CONSTITUENTS DETECTED
December 11, 1990, November 16-18, 1992 and March 3, 1993 SAMPLING EVENTS

Analyte	Date Sampled	Analytical Method	MDL	MW-1	MW-2	MW-3	MW-4	PZ-24	NCS	MCL	TRIP
Trichloroethene	December 11, 1990	SW846 Method 8240	5			9		---	2.8	5	
(TCE)	November 16-18, 1992	SW846 Method 8010	1			23		110	2.8	5	
	March 5, 1993	EPA Method 502.2	0.2	0.4	2.4	18.1	0.7		2.8	5	
	March 5, 1993	SW846 Method 8021	0.2		2.1	15.7	0.8	79.5	2.8	5	
1,1,1-Trichloroethane	December 11, 1990	SW846 Method 8240	5		394	102			200	200	
(1,1,1-TCA)	November 16-18, 1992	SW846 Method 8010	1		980	68	6		200	200	
	March 5, 1993	EPA Method 502.2	0.4		1646	19.0	10.5		200	200	
	March 5, 1993	SW846 Method 8021	0.4		1212	19.0	22.5	1.4	200	200	
Tetrachloroethene	December 11, 1990	SW846 Method 8240	5		7	25			0.7	5	
(PCE)	November 16-18, 1992	SW846 Method 8010	1		5	39		4	0.7	5	
	March 5, 1993	EPA Method 502.2	0.5	0.5	11.2		1.6		0.7	5	
	March 5, 1993	SW846 Method 8021	0.5		11.8	24.9	1.6	12.5	0.7	5	
1,1,-Dichloroethane	December 11, 1990	SW846 Method 8240	5		52	178			700[1]	---	
(1,1-DCA)	November 16-18, 1992	SW846 Method 8010	1		41	250		81	700[1]	---	
	March 5, 1993	EPA Method 502.2	0.7		96	173.3	1.2	77	700[1]	---	
	March 5, 1993	SW846 Method 8021	0.7		82	161	1.1	43.7	700[1]	---	
1,1-Dichloroethene	December 11, 1990	SW846 Method 8240	5		80	7			7	7	
(1,1-DCE)	November 16-18, 1992	SW846 Method 8010	1		110	14			7	7	
	March 5, 1993	EPA Method 502.2	0.7		232	10.3	5.1	0.9	7	7	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.7 *(0.3)		143.6	9	4.5	*	7	7	
cis-1,2-Dichloroethene	March 5, 1993	EPA Method 502.2	0.7	0.7	1.4	36.4		225	70	70	
(cis-1,2-DCE)	March 5, 1993	SW846 Method 8021 and *(8240)	0.7 *(0.7)		1	26.6	*	87.8	70	70	

Note: All Concentrations are in ppb (ug/L) (other footnotes located on page 4)

WATAUGA COUNTY LANDFILL GROUNDWATER

ORGANIC CONSTITUENTS DETECTED

DECEMBER 11, 1990, NOVEMBER 16-18, 1992 AND MARCH 5, 1993 SAMPLING EVENTS

Analyte	Date Sampled	Analytical Method	MDL	MW-1	MW-2	MW-3	MW-4	PZ-24	NCS	MCL	TRIP
Methylene Chloride	December 11, 1990	SW846 Method 8240	5			23		---	5	5	
	November 16-18, 1992	SW846 Method 8010	1			16		15	5	5	
	March 5, 1993	EPA Method 502.2	0.6		4.2	9.4			5	5	
	March 5, 1993	SW846 Method 8021	0.6						5	5	
Vinyl Chloride	December 11, 1990	SW846 Method 8240	10					---	.015	2	
	November 16-18, 1992	SW846 Method 8010	1			3		12	.015	2	
	March 5, 1993	EPA Method 502.2	0.4			3.4		18.3	.015	2	2.6
	March 5, 1993	SW846 Method 8021 and *(8240)	0.4 *(1.0)			*		*	.015	2	
Dichlorodifluoromethane	December 11, 1990	SW846 8240	5			21		---	0.19	---	
	November 16-18, 1992	SW846 Method 8010	1						0.19	---	
	March 5, 1993	EPA Method 502.2	0.8			11.8		6.9	0.19	---	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.8 *(0.8)			*			0.19	---	
Chloroethane	December 11, 1990	SW846 Method 8240	10					---	---	---	
	November 16-18, 1992	SW846 8010	1			5		8	---	---	
	March 5, 1993	EPA Method 502.2	1.4		2.6				---	---	
	March 5, 1993	SW846 method 8021 and *(8240)	1.4 *(10)			*		*	---	---	
Trans-1,3-Dichloropropene	December 11, 1990	SW846 Method 8240	5			9-J		---	70	100	
	November 16-18, 1992	SW846 Method 8010	1					3	70	100	
	March 5, 1993	EPA Method 502.2	0.7			0.9		5.5	70	100	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.7 *(0.7)			*			70	100	

Note: All Concentrations are in ppb (ug/L) (other footnotes located on page 4)

[redacted] COUNTY [redacted] GROUNDWATER

ORGANIC CONSTITUENTS DETECTED

DECEMBER 11, 1990, NOVEMBER 16-18, 1992 AND MARCH 5, 1993 SAMPLING EVENTS

Analyte	Date Sampled	Analytical Method	MDL	MW-1	MW-2	MW-3	MW-4	PZ-24	NCS	MCL	TRIP
Benzene	December 11, 1990	SW846 Method 8240	5					---	1.0	5	
	March 5, 1993	EPA Method 502.2	0.1			1.5	0.5	6.3	1.0	5	
	March 5, 1993	SW846 Method 8021	0.1			1.3		6.3	1.0	5	
1,4-Dichlorobenzene	November 15-18, 1992	SW846 Method 8010	0.3			0.5			0.19	75	
	March 5, 1993	EPA Method 502.2	0.5		0.8				1.8	75	
	March 5, 1993	SW846 Method 8021	0.5						1.8	75	
Chloroform	December 11, 1990	SW846 Method 8240	5					---	0.19	100	
	November 16-18, 1992	SW846 Method 8010	1				2	1	0.19	100	3
	March 5, 1993	EPA Method 502.2	0.3						0.19	100	
	March 5, 1993	SW846 Method 8021	0.3			0.5			0.19	100	
1,2-Dichloropropane	December 11, 1990	SW846 Method 8240	5					---	0.56	5	
	November 16-18, 1992	SW846 Method 8010	1						0.56	5	
	March 5, 1993	EPA Method 502.2	0.3		0.3	0.3			0.56	5	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.3 *(0.3)			*	*	*	0.56	5	
2,2-Dichloropropane	March 5, 1993	EPA Method 502.2	0.7	0.7	1.4				---	---	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.7 *(0.7)		*	*	*	*	---	---	
1,1-Dichloropropene	March 5, 1993	SW846 Method 8240	0.5	3.8					---	---	
Bis(2-ethylhexyl)phthalate	March 5,1993	SW846 Method 8270	2		20				---	---	
Xylenes, Total	March 5, 1993	SW846 Method 8021	0.4					1	0.4	10	
4,4'-DDD	March 5, 1993	SW846 Method 8080	0.1					0.1	---	---	

Note: All Concentrations are in ppb (ug/L) (other footnotes located on page 4)

[redacted] WA[redacted]UGA COUNTY LANDFILL GROUNDWATER
ORGANIC CONSTITUENTS DETECTED
DECEMBER 11, 1990, NOVEMBER 16-18, 1992 AND MARCH 5, 1993 SAMPLING EVENTS

Analyte	Date Sampled	Analytical Method	MDL	MW-1	MW-2	MW-3	MW-4	PZ-24	NCS	MCL	TRIP
Bromodichloromethane	December 11, 1990	SW846 Method 8240	5					---	---	100	
	November 16-18, 1992	SW846 Method 8010	1						---	100	
	March 5, 1993	EPA Method 502.2	0.3		0.6				---	100	
Carbon Tetrachloride	December 11, 1990	SW846 Method 8240	5					---	0.3	5	
	November 16-18, 1992	SW846 Method 8010	1						0.3	5	
	March 5, 1993	EPA Method 502.2	0.1			0.2	0.2	0.3	0.3	5	
	March 5, 1993	SW846 Method 8021	0.1						0.3	5	
	March 5, 1993	SW846 Method 8021	0.3						0.38	5	
1,2-Dichloroethane	December 11, 1990	SW846 Method 8240	5					---	0.38	5	
	November 16-18, 1992	SW846 Method 8010	1			1			0.38	5	
	March 5,1993	EPA Method 502.2	0.3		0.3				0.38	5	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.3 *(0.3)		*	*		*	0.38	5	

PA SW-846 Methods 8011, 8030, 8040, 8090, 8120, 8150, and 8310 were Also Performed on Samples Collected on March 5, 1993, Resulting in No Analytes Detected.

IDL Analytical Method Detection Limit
CS North Carolina Water Quality Standard (DEHNR: 15A NCAC 2L .0202)
CL EPA Primary Drinking Water Standard Maximum Contaminant Level

ecember 11, 1990 Sampling Event - Conducted by Engineering Tectonics and split-sampled with the NCDEHNR Solid Waste Section - Analysis performed by the North Carolina State Laboratory of Public Health.
ovember 16-18, 1993 and March 5, 1993 Sampling Event - Conducted by Draper Aden Associates - Analysis performed by Central Virginia Laboratories and Consultants, Inc. (CVLC).
PA Metho 502.2 Co-elutes compounds cis-1,2-Dichloroethene and 2,2-Dichloropropane

denotes estimated result
denotes proposed NCS
denotes *(method) utilized and analyte not detected

ote: All Concentrations are in ppb (ug/L)

APPENDIX D

Potable Well Organic Analysis Summary Table

POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMIVOLATILE ANALYSIS

date: 3/5/98

CONSTITUENT	MARCH 5, 1993*	MARCH 18, 1993*	MARCH 24, 1993*	JUNE 23, 1993**	JULY 13, 1994**	NCS	MCL
Carroll Residence (12) WELL ABANDONED IN 1995							
Benzene	2.1	1.7		1.9		1.0	5
Chloroethane	173.4	74.5		ND		---	---
Chloromethane	ND	14.8		ND		---	---
Dichlorodifluoromethane	30.6	ND		ND		0.19	---
1,1-Dichloroethane	20.9	17.4		ND		700	---
1,1-Dichloroethene	4.1	1.5		ND		7	7
cis-1,2-Dichloroethene#	1.2	0.9		<1.0		70	70
2,2-Dichloropropane#	1.2	0.9		ND		---	---
4-Isopropyltoluene	ND	0.2	NS	ND	NS	---	---
Isopropylbenzene	0.6	ND		ND		---	---
Methylene Chloride	ND	43.0 (T)		138.2		5	5
Styrene	2.8	0.5		ND		0.014	100
Tert-Butyl Methyl Ether	ND	ND		2.4		200	---
Tetrachloroethene	5.4	4.7		4.2		0.7	5
Toluene	ND	0.6 (T)		ND		1000	1000
1,1,1-Trichloroethane	19.7	15.7		29.4		200	200
Trichloroethene	7	5.5		7.0		2.8	5
Trichlorofluoromethane	37.1	20.2		ND		2100	---
Vinyl Chloride	1.7 (T)	ND		ND		0.015	2
p and m-Xylene	ND	ND		<1.0		400	10,000
o-Xylene	ND	3.4		2.9		400	10,000
Nissan-Mazda Dealership (4) WELL ABANDONED IN 1995							
Carbon Tetrachloride	0.2		ND		ND	0.3	5
Chloroethane	19.1		ND		ND	---	---
Dichlorodifluoromethane	8.2		8.7		ND	0.19	---
1,1-Dichloroethane	98.5		63.1		104.3	700	---
1,2-Dichloroethane	ND		0.5		ND	0.38	---
1,1-Dichloroethene	5.4		3.7		4.7	7	7
cis-1,2-Dichloroethene#	22.2		13.0		23.7	70	70
1,2-Dichloropropane	0.5		0.3		ND	0.56	5
2,2-Dichloropropane#	22.2	NS	13.0	NS	ND	---	---
Tetrachloroethene	21.8		28.1		30.9	0.7	5
Toluene	ND		0.8(T)		ND	1000	1000
1,1,1-Trichloroethane	14.7		19.3		22.9	200	200
Trichloroethene	11.2		9.1		12.6	2.8	5
Trichlorofluoromethane	0.4		ND		ND	2100	---
o-Xylene	0.4		0.5(T)		ND	400	10,000

NOTE: All Concentrations are in ppb (ug/L). (Other footnotes located on page 4)

POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

date: 2/5/98

CONSTITUENT	3/5/93*	3/18/93*	5/11/93**	6/23/93**	3/30/94**	4/6/94**	8/2/94**	12/7/94**	4/26/95**	10/24/95**	4/9/96**	5/20/96**	10/9/96**	6/4/97**	2/10/98**	8/17/98**	2/18/99**	6/9/99**	NCS	MCL
Blue Ridge Electric Membership Company - (BREMCO) (5)																				
Benzene	ND					ND	ND	ND	ND	ND	ND		ND	ND	3.2 (J)	trace	trace		1	5
1,1-Dichloroethane	0.7					<1.0	1.4	1.0	1.2	1.8	1.5		1.5	2.0	3.2 (J)	1.6	1.5		700	---
1,1,1-Trichlorothane	0.2					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	trace	trace	trace		200	200
Trichloroethene	0.5	NS	NS	NS	NS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	<1.0	<1.0	1.2 (J)	0.5	trace	NS	2.8	5
1,1-Dichloroethene	ND					1.0	1.9	<1.0	1.1	1.7	1.0		<1.0	1.7	3.9 (J)	2.6	ND		7	7
cis-1,2-Dichloroethene	ND					<1.0	ND	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	0.5 (J)	trace	trace		70	70
Tetrachloroethene	ND					<1.0	<1.0	trace	<1.0	<1.0	<1.0		<1.0	<1.0	trace	trace	trace		0.7	5
Cloroform	ND					ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	trace		0.19	100
Tetrahydrofuran	ND					ND	ND	ND	ND	ND	ND		ND	ND	ND	0.5 (J)	ND		---	---
Bolick rental resident (2)																				
tert-Butylbenzene	1.1					ND				ND	ND		ND	ND	ND		ND		---	---
Isopropylbenzene	0.7					ND				ND	ND		ND	ND	ND		ND		---	---
Trichloroethene	0.5					ND				ND	ND		ND	ND	ND		ND		2.8	5
1,3,5-Trimethylbenzene	0.7	NS	NS	NS	NS	ND	NS	NS	NS	ND	ND	NS	ND	ND	ND	NS	ND	NS	---	---
1,1-Dichloroethane	ND					trace				<1.0	trace		<1.0	trace	ND		<1.0		700	---
1,1-Dichloroethene	ND					trace				trace	ND		trace	ND	ND		ND		7	7
Methyl Ethyl Ketone	ND					trace				35.3	ND		ND	ND	ND		ND		170	---
Tetrahydrofuran	ND					ND				42.3	ND		ND	ND	ND		ND		---	---
Perry Residence (11)																				
Dichlorodifluromethane	2.5			ND	ND								ND						0.19	---
Naphthalene	0.7			ND	ND								ND						---	---
Chloromethane	<9	NS	NS	ND	ND	NS	NS	NS	NS	NS	NS	NS	ND	NS	NS	NS	NS	NS	---	---
Methylene Chloride	<0.6			ND	ND								ND						5	5
Chloroform				ND	<1.0								NDT						0.19	100
Greer residence (15)																				
Benzene		ND				<1.0		ND											1.0	5
Toluene		ND				6.4		ND											1000	1000
Tetrachloroethene	NS	ND	NS	NS	NS	trace	NS	ND	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.7	5
Ethylbenzene		ND				trace		ND											29	700
p and m - Xylene		ND				<1.0		ND											400	10,000
Styrene		ND				trace		ND											0.14	100
Ward residence (24)																				
Methylene Chloride			3.2	ND	ND		ND	ND	ND	ND		ND	ND		ND	ND		ND	5	5
1,1,1-Trichloroethane			<1.0	<1.0	<1.0		ND	ND	ND	ND		ND	ND		ND	ND		ND	200	200
Trichloroethene			trace	trace	<1.0		ND	trace	ND	ND		ND	ND		ND	ND		ND	2.8	5
Tetrachloroethene	NS	NS	ND	trace	<1.0	NS	ND	trace	trace	<1.0	NS	<1.0	trace	NS	ND	trace	NS	ND	0.7	5
Carbon Tetrachloride			ND	ND	<1.0		ND	ND	ND	ND		ND	ND		ND	ND		ND	0.3	5
1,1-Dichloroethane			ND	ND	<1.0		ND	<1.0	<1.0	trace		<1.0	ND		ND	trace		ND	700	---
Chloroform			ND	ND	trace		ND	ND	trace	trace		ND	ND		ND	trace		ND	0.19	100
1,2-Dibromoethane (EDB)			ND	ND	ND		ND	ND	ND	trace		ND	ND		ND	ND		ND	0.0004	0.05

NOTE: All Concentrations are in ppb (ug/L). (Other footnotes located on page 4)

POTABLE WELL TESTING
WATAUGA COUNTY, NC
RESULTS OF ANALYSIS

CONSTITUENT	3/5/93**	4/26/95**	4/9/96**	2/10/98**	NCS	MCL
Chevrolet dealership (7)						
chloroform	ND	ND	ND	39.7	0.19	100
bromodichloromethane	ND	ND	ND	5	---	100
t-butyl methyl ether	ND	24.4	2.5	ND	200	---

CONSTITUENT	3/18/93*	5/11/93**	9/21/93**	3/30/94**	1/12/95**	10/24/95**	4/9/96**	10/9/96**	6/12/97**	2/10/98**	6/9/99**	11/2/99**	NCS	MCL
Shared Well #1 (8 Houses) (13)														
sec-Butylbenzene	0.2	ND	ND									ND	---	---
Carbon Tetrachloride	0.1	ND	ND									ND	0.3	5
Methylene Chloride	1.5	ND	ND	NS	NS	NS	NS	NS	NS	NS	NS	ND	5	5
alpha-Chlordane	0.4	ND	ND									ND	0.27	2
gamma-Chlordane	0.3	ND	ND									ND	0.27	2
1,4-Dichlorbenzene	ND	ND	ND									trace		
Chloroform	ND	ND	ND									trace	0.19	100
Shared Well #2 (4 Houses) (14)														
1,4-Dichlorobenzene	0.5			ND	ND	ND	ND	ND	ND	ND	ND		---	---
1,1-Dichloroethane	ND			ND	ND	<1.0	<1.0	<1.0	ND	ND	ND		700	---
1,1-Dichloroethene	ND			<1.0	<1.0	ND	ND	ND	ND	ND	ND		7	7
Tetrachloroethene	ND			ND	ND	trace	ND	trace	ND	ND	ND		0.7	5
1,1,1-Trichoroethane	ND	NS	NS	<1.0	ND	trace	ND	ND	ND	ND	ND	NS	200	200
Chloroform	ND			trace	ND	9.0	ND	ND	ND	ND	ND		0.19	100
Bromodichloromethane	ND			ND	ND	1.4	ND	ND	ND	ND	ND		---	100
Dibromochloromethane	ND			ND	ND	<1.0	ND	ND	ND	ND	ND		---	---
2-Chlorotoluene	ND			ND	ND	1.2	ND	ND	ND	ND	ND		---	---
4-Chlorotoluene	ND			ND	ND	1.0	ND	ND	ND	ND	ND		---	---
Methyl Ethyl Ketone	ND			ND	ND	24.6	ND	ND	ND	ND	ND		170	---
Tetrahydrofuran	ND			ND	ND	13.4	ND	ND	ND	ND	ND		---	---

date: 3/5/98

CONSTITUENT	3/23/93**	5/11/93**	6/23/93**	8/3/93**	8/9/93**	10/20/93**	9/21/94**	1/12/95**	2/21/96**	5/20/96**	10/9/96**	6/12/97**	2/10/98**	8/19/98**	2/18/99**	6/9/99**	11/2/99**	NCS	MCL
Simko residence (20)																			
1,1,1-Trichloroethane	trace									trace	trace	trace				ND		---	200
t-butyl methyl ether	ND	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND	NS	NS	NS	<1.0	NS	200	---
Chloroform	<1.0									<1.0	NDT	ND				<1.0		0.19	100
Johnson residence (23)																			
Chloroform		trace								<1.0		<1.0	ND				trace	0.19	100
Toluene		ND								ND		ND	ND				trace	1000	1000
Ethyl Benzene	NS	ND	NS	NS	NS	NS	NS	NS	NS	ND	NS	ND	ND	NS	NS	NS	trace	29	700
Xylenes		ND								ND		ND	ND				trace	400	10000
1,4-Dichlorobenzene		ND								ND		ND	ND				trace	---	---
Younce residence (25)																			
Tetrahydrofuran	NS	ND	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.2 J	---	---
McLean residence (26)																			
Chloroform	NS	NS	<1.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.0	100
Yates residence (30)																			
Chloroform	NS	NS	NS	<1.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.19	100
McClintock residence (33)																			
1,2-Dichloroethane	NS	NS	NS	NS	<1.0	<1.0	ND	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	700	---
Chloroform					<1.0	ND	<1.0									<1.0	<1.0	0.19	100
Meadowridge condominiums (38)																			
Chloroform						<1.0			ND					ND	ND			0.19	100
trans-1,2-Dichloroethene						<1.0			ND					ND	ND			70	70
1,1,1-Trichloroethane	NS	NS	NS	NS	NS	trace	NS	NS	ND	NS	NS	NS	NS	ND	ND	NS	NS	200	200
Trichloroethene						trace			ND					ND	ND			2.8	5
Austin residence (40)																			
Chloroform	NS	NS	NS	NS	NS	NS	NS	trace	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.19	100

NOTE: All Concentrations are in ppb (ug/L) (Other footnotes located on page 4)

POTABLE WELL TESTING - WATAUGA COUNTY, NC
WELLS SHOWING NO DETECTED ORGANIC COMPOUNDS

date: 3/5/98

SAMPLING LOCATION	SAMPLING DATES
Colene Bolick residence (1)	March 5, 1993* and February 21, 1996**
Roten residence (3)	March 5, 1993* and July 3, 1994**
Hollar and Green Produce (6)	March 5, 1993* and August 19, 1998**
Vannoy residence (8)	March 5, 1993*
Martin High Country Rentals #1 (9)	March 5, 1993*
Martin High Country Rentals #2 (10)	March 5, 1993*
Williamson residence (16)	March 18, 1993*
Suddreth residence (17)	3/18/1993*, 9/21/1993**, 73/1994**and 10/12/1999**
Taylor residence (18)	March 18, 1993*, October 9, 1996** and November 2, 1999*
Hodges residence (19)	March 18, 1993* and October 12, 1999**
Findt residence (21)	March 18, 1993*
Rusher residence (22)	March 23, 1993* and October 12, 1999**
Younce residence (25)	May 11, 1993**
Medloin residence (27)	June 23, 1993**
Rector residence (28)	June 23, 1993**
Robinson residence (29)	June 23, 1993**
Cook residence (31)	August 3, 1993**
Animal Control Office (32)	August 3, 1993**
Brook Hollow Trailer Park (37)	October 11, 1993**
Green residence (34)	October 20, 1993**
Shared well #3 (35)	October 20, 1993**
BREMCO residence (36)	September 21, 1993**
Isaacs residence (39)	November 16, 1994**
Norris residence (41)	January 12, 1995**
Meadowridge Condominiums (42)	February 16&17, 1998**
Meadowridge Condominiums (43)	February 16&17, 1998**
Meadowridge Condominiums (44)	August 19, 1998**
Winkler residence (45)	October 12, 1999**

TABLE NOTES:

The sampled well reference number as presented on the Vicinity Map (Figure 1) is denoted in parentheses following the sampling locations name.

* Laboratory analysis performed by Central Virginia Laboratories and Constultants (CVLC) utilizing EPA Methods 502.2 (Volatiles) and 525.1 (Semi-Volatiles).

** Laboratory Analysis performed by NCDENR Division of Laboratory Services utilizing EPA Method 502.2 (Volatiles).

NSC - North Carolina Water Quality Standard (DEHNR-15A NCAC 2L.0202)

MCL - EPA Primary Drinking Water Standard Maximum Contaminant Level

# denotes compound co-elutes.

ND denotes no compounds detected for entire analytical scan.

NDT denotes compound detected in trip blank at same concentration as well sample.

NS denotes not sampled on that date.

NA denotes compound not analyzed on that date.

(J) denotes estimated result.

(T) denotes found in Trip Blank.

trace = < 0.5 ppb (ug/l)

Note that chloroform was detected in the residential wells 17, 19, 22 and 45 on October 12, 1999, and in residential well 18 on November 2, 1999.
Chloroform has not been detected in any of the landfill assessment monitoring wells to date, and is likely a transformation product resulting from the chlorination of the well systems.

APPENDIX E

Laboratory Analytical Data Summary Sheets
And Associated Data Validation Reports

CLP VOLATILE ORGANIC ANALYSIS (VOA) DATA VALIDATION SUMMARY

Draper Aden Associates (DAA) performed a limited review of the analytical results for volatile organic parameters analyzed by EPA CLP 3/90 Statement of Work (SOW) document number OLM03.2. The reduced parameter list included dichlorodifluoromethane. Monitoring well samples were collected from monitoring well locations denoted as MW-2, MW-3, MW-8, MW-9, MW-12, MW-17, and surface water samples denoted as S-1, S-2, S-3, S-4, S-5, and S-6 during the July 12-13, 1999 semiannual Assessment monitoring event at the Watauga County Landfill.

CompuChem Environmental Corporation, a division of Liberty Analytical Corp., (CompuChem), of Cary, North Carolina performed the GC/MS analysis. CompuChem submitted results to DAA in a final certificate of analysis which included sample analytical results as well as relevant documentation to validate and verify the analytical results.

The evaluation of CompuChem's compliance with the method was based on a limited review of the following items: QC deliverables package, case narrative, technical holding time and preservation requirements, instrument performance check, instrument calibrations, blank analysis, system monitoring recoveries, matrix spike/matrix spike duplicate (MS/MSD) analysis, internal standard requirements, laboratory control samples (LCS), and confirmation of detected parameters. Review of transcriptions from raw data to summary sheets was performed. Specific representative calculations were not performed except where noted. The following information is intended to summarize data review results and any observed significant deviations from method and/or contractual requirements.

The original certificate of analysis presented data which were of acceptable quality. The original report did not contain BFB tuning information for initial calibration analyses performed on 7/21/-22/99. CompuChem provided this data. It is presented in the revision section and inserted into the original report. The fourteen-day technical holding time was met for all samples. However, the analysis for sample S-2 was performed at a 1 to 1.7 dilution. Reanalysis without dilution was performed out of holding time. The diluted and undiluted sample results are consistent. All validated sample results for S-2 were obtained from the 1 to 1.7 dilution performed within holding time. All preservation criteria were met.

All BFB tuning criteria were met. All initial calibration requirements were met. All continuing calibration requirements were met. The percent difference for tetrachloroethene was 26.7% in the CCAL analyzed on July 23, 1999. Tetrachloroethene results in samples S-2, S-3, S-4, S-5, S-6 and MW-17 were qualified as estimated as per validated guidelines. The laboratory method blanks and the trip blank contained low levels of methylene chloride. All samples also contained low levels of methylene chloride which were qualified as blank contamination. All system monitoring compound criteria were met. Matrix spike/matrix spike duplicate analyses were performed on MW-3. All MS/MSD QC requirements were met. All internal standard area and retention time requirements were fulfilled. Overall, instrument performance appeared acceptable.

CLP VOLATILE ORGANIC ANALYSIS (VOA) DATA VALIDATION SUMMARY

Draper Aden Associates (DAA) performed a limited review of the analytical results for volatile organic parameters analyzed by EPA CLP 3/90 Statement of Work (SOW) document number OLM03.2. The reduced parameter list included dichlorodifluoromethane. Monitoring well samples were collected from monitoring well locations denoted as MW-2, MW-3, MW-8, MW-9, MW-12, MW-17, and surface water samples denoted as S-1, S-2, S-3, S-4, S-5, and S-6 during the July 12-13, 1999 semiannual Assessment monitoring event at the Watauga County Landfill.

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The original certificate of analysis presented data which were of acceptable quality. The original report did not contain BFB tuning information for initial calibration analyses performed on 7/21/-22/99. CompuChem provided this data. It is presented in the revision section and inserted into the original report. The fourteen-day technical holding time was met for all samples. However, the analysis for sample S-2 was performed at a 1 to 1.7 dilution. Reanalysis without dilution was performed out of holding time. The diluted and undiluted sample results are consistent. All validated sample results for S-2 were obtained from the 1 to 1.7 dilution performed within holding time. All preservation criteria were met.

All BFB tuning criteria were met. All initial calibration requirements were met. All continuing calibration requirements were met. The percent difference for tetrachloroethene was 26.7% in the CCAL analyzed on July 23, 1999. Tetrachloroethene results in samples S-2, S-3, S-4, S-5, S-6 and MW-17 were qualified as estimated as per validated guidelines. The laboratory method blanks and the trip blank contained low levels of methylene chloride. All samples also contained low levels of methylene chloride which were qualified as blank contamination. All system monitoring compound criteria were met. Matrix spike/matrix spike duplicate analyses were performed on MW-3. All MS/MSD QC requirements were met. All internal standard area and retention time requirements were fulfilled. Overall, instrument performance appeared acceptable.

Numerous target parameters were detected both above and below the contract required quantitation limit (CRQL) and are listed in Section N of this data validation report. Sample S-2 was analyzed at a 1/1.7 dilution. CRQLs were raised to 17 µg/l for all S-2 parameter results. A review of tentatively identified compound (TIC) results revealed the presence of dichlorofluoromethane and ether in several samples.

CLP VOLATILE ORGANIC ANALYSIS DATA VALIDATION

Sample ID: MW-2, MW-3, MW-8, MW-9, MW-12, MW-17, S-1, S-2, S-3, S-4, S-5, and S-6.

QC Samples: Trip blank and Lab blanks, LCSs, MW-3 MS/MSD

Laboratory: CompuChem Environmental Corporation, a division of Liberty Analytical Corp., of Cary, NC.

- Were all samples analyzed under CLP SOW for organic analysis (3/90) and did the parameter list include dichlorodifluoromethane? ☑ YES ☐ NO

Comments: Samples were analyzed under CLP protocol (OLMO3.2) for 12 volatile parameters including dichlorodifluoromethane.

A. CLP TECHNICAL HOLDING TIME AND PRESERVATION CRITERIA:

1. Was the 14-day sample collection to analysis holding time met? ☑YES ☐ NO
2. Were the samples received at 4°C (+/- 2°C) and in good condition? ☑YES ☐ NO
3. Were the samples preserved, & pHs adjusted to <2 with HCl? ☑ YES ☐ NO
   If samples were not preserved, were they analyzed within 7 days? ☐ YES ☐ NO ☑ NA

Comments: The fourteen-day technical holding time was met for all sample analyses. A diluted (1 to 1.7) analysis of S-2 was performed within holding time. The undiluted analysis of S-2 was performed out of holding time. The undiluted, but out of holding time, analysis is consistent with the diluted analysis. The diluted analysis was validated. All other preservation criteria were met.

B. GCMS INSTRUMENT PERFORMANCE CHECK CRITERIA:

1. Was analysis of the instrument performance check solution performed at the beginning of each 12 hour period during which standards or samples were analyzed? ☑ YES ☐ NO
2. Was there documentation of the injection of a 50 ng bromofluorobenzene (BFB) solution? ☐ YES ☑ NO

3. Were all ion abundance criteria met? (CLP Form V VOA) ☑ YES ☐ NO

Comments: GCMS instrument performance check criteria were met. Draper Aden Associates previously contacted Sarah Hubbard, of CompuChem, who confirmed that tuning was performed using 2 µl of a 25 ng/µl BFB standard.

C. INITIAL GCMS CALIBRATION CRITERIA:

- Were initial calibrations (ICAL) and any directly associated blanks and samples analyzed within 12 hours of the associated instrument performance (tune) check? ☑ YES ☐ NO

1. CLP Validation Criteria:

- Were all quantitation ions used and listed on the data checked against the primary quantitation ions required by the method? (Note any differences and request explanation from laboratory.) ☑ YES ☐ NO
- Were all RRFs calculated based on the internal standard associated with that parameter as listed in the method? ☑ YES ☐ NO
- Did all target parameters and system monitoring compounds (surrogates) have RRFs ≥ 0.05 and %RSDs ≤ 30.0%? ☑ YES ☐ NO
  If not, list compounds which exceed criteria:
- Were 10% of the analytes recalculated? ☐ YES ☑ NO

2. CLP Contractual Requirements:

- Please refer to Table 5 of OLMO3.2 and evaluate all relative response factors and % RSD results for method compliance. (Up to two compounds may fail these criteria however, these parameters must have a minimum RRF ≥ 0.0100 and a % RSD ≤ 40.)
- Did ICAL meet the CLP initial calibration criteria? ☑ YES ☐ NO
- If not, explain:

Comments: All initial calibration criteria were met.

D. CONTINUING GCMS CALIBRATION CRITERIA:

- Were continuing calibrations (CCAL) analyzed at the beginning of each 12 hour period following the analysis of the instrument performance check and prior to analysis of the method blank and samples? The CCAL may be part of the ICAL or run independently on another 12 hour analysis period. ☑ YES ☐ NO

1. CLP Validation Criteria:

- Did all target parameters and system monitoring compounds (surrogates) have RRFs ≥ 0.05 and %D within ± 25.0%? ☐ YES ☑ NO
  If not, list compounds which exceed criteria:
  7/23/99 Tetrachloroethene %D = 26.7
- Were 10% of the analytes recalculated? ☐ YES ☑ NO

2. CLP Contractual Requirements:

- Please evaluate RRFs and %D results based on Table 5 of OLMO3.2 (Up to two compounds may fail these criteria however, these parameters must have a minimum RRF ≥ 0.0100 and a %D ± 40.)
- Did the CCAL meet CLP continuing calibration criteria ☑ YES ☐ NO

Comments: All continuing calibration criteria were met with the exception of tetrachloroethene which exceeded %D criteria. Tetrachloroethene results in samples S-2, S-3, S-4, S-5, S-6 and MW-17 were qualified as estimated as per validated guidelines.

E. BLANK CRITERIA:

1. Was a method blank analyzed after the calibration standards, prior to sample analysis, and once for every 12 hour period, and was a blank also analyzed after any highly contaminated samples to prevent carry over contamination? ☑ YES ☐ NO
2. Was a trip blank analyzed with this sample batch? ☑ YES ☐ NO
3. Were the trip blanks and method blanks interference free? ☐ YES ☑ NO
4. Were any target parameters detected in other associated blanks? ☑ YES ☐ NO
5. List target parameters detected in the blanks:
   VBLKDA analyzed on July 22, 1999 contained 3 µg/L of methylene chloride.
   VBLKCG analyzed on July 23, 1999 contained 1 µg/L of methylene chloride.
   Trip blank contained 2 µg/L of methylene chloride.

see comments on next page

Comments: The trip blank contained methylene chloride at 2 µg/L. Methylene chloride was also detected in method blanks for July 22 and 23 at 3 µg/L and 2 µg/L respectively. All methylene chloride sample results less than 3x10=30 µg/L were qualified as possible contaminants and the associated CRQL was adjusted accordingly.

F. SYSTEM MONITORING COMPOUNDS CRITERIA:

CLP Performance Criteria:

1. Were all three system monitoring compounds added to all samples and blanks to measure their recoveries in sample matrices? ☑ YES ☐ NO
2. Were the recoveries for the following parameters within the specified limits? ☑ YES ☐ NO
   - 1,2-dichloroethane-d_4 (76-114%)
   - 4-bromofluorobenzene (86-115%)
   - toluene-d_8 (88-110%)

Comments: System monitoring compounds criteria were met.

G. MATRIX SPIKE, MATRIX SPIKE DUPLICATE CRITERIA:

1. Was the MS/MSD analyzed at a frequency of one MS and MSD per 20 samples of a similar matrix? ☑ YES ☐ NO ☐ N/A

2. Were spike recoveries within limits provided below, and as shown on Form III VOA? ☑ YES ☐ NO ☐ N/A

Compound	*% R-Water*	*% RPD Water*
1,1-dichloroethene	61-145	≤ 14
trichloroethene	71-120	≤ 14
benzene	76-127	≤ 11
toluene	76-125	≤ 13
chlorobenzene	75-130	≤ 13

3. Were relative percent differences (RPDs) between MS/ MSD recoveries within the advisory limits provided above, and as shown on Form III VOA? ☑ YES ☐ NO ☐ N/A

Comments: All MS/MSD criteria were met.

H. INTERNAL STANDARDS CRITERIA:

1. Were internal standard areas within - 50% to + 100% of the last CCAL? ☑ YES ☐ NO
2. Were the internal standard retention times within +/- 30 seconds of the last CCAL? ☑ YES ☐ NO
3. Were the following internal standards used? ☑ YES ☐ NO
   - bromochloromethane
   - 1,4-difluorobenzene
   - chlorobenzene-d_5

Comments: Internal standards criteria were met.

I. TARGET PARAMETER IDENTIFICATION:

1. Were the RRTs of the reported parameters within +/- 0.06 RRT units of the standard RRT? ☑ YES ☐ NO
2. Check the sample spectra against the laboratory standard spectra to see that the following criteria were met:
   - Were all ions present in the standard spectra at a relative intensity of >10 %, present in the sample spectra? ☑ YES ☐ NO
   - Were the relative intensities of the ions between the standard and sample spectra within +/- 20 %? (Consider and account for ions present at > 10% in the sample spectra and not in the standard spectra.) ☑ YES ☐ NO
3. Were all reported parameters confirmed? ☑ YES ☐ NO
4. Were all parameter concentrations which were recorded on the raw sample quantitation reports accurately transferred to the sample summary sheets? ☑ YES ☐ NO

Comments: Target parameter identification criteria were met. All reported parameters were confirmed.

J. TARGET PARAMETER QUANTITATION:

1. Was the correct internal standard, quantitation ion, and RRF used to quantitate the parameter? ☑ YES ☐ NO

2. Were the same internal standards, quantitation ions, and RRFs used consistently throughout, in both the calibration and quantitation process? ☑ YES ☐ NO
3. Were checks for peak splitting and tailing performed? ☑ YES ☐ NO
4. List all samples which required dilution: S-2 was analyzed at a 1/1.7 dilution. This sample required reanalysis without dilution. Unfortunately, that reanalysis was performed out of holding time. Results from the 1/1.7 dilution were validated.

Comments: Target parameter quantitation was accurate.

K. TENTATIVELY IDENTIFIED COMPOUNDS (TICs) THROUGH LIBRARY SEARCHES

Comments: A review of tentative identified compound (TIC) results revealed the presence of dichlorofluoromethane and ether in several samples.

L. SYSTEM PERFORMANCE:

1. Evaluate the overall system performance over the course of the 12 hour tune/calibration period based on:

   - shifts in chromatographic baseline
   - extraneous peaks
   - loss of resolution
   - peak tailing or splitting
   - trends in increase or decrease of IS areas

2. Was the overall system performance ☑ satisfactory ☐ unsatisfactory

Comments: Instrument appeared reasonably stable for all parameters.

M. ADDITIONAL COMMENTS:

The original data report did not contain BFB ion abundance information for initial calibration runs performed on 7/21/99 (See page 31 of the data report). CompuChem provided revised acceptable data.

N. ANALYTICAL DATA SET NOTES:

PARAMETER	SAMPLE ID	LAB RESULT (µg/L)	VALIDATED RESULT (µg/L)	NOTES[1]
methylene chloride	MW-2	4 JB	10 U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
1,1-dichloroethene	MW-2	47	47	No action taken.
1,1-dichloroethane	MW-2	24	24	No action taken.
1,1,1-trichloroethane	MW-2	190	190	No action taken.
tetrachloroethene	MW-2	3 J	3 J	Result is less than the CRQL and is an estimated value.
vinyl chloride	MW-3	2 J	2 J	Result is less than the CRQL and is an estimated value.
chloroethane	MW-3	8 J	8 J	Result is less than the CRQL and is an estimated value.
methylene chloride	MW-3	3 JB	10 U	Methylene chloride was detected in method blank VBLKDA at 3µg/L Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
1,1-dichloroethene	MW-3	1J	1J	Result is less than the CRQL and is an estimated value.
1,1-dichloroethane	MW-3	72	72	No action taken.
1,1,1-trichloroethane	MW-3	3J	3J	Result is less than the CRQL and is an estimated value.
trichloroethene	MW-3	10	10	No action taken.
benzene	MW-3	2J	2J	Result is less than the CRQL and is an estimated value.
tetrachloroethene	MW-3	19	19	No action taken.
cis-1,2-dichloroethene	MW-3	69	69	No action taken.
chloroethane	MW-8	10	10	No action taken.

[1] See definition section of report for additional information on Data Validation and Reporting Qualifiers.

PARAMETER	SAMPLE ID	LAB RESULT (µg/L)	VALIDATED RESULT (µg/L)	NOTES[1]
methylene chloride	MW-8	3JB	10 U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
1,1-dichlorethene	MW-8	2J	2J	Result is less than the CRQL and is an estimated value.
1,1-dichloroethane	MW-8	47	47	No action taken.
1,1,1-trichlorethane	MW-8	2J	2J	Result is less than the CRQL and is an estimated value.
benzene	MW-8	1J	1J	Result is less than the CRQL and is an estimated value.
tetrachloroethene	MW-8	8J	8J	Result is less than the CRQL and is an estimated value.
cis-1,2-dichloroethene	MW-8	21	21	No action taken.
trichloroethene	MW-8	10	10	No action taken.
methylene chloride	MW-9	4JB	10 U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
1,1-dichloroethane	MW-9	20	20	No action taken.
trichloroethene	MW-9	3J	3J	Result is less than the CRQL and is an estimated value.
benzene	MW-9	3J	3J	Result is less than the CRQL and is an estimated value.
tetrachloroethene	MW-9	2J	2J	Result is less than the CRQL and is an estimated value.
cis-1,2-dichloroethene	MW-9	12	12	No action taken
methylene chloride	MW-12	3JB	10 U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.

PARAMETER	SAMPLE ID	LAB RESULT (µg/L)	VALIDATED RESULT (µg/L)	NOTES[1]
vinyl chloride	MW-17	2J	2J	Result is less than the CRQL and is an estimated value.
chloroethane	MW-17	7J	7J	Result is less than the CRQL and is an estimated value.
methylene chloride	MW-17	2JB	10 U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
1,1-dichloroethane	MW-17	71	71	No action taken.
1,1,1-trichloroethane	MW-17	1J	1J	Result is less than the CRQL and is an estimated value.
trichloroethene	MW-17	15	15	No action taken.
benzene	MW-17	2J	2J	Result is less than the CRQL and is an estimated value.
tetrachloroethene	MW-17	29	29J	The %D for tetrachloroethene was 26.7 in the CCAL therefore, associated sample results are qualified as estimated "J".
cis-1,2-dichloroethene	MW-17	88	88	No action taken.
methylene chloride	S-1	5JB	10U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
chloroethane	S-2	58	58	No action taken.
methylene chloride	S-2	5JB	17U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample was analyzed at a 1/1.7 dilution; therefore, the adjusted CRQL for methylene chloride is 17µg/L. Sample result is less than the adjusted CRQL and less than 10x the blank result; therefore, the validated result is 17U.

PARAMETER	SAMPLE ID	LAB RESULT (µg/L)	VALIDATED RESULT (µg/L)	NOTES[1]
1,1-dichloroethane	S-2	11J	11J	Sample was analyzed at a 1/1.7 dilution; therefore, the adjusted CRQL is 17µg/L. Result is less than the CRQL and is an estimated value.
benzene	S-2	2J	2J	Sample was analyzed at a 1/1.7 dilution; therefore, the adjusted CRQL is 17µg/L. Result is less than the CRQL and is an estimated value.
cis-1,2-dichloroethene	S-2	5J	5J	Sample was analyzed at a 1/1.7 dilution; therefore, the adjusted CRQL is 17µg/L. Result is less than the CRQL and is an estimated value.
All S-2 sample results not previously listed	S-2	17U	17U	Sample was analyzed at a 1/1.7 dilution; therefore, the adjusted CRQL is 17µg/L.
methylene chloride	S-3	2JB	10U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
methylene chloride	S-4	2JB	10U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
1,1-dichloroethane	S-4	5J	5J	Result is less than the CRQL and is an estimated value.
trichloroethene	S-4	1J	1J	Result is less than the CRQL and is an estimated value.

PARAMETER	SAMPLE ID	LAB RESULT (µg/L)	VALIDATED RESULT (µg/L)	NOTES[1]
tetrachloroethene	S-4	2J	2J	The result is less than the CRQL and is an estimated value. The %D for tetrachloroethene was 26.7 in the CCAL therefore, associated sample results are qualified as estimated "J".
cis-1,2-dichloroethene	S-4	8J	8J	Result is less than the CRQL and is an estimated value.
methylene chloride	S-5	2JB	10U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
methylene chloride	S-6	1JB	10U	Methylene chloride was detected in method blank VBLKDA at 3µg/L. Sample result is less than the CRQL and less than 10x the blank result; therefore, the validated result is 10 U.
tetrachloroethene	S-2, S-3, S-5 and S-6	U	UJ	The %D for tetrachloroethene was 26.7 in the CCAL therefore, associated sample results are qualified as estimated "J".
dichlorofluoromethane	MW-3	18NJ	18NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.
ether	MW-3	8NJ	8NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.
dichlorofluoromethane	M-8	12NJ	12NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.

PARAMETER	SAMPLE ID	LAB RESULT (µg/L)	VALIDATED RESULT (µg/L)	NOTES[1]
ether	MW-8	6NJ	6NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.
dichlorofluoromethane	MW-9	22NJ	22NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.
ether	MW-9	5NJ	5NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.
dichlorofluoromethane	MW-17	12NJ	12NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.
ether	MW-17	7NJ	7NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.
dichlorofluoromethane	S-2	10NJ	10NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.
ether	S-2	14NJ	14NJ	Tentatively identified through comparison with the NIST/EPA/MSDS library of spectra. Estimated concentration calculated based on nearest internal standard.

[1] See definition section of report for additional information on Data Validation and Reporting Qualifiers.

O. LIMITATIONS AND REFERENCES:

Draper Aden Associates conducted a limited data validation of the above noted data set using summary tables and raw data provided by the analyzing laboratory. Data evaluation was conducted in general accordance with *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (2/94).* Validation of this data set is limited to the items detailed in this report.

Validated by:

S. Jeanie Flint
Environmental Scientist
Draper Aden Associates

Date: 9.7.99

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

MW-12

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950691

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050691A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	3	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	10	U
71-43-2	Benzene	10	U
127-18-4	Tetrachloroethene	10	U
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

MW-12

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950691

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050691A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

MW-17

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950692

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CR050692A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	2	J
75-00-3	Chloroethane	7	J
75-09-2	Methylene Chloride	2	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	71	
71-55-6	1,1,1-Trichloroethane	1	J
79-01-6	Trichloroethene	15	
71-43-2	Benzene	2	J
127-18-4	Tetrachloroethene	29	
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	88	

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

MW-17

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950692

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CR050692A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 2

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	75-43-4	METHANE, DICHLOROFLUORO-	7.45	12	NJ
2.	60-29-7	ETHER	8.42	7	NJ
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

MW-2

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950683

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050683A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	4	JB
75-35-4	1,1-Dichloroethene	47	
75-34-3	1,1-Dichloroethane	24	
71-55-6	1,1,1-Trichloroethane	190	
79-01-6	Trichloroethene	10	U
71-43-2	Benzene	10	U
127-18-4	Tetrachloroethene	3	J
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

MW-2

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950683

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050683A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

MW-3

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950688

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050688A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	2	J
75-00-3	Chloroethane	8	J
75-09-2	Methylene Chloride	3	JB
75-35-4	1,1-Dichloroethene	1	J
75-34-3	1,1-Dichloroethane	72	
71-55-6	1,1,1-Trichloroethane	3	J
79-01-6	Trichloroethene	10	
71-43-2	Benzene	2	J
127-18-4	Tetrachloroethene	19	
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	69	

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

MW-3

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950688

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050688A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 2

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	75-43-4	METHANE, DICHLOROFLUORO-	7.45	18	NJ
2.	60-29-7	ETHER	8.43	8	NJ
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

MW-8

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950689

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050689A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	
75-09-2	Methylene Chloride	3	JB
75-35-4	1,1-Dichloroethene	2	J
75-34-3	1,1-Dichloroethane	47	
71-55-6	1,1,1-Trichloroethane	2	J
79-01-6	Trichloroethene	10	
71-43-2	Benzene	1	J
127-18-4	Tetrachloroethene	8	J
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	21	

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

MW-8

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950689

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050689A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 2

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	75-43-4	METHANE, DICHLOROFLUORO-	7.48	12	NJ
2.	60-29-7	ETHER	8.44	6	NJ
3.					
4.					
5.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

MW-9

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950690

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050690A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	4	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	20	
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	3	J
71-43-2	Benzene	3	J
127-18-4	Tetrachloroethene	2	J
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	12	

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

MW-9

Lab Name: COM[illegible]JCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950690

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050690A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 2

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	75-43-4	METHANE, DICHLOROFLUORO-	7.45	22	NJ
2.	60-29-7	ETHER	8.44	5	NJ
3.					
4.					
5.					
6.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

S-1

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950698

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050698A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	10	U
71-43-2	Benzene	10	U
127-18-4	Tetrachloroethene	10	U
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

S-1

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950698

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050698A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/22/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

S-2

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950699

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CR050699A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.7

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	17	U
75-00-3	Chloroethane	58	
75-09-2	Methylene Chloride	5	BJ
75-35-4	1,1-Dichloroethene	17	U
75-34-3	1,1-Dichloroethane	11	J
71-55-6	1,1,1-Trichloroethane	17	U
79-01-6	Trichloroethene	17	U
71-43-2	Benzene	2	J
127-18-4	Tetrachloroethene	17	U
75-71-8	Dichlorodifluoromethane	17	U
156-60-5	trans-1,2-Dichloroethene	17	U
156-59-2	cis-1,2-Dichloroethene	5	J

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

S-2

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950699

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CR050699A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.7

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 2

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	75-43-4	METHANE, DICHLOROFLUORO-	7.45	10	NJ
2.	60-29-7	ETHER	8.43	14	NJ
3.					
4.					
5.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

S-2RE

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950699

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: C2R50699B55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/30/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	76	
75-09-2	Methylene Chloride	4	J
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	14	
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	10	U
71-43-2	Benzene	2	J
127-18-4	Tetrachloroethene	10	U
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	6	J

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

S-2RE

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950699

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: C2R50699B55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/30/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 4

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	75-43-4	METHANE, DICHLOROFLUORO-	7.43	8	NJ
2.		SUBSTITUTED BUTANE	7.91	6	J
3.	60-29-7	ETHER	8.42	12	NJ
4.		DIMETHYLBENZENE ISOMER	19.71	6	J
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

S-3

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 951700

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050700A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	2	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	10	U
71-43-2	Benzene	10	U
127-18-4	Tetrachloroethene	10	U
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

S-3

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 951700

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050700A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

S-4

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950701

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050701A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	2	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	5	J
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	1	J
71-43-2	Benzene	10	U
127-18-4	Tetrachloroethene	2	J
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	8	J

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

S-4

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950701

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050701A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

S-5

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950702

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050702A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	2	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	10	U
71-43-2	Benzene	10	U
127-18-4	Tetrachloroethene	10	U
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

S-5

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950702

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050702A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

S-6

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950703

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050703A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	1	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	10	U
71-43-2	Benzene	10	U
127-18-4	Tetrachloroethene	10	U
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

S-6

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950703

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050703A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TRIPBLANK

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950704

Sample wt./vol: 5.0 (g/mL) ML Lab File ID: CN050704A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	2	JB
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
71-55-6	1,1,1-Trichloroethane	10	U
79-01-6	Trichloroethene	10	U
71-43-2	Benzene	10	U
127-18-4	Tetrachloroethene	10	U
75-71-8	Dichlorodifluoromethane	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

TRIPBLANK

Lab Name: COMPUCHEM Contract: OLM03-REVS

Lab Code: COMPU Case No.: 34083 SAS No.: SDG No.: 00003

Matrix: (soil/water) WATER Lab Sample ID: 950704

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN050704A55.D

Level: (low/med) LOW Date Received: 07/15/99

% Moisture: not dec. _____ Date Analyzed: 07/23/99

GC Column:DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0

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

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
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APPENDIX F

HORIZONTAL AND VERTICAL PLUME DELINEATION MAPS

1,1-DCA Delineation Maps
November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution
April 10, 1996 Vertical Distribution - West Drainage
January 12, 1999 Vertical Distribution - West Drainage
July 12, 1999 Vertical Distribution - West Drainage

cis-1,2-DCE Delineation Maps
November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution
April 10, 1996 Vertical Distribution - West Drainage
January 12, 1999 Vertical Distribution - West Drainage
July 12, 1999 Vertical Distribution - West Drainage

PCE Delineation Maps
November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution
April 10, 1996 Vertical Distribution - West Drainage
January 12, 1999 Vertical Distribution - West Drainage
July 12, 1999 Vertical Distribution - West Drainage

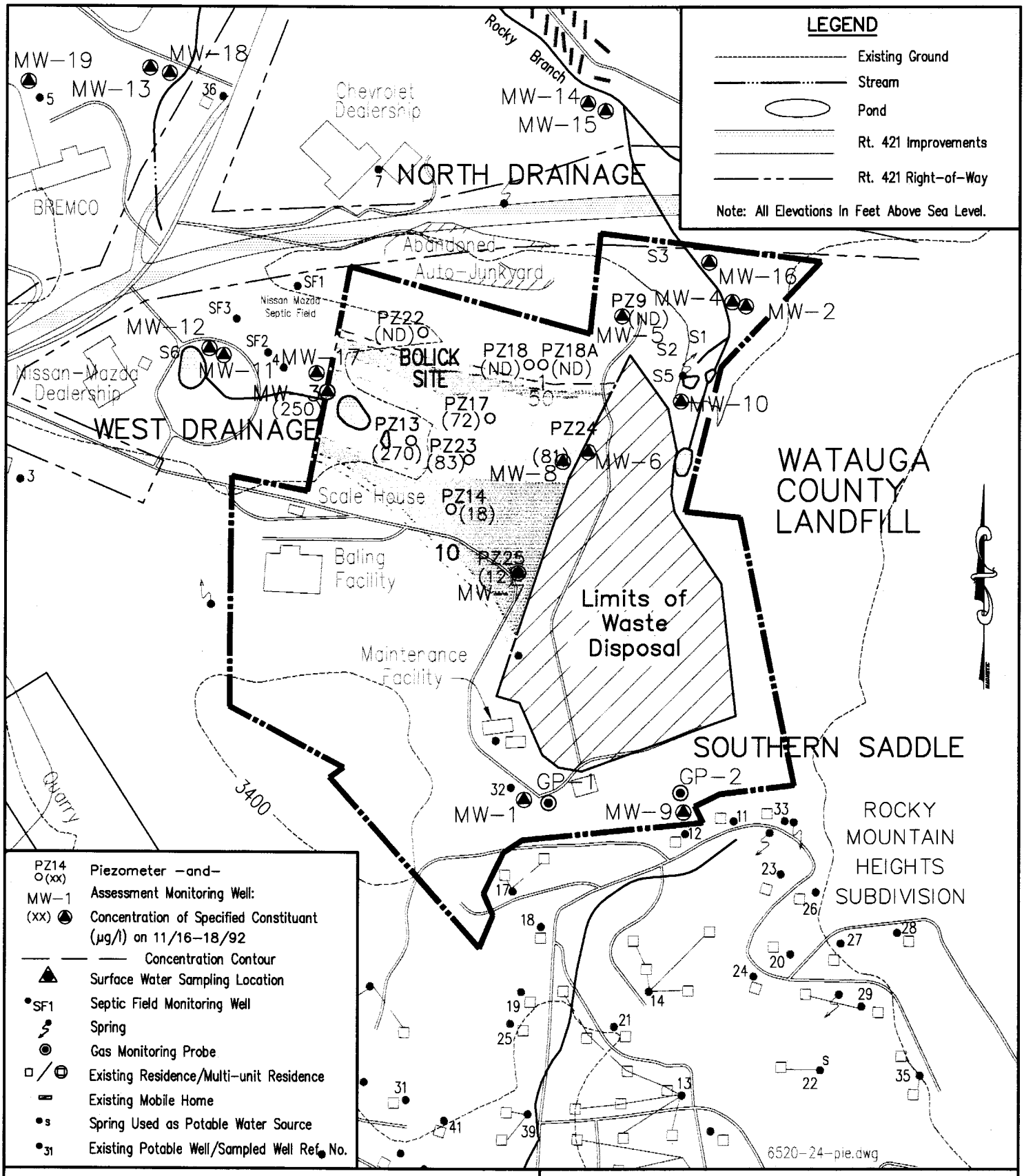
TCE Delineation Maps
November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution

1,1,1-TCA Delineation Maps
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution
April 10, 1996 Vertical Distribution - North Drainage
January 12, 1999 Vertical Distribution - North Drainage
July 12, 1999 Vertical Distribution - North Drainage

Vinyl Chloride Delineation Maps
November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution

1,1-DCA Delineation Maps

November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution
April 10, 1996 Vertical Distribution - West Drainage
January 12, 1999 Vertical Distribution - West Drainage
July 12, 1999 Vertical Distribution - West Drainage

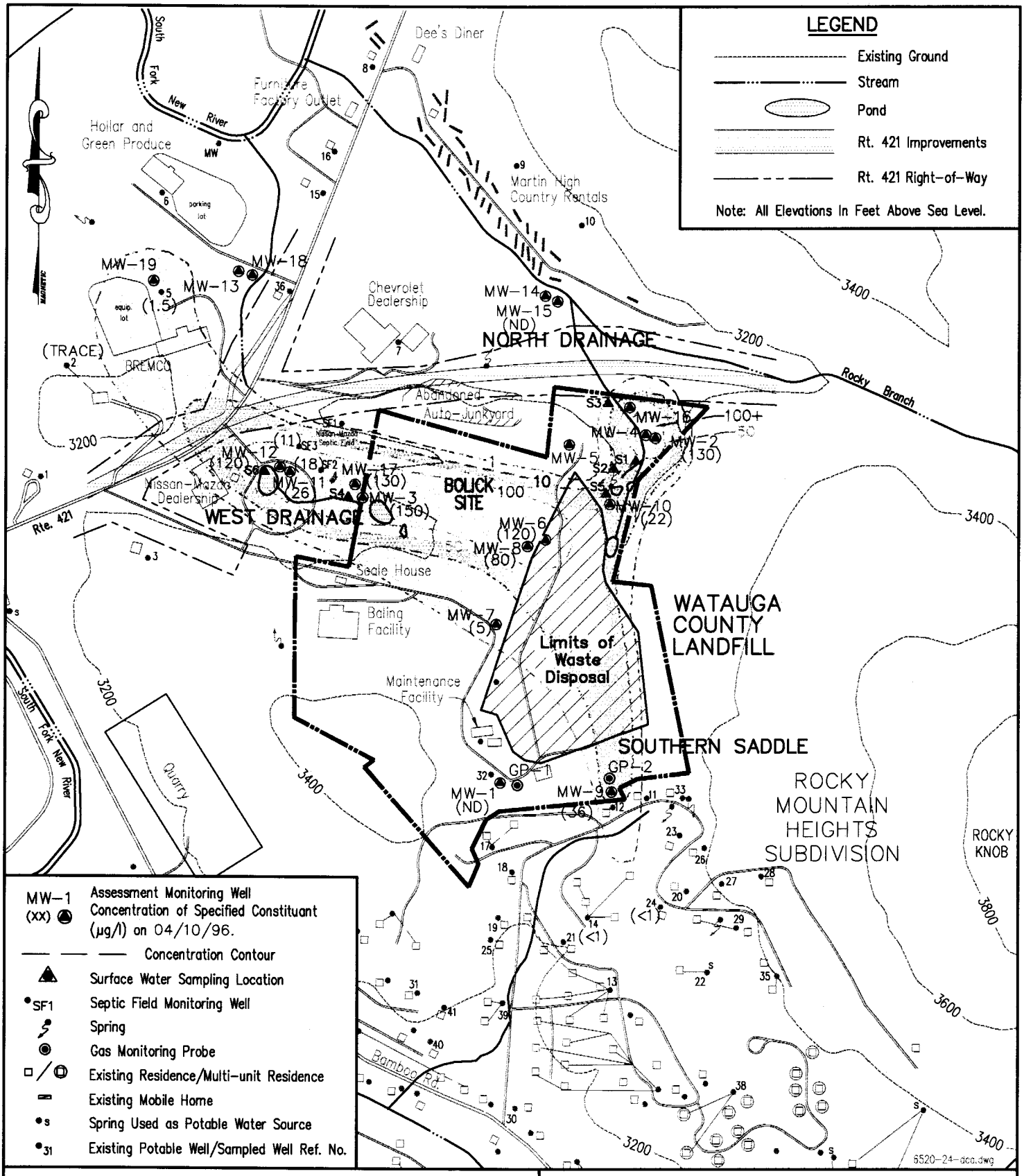


1,1-DCA HORIZONTAL DISTRIBUTION NOVEMBER 16-18, 1992

WATAUGA COUNTY LANDFILL WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA - Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	NONE



1,1-DCA HORIZONTAL DISTRIBUTION APRIL 10, 1996

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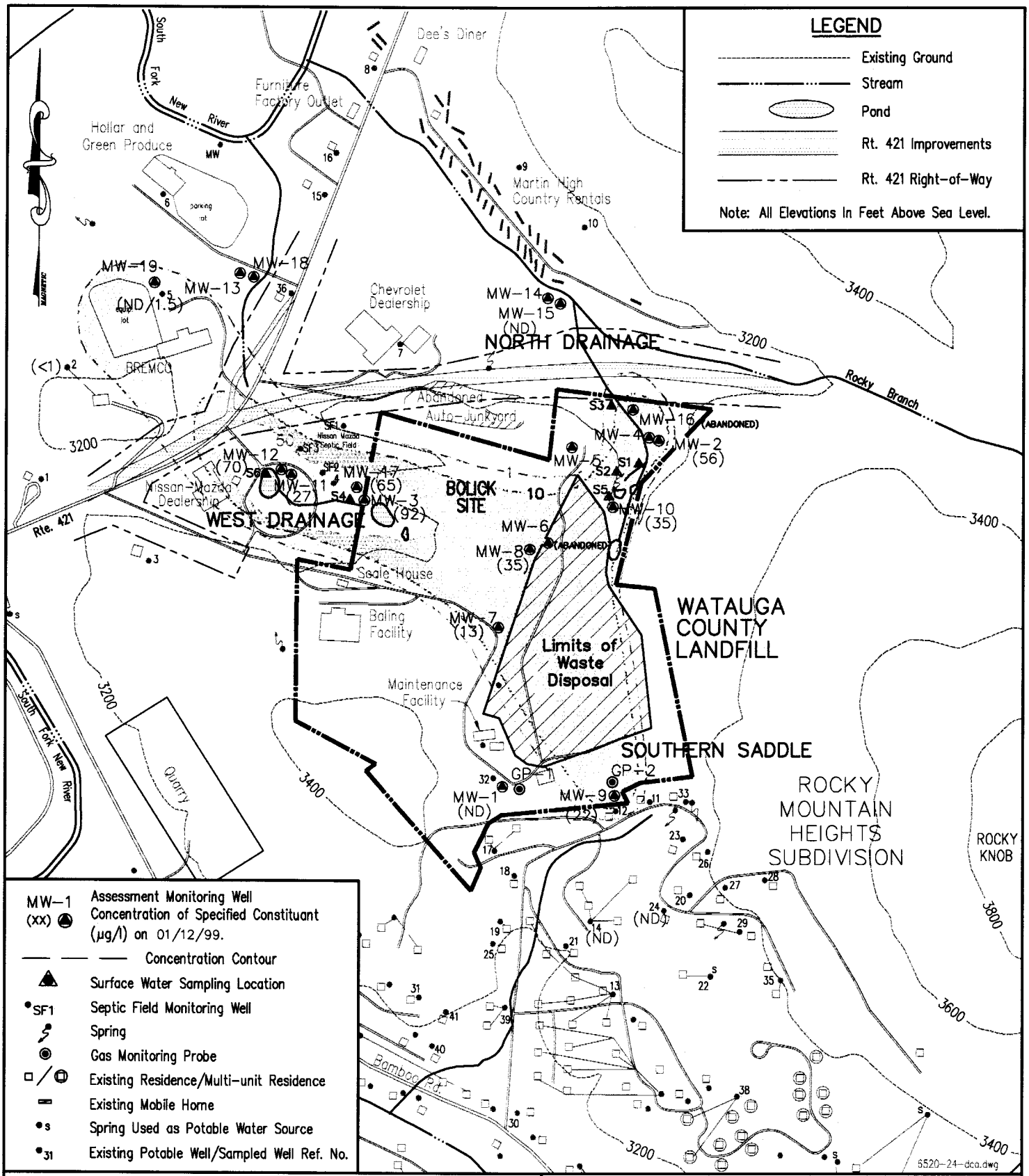
Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±

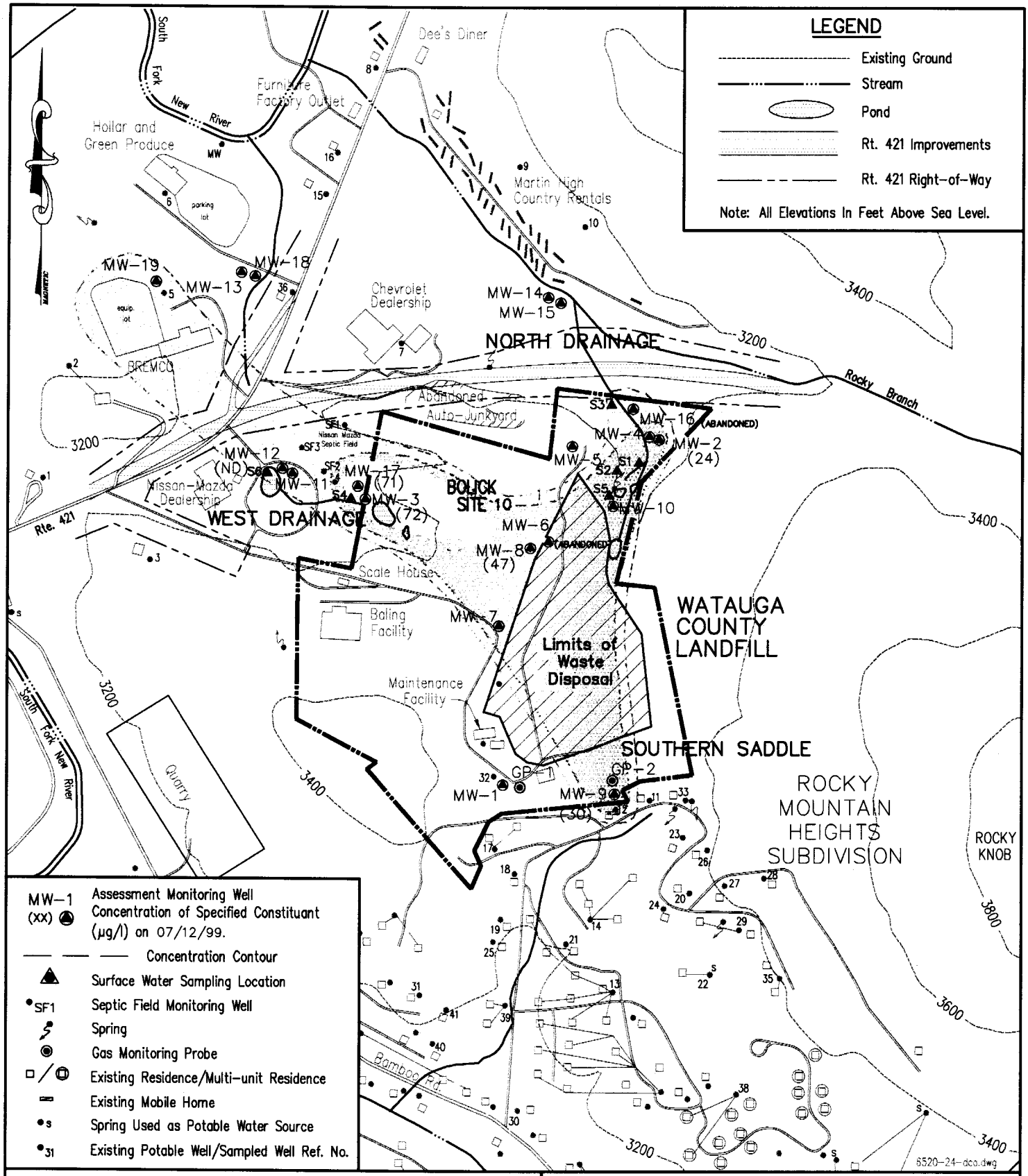


1,1-DCA HORIZONTAL DISTRIBUTION JANUARY 12, 1999

WATAUGA COUNTY LANDFILL WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



1,1-DCA HORIZONTAL DISTRIBUTION JULY 12, 1999

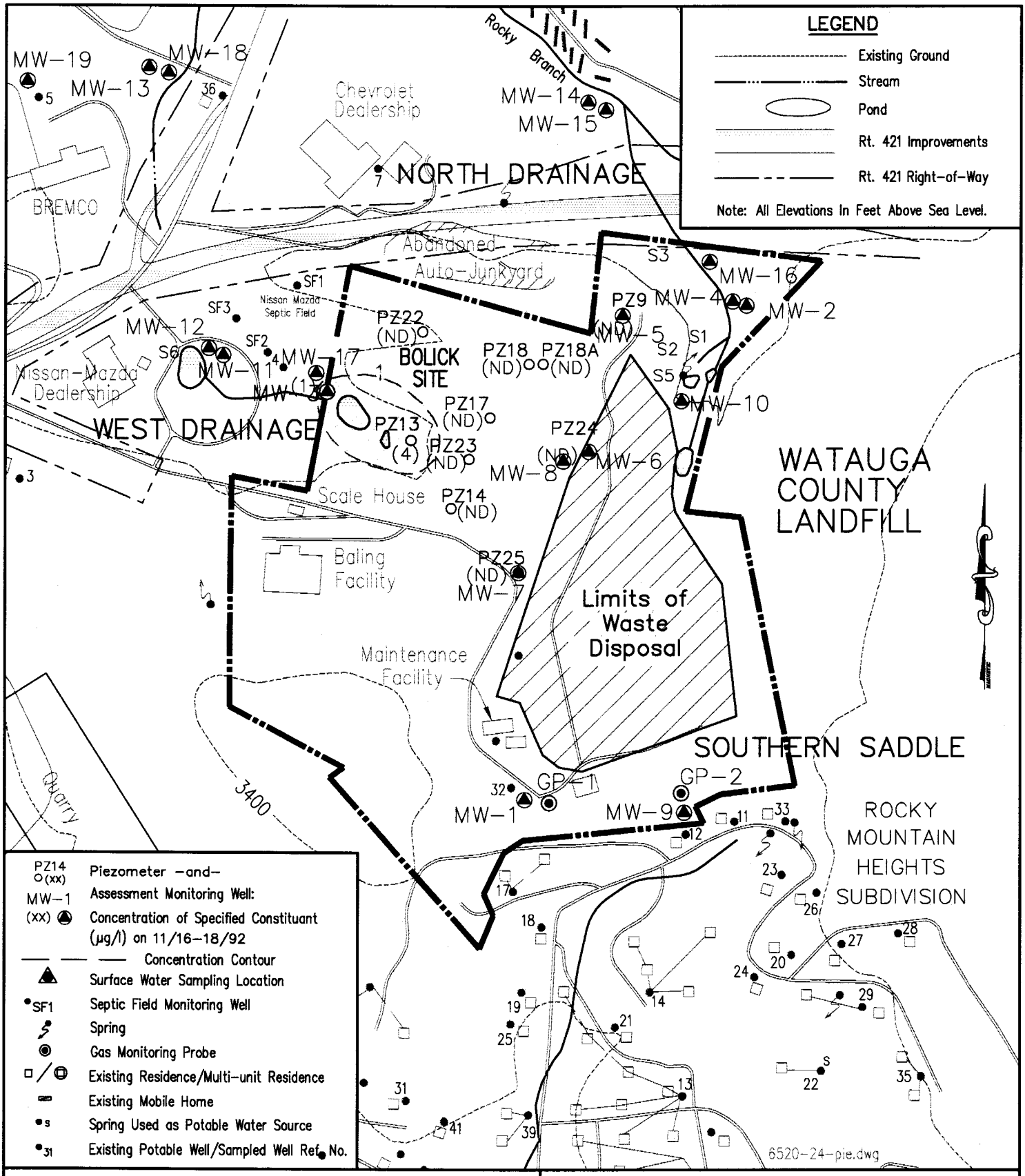
WATAUGA COUNTY LANDFILL WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA - Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±

cis-1,2-DCE Delineation Maps

November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution
April 10, 1996 Vertical Distribution - West Drainage
January 12, 1999 Vertical Distribution - West Drainage
July 12, 1999 Vertical Distribution - West Drainage

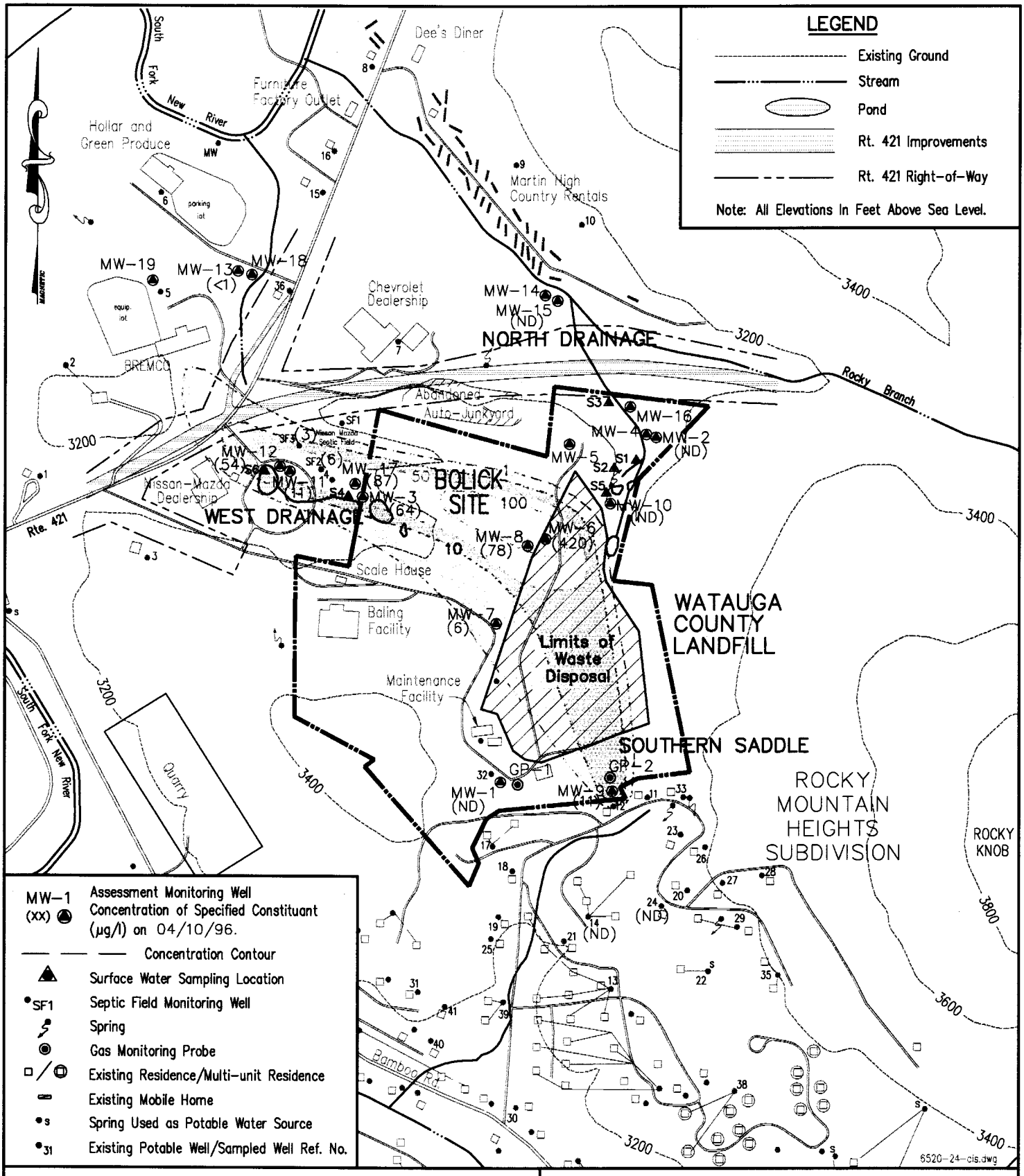


CIS-1,2-DCE
HORIZONTAL DISTRIBUTION
NOVEMBER 16-18, 1992

WATAUGA COUNTY LANDFILL
WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA - Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	NONE

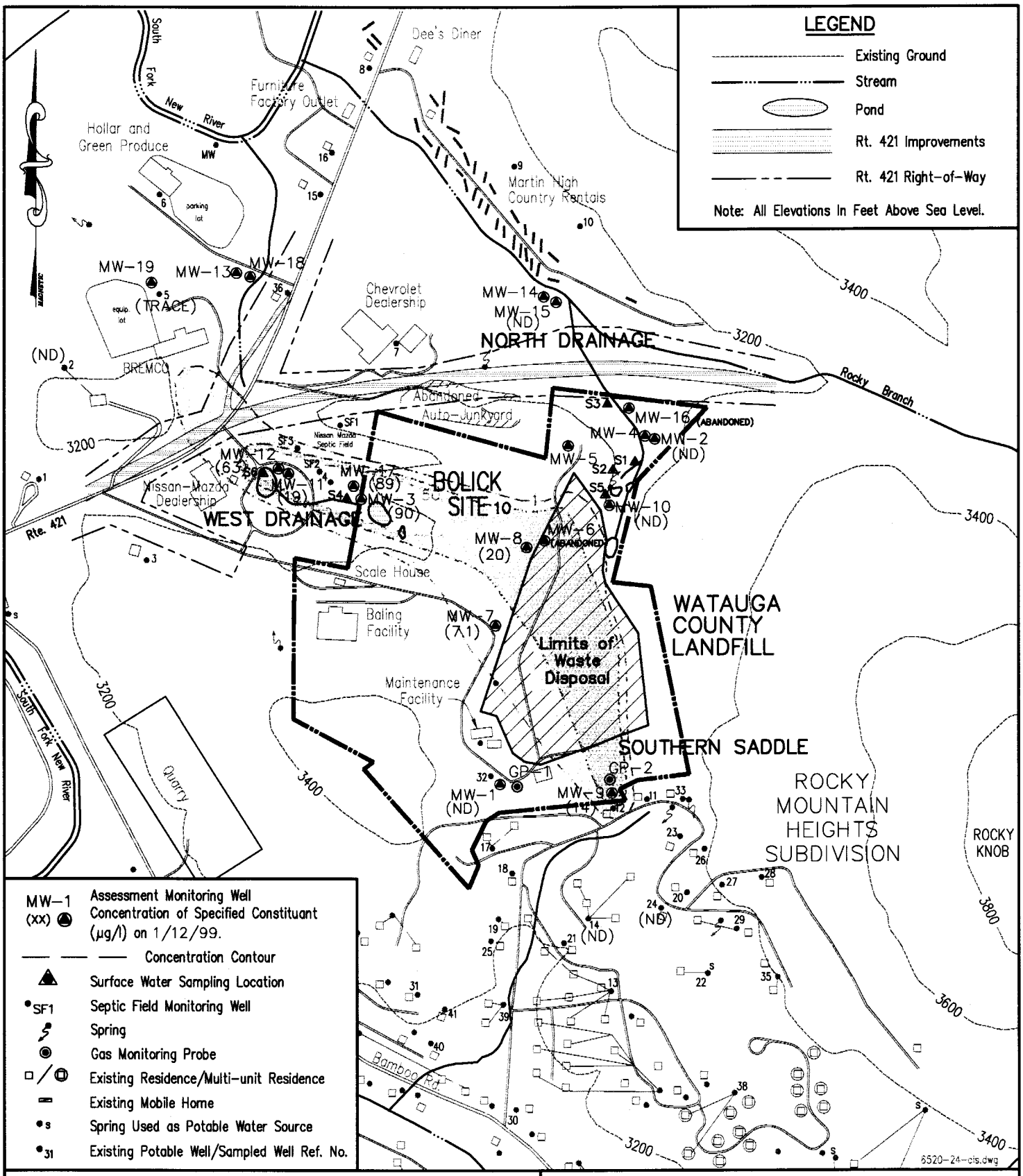


CIS-1,2-DCE HORIZONTAL DISTRIBUTION APRIL 10, 1996

WATAUGA COUNTY LANDFILL WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±

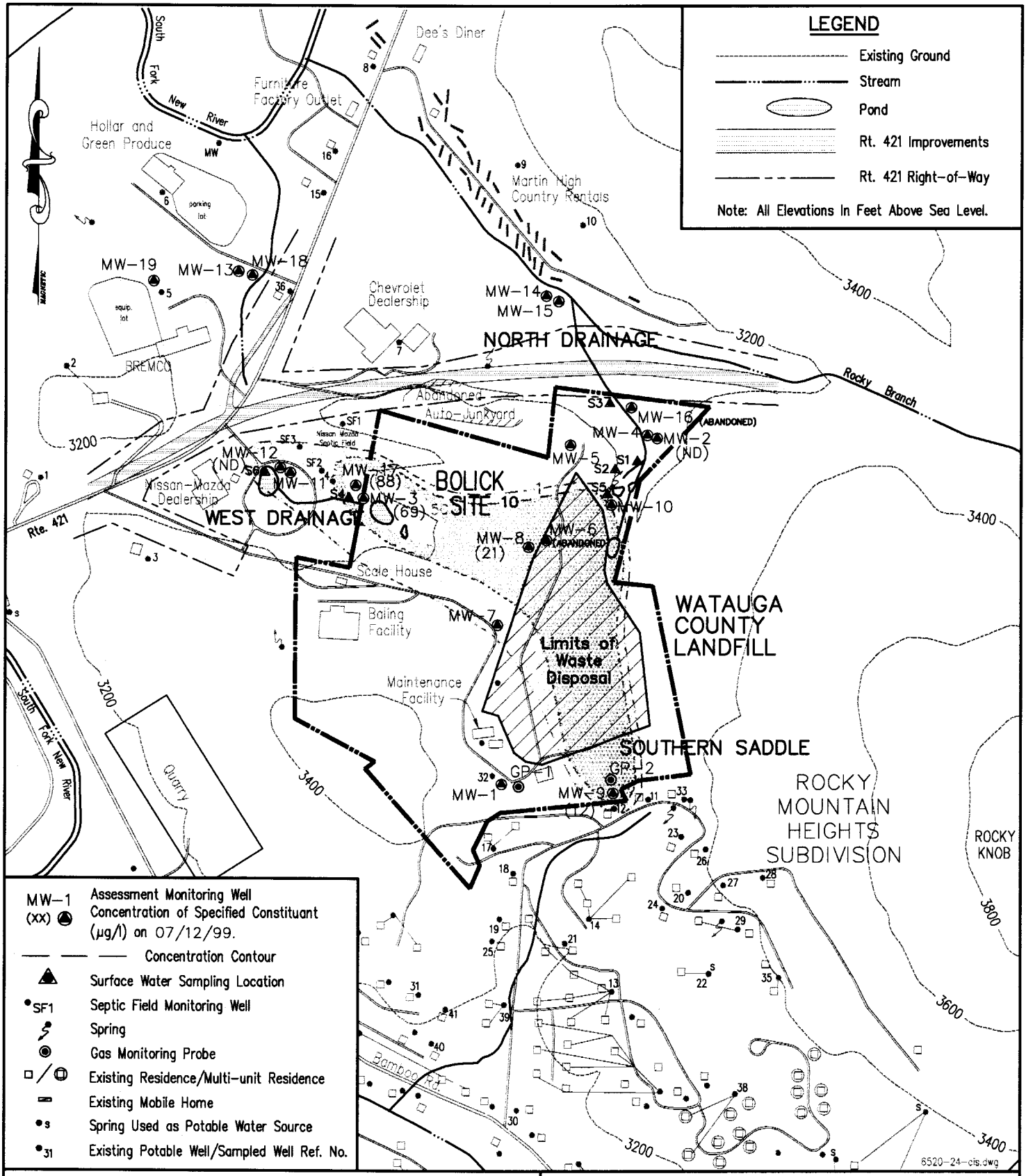


CIS-1,2-DCE HORIZONTAL DISTRIBUTION JANUARY 12, 1999

WATAUGA COUNTY LANDFILL WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



CIS-1,2-DCE HORIZONTAL DISTRIBUTION JULY 12, 1999

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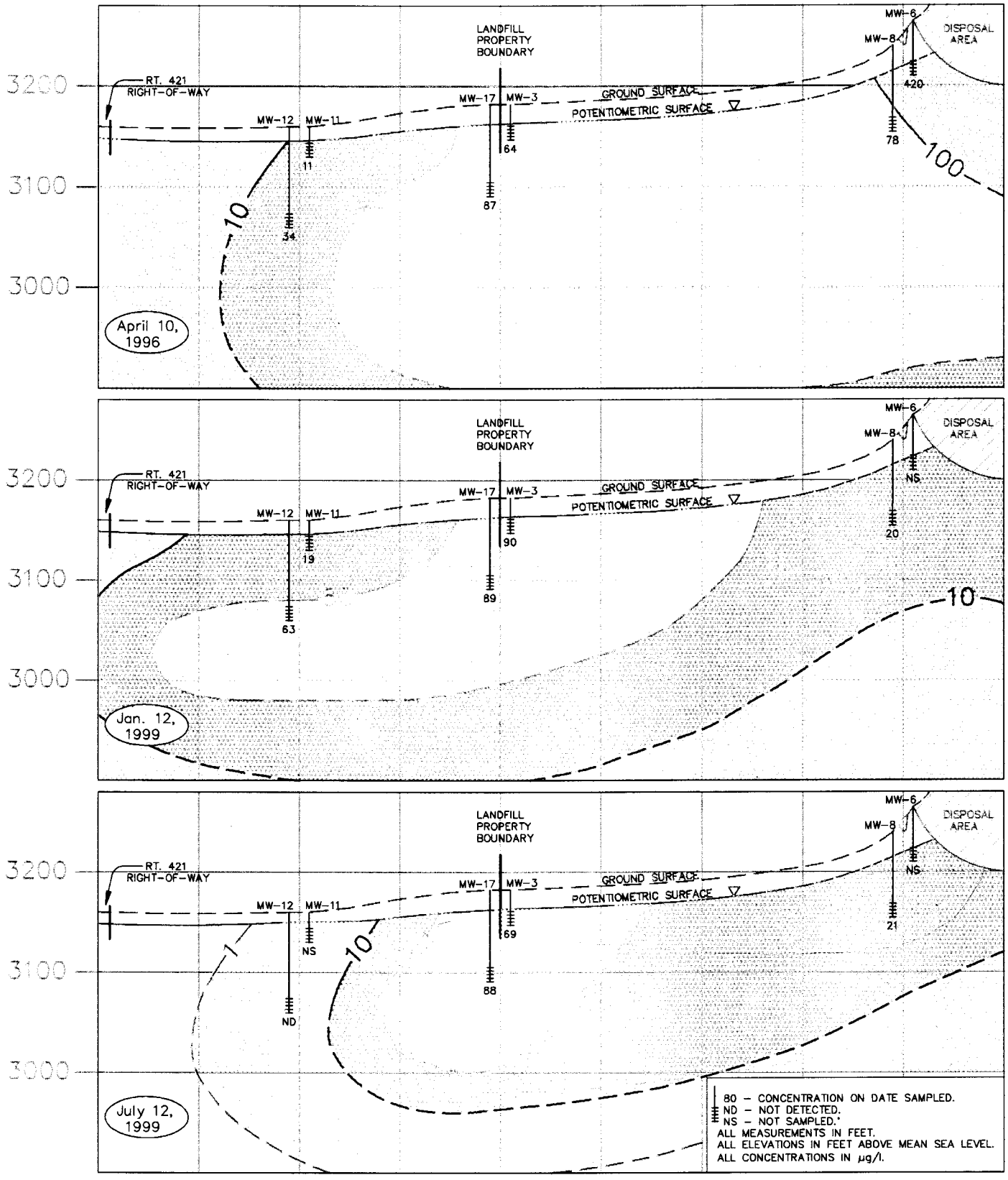
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



CIS–1,2–DCE VERTICAL DISTRIBUTION WEST DRAINAGE

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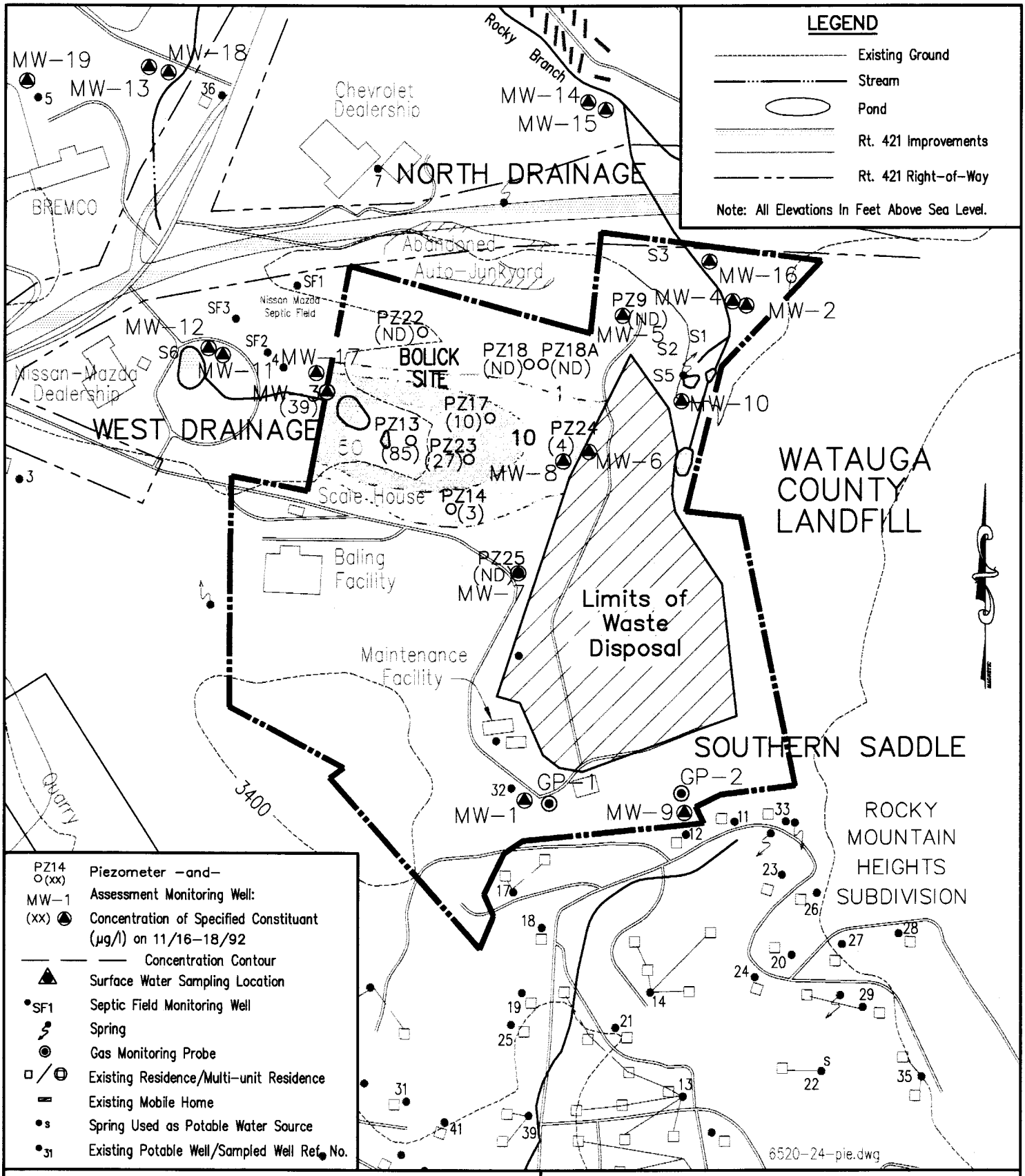
JOB No.	DATE:	SCALE:
6520–24	03 NOV 99	VERT: 1"=100' HORIZ: 1"=300'

PCE Delineation Maps

November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution
April 10, 1996 Vertical Distribution - West Drainage
January 12, 1999 Vertical Distribution - West Drainage
July 12, 1999 Vertical Distribution - West Drainage



PCE HORIZONTAL DISTRIBUTION NOVEMBER 16-18, 1992

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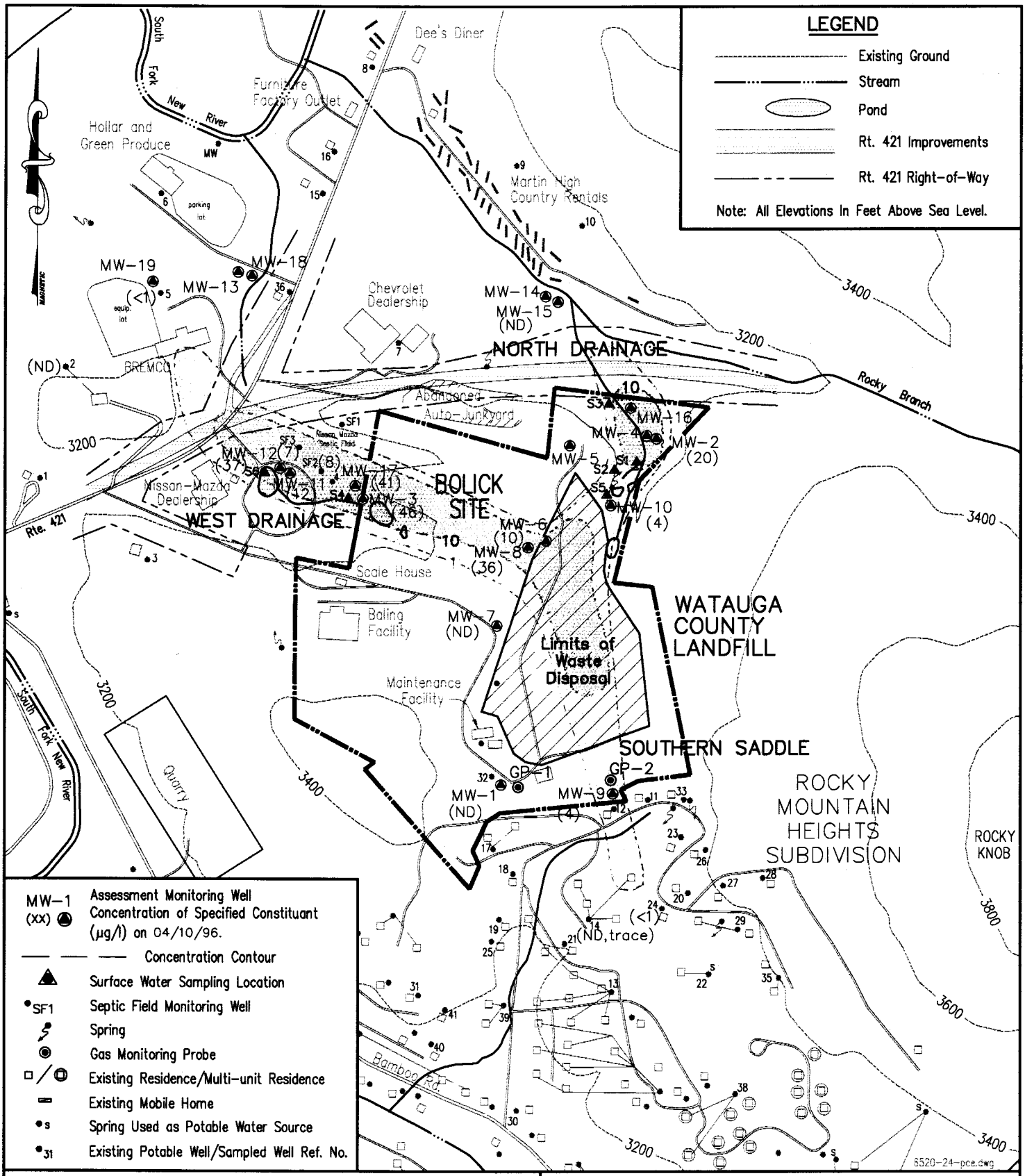
CONSULTING ENGINEERS
Blacksburg, VA - Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	NONE



PCE HORIZONTAL DISTRIBUTION APRIL 10, 1996

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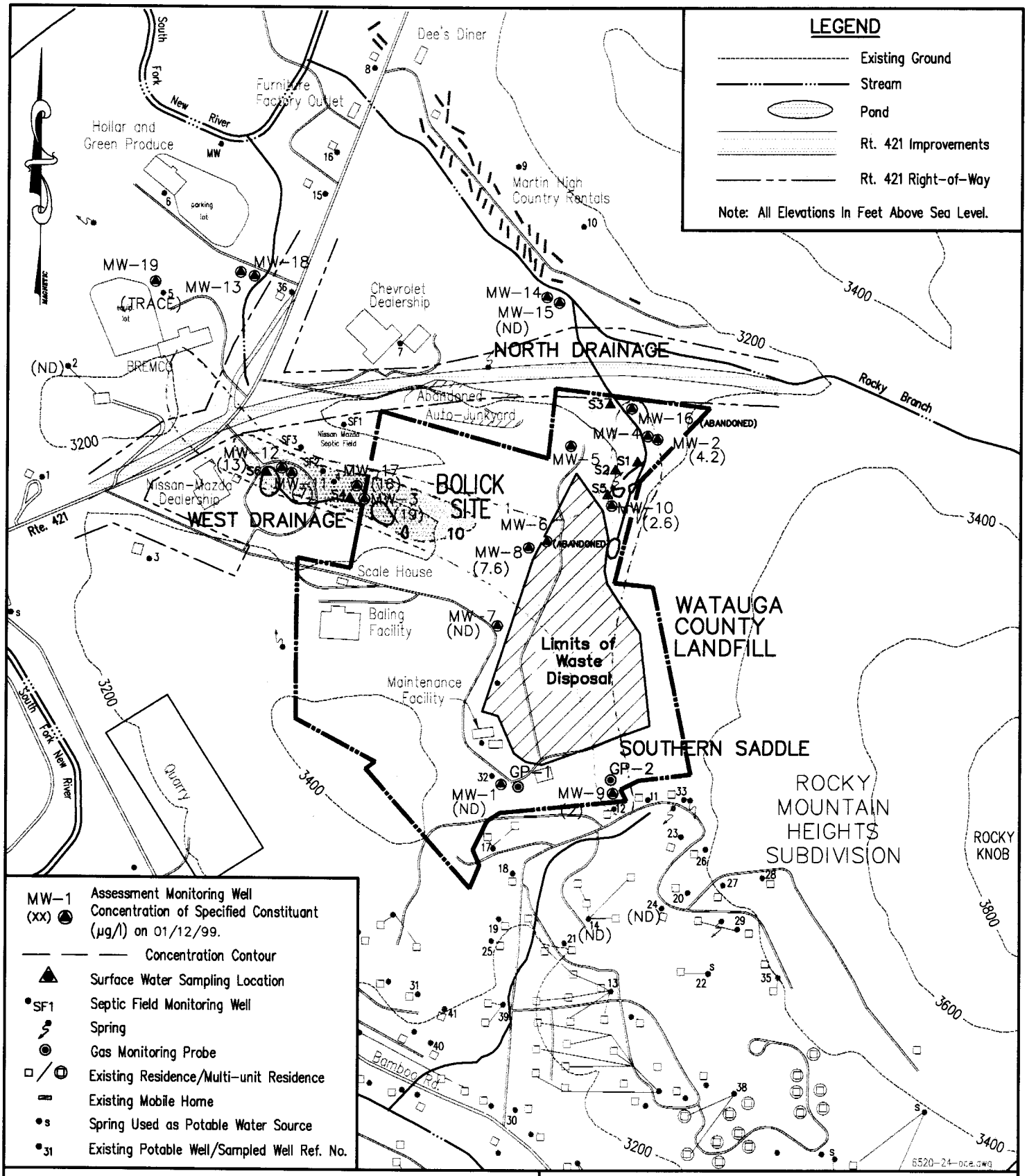
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



PCE HORIZONTAL DISTRIBUTION JANUARY 12, 1999

WATAUGA COUNTY LANDFILL WATAUGA COUNTY, NORTH CAROLINA

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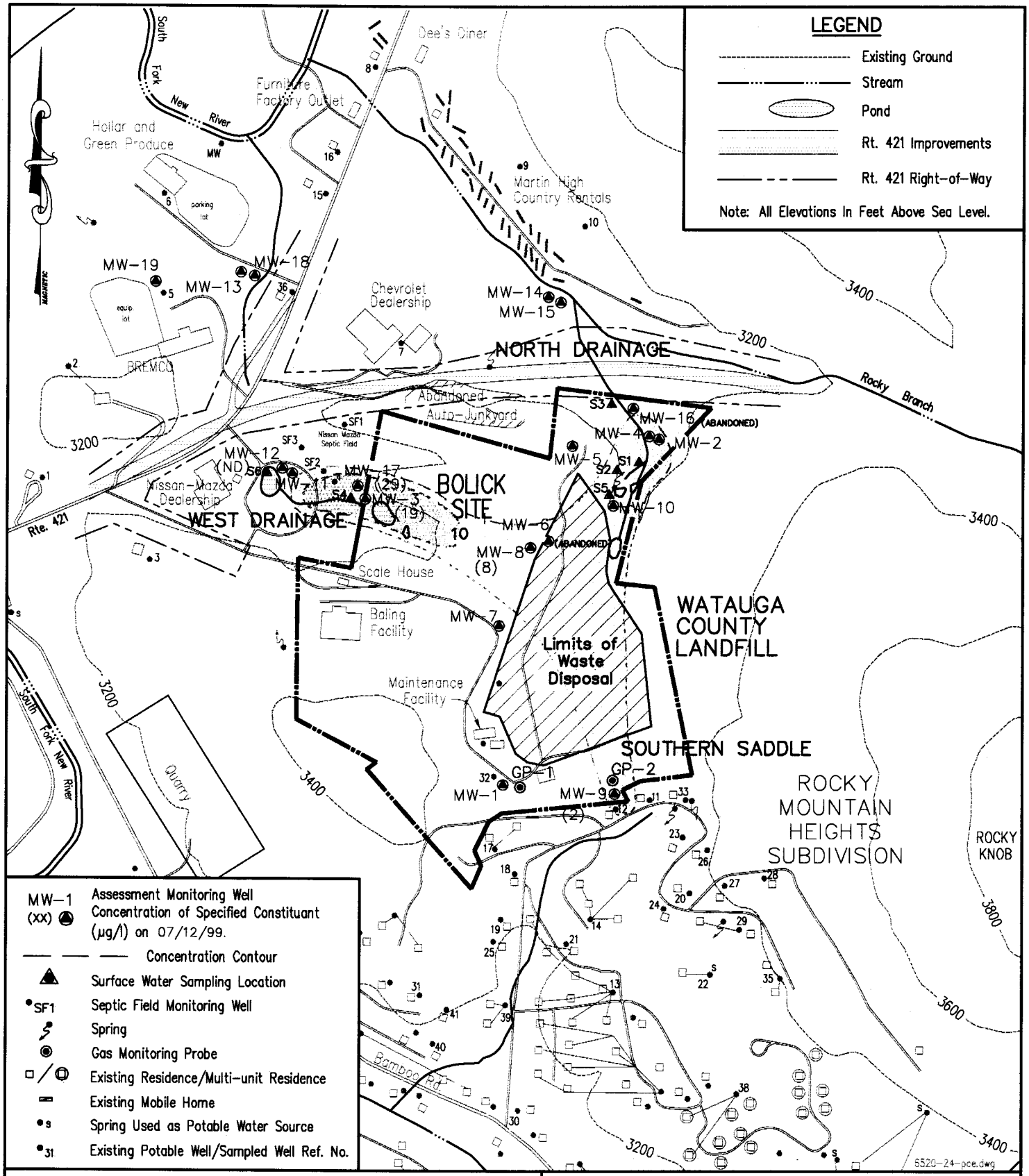
JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



PCE HORIZONTAL DISTRIBUTION JULY 12, 1999

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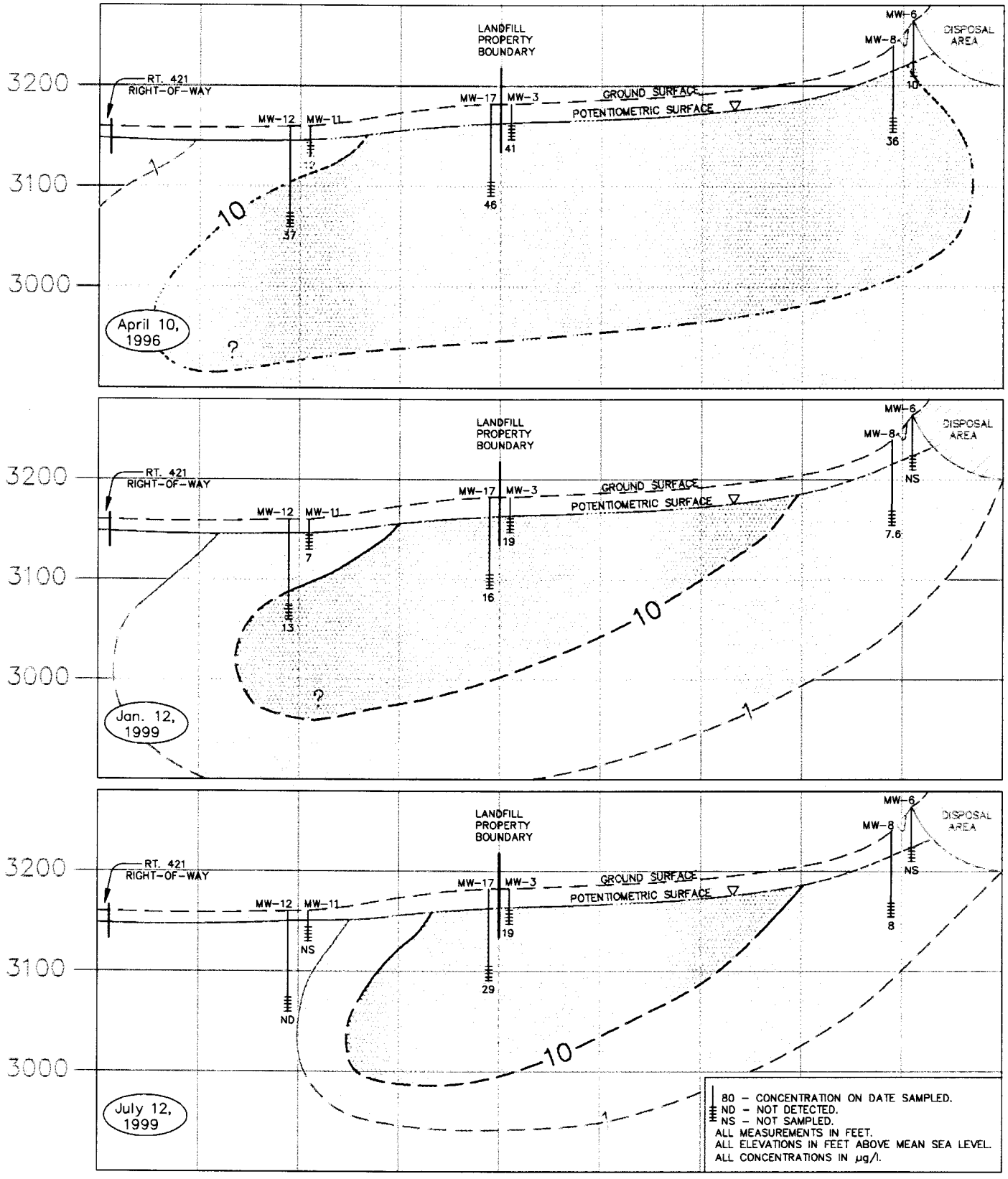
JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



PCE VERTICAL DISTRIBUTION WEST DRAINAGE

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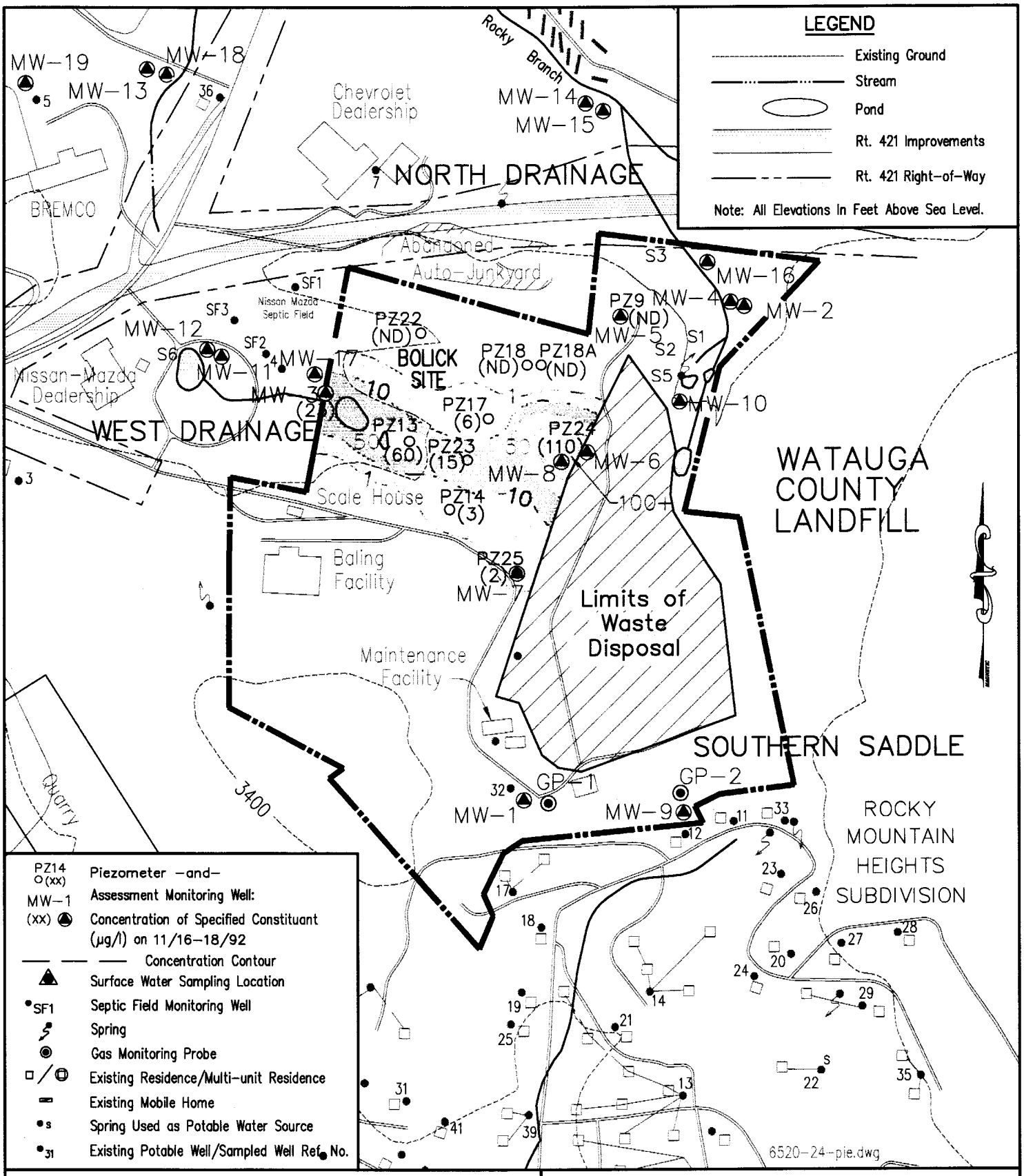
CONSULTING ENGINEERS
Blacksburg, VA - Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	03 NOV 99	VERT: 1"=100' HORIZ: 1"=300'

TCE Delineation Maps

November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution



TCE HORIZONTAL DISTRIBUTION NOVEMBER 16-18, 1992

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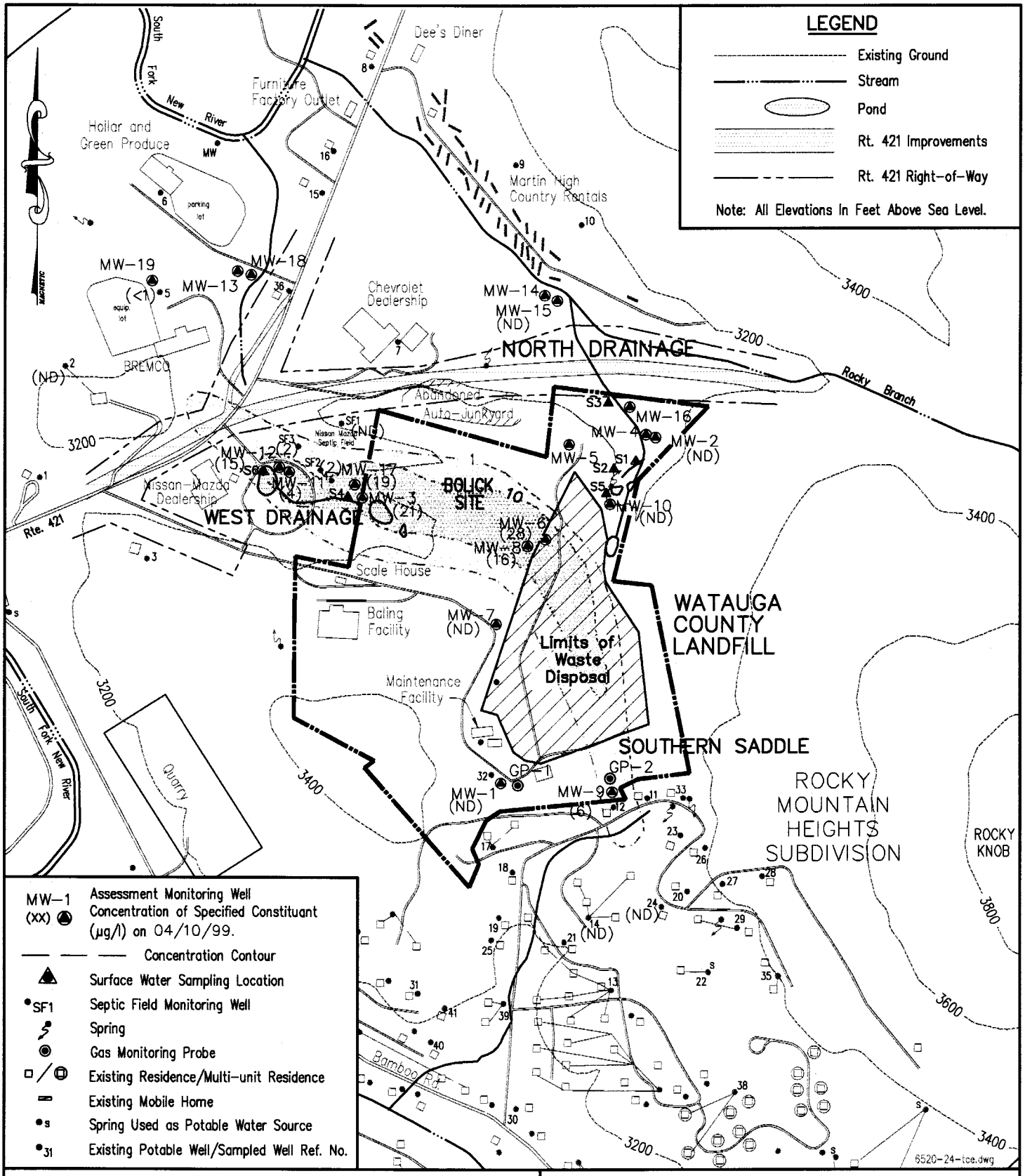
Blacksburg, VA - Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	NONE



TCE HORIZONTAL DISTRIBUTION APRIL 10, 1996

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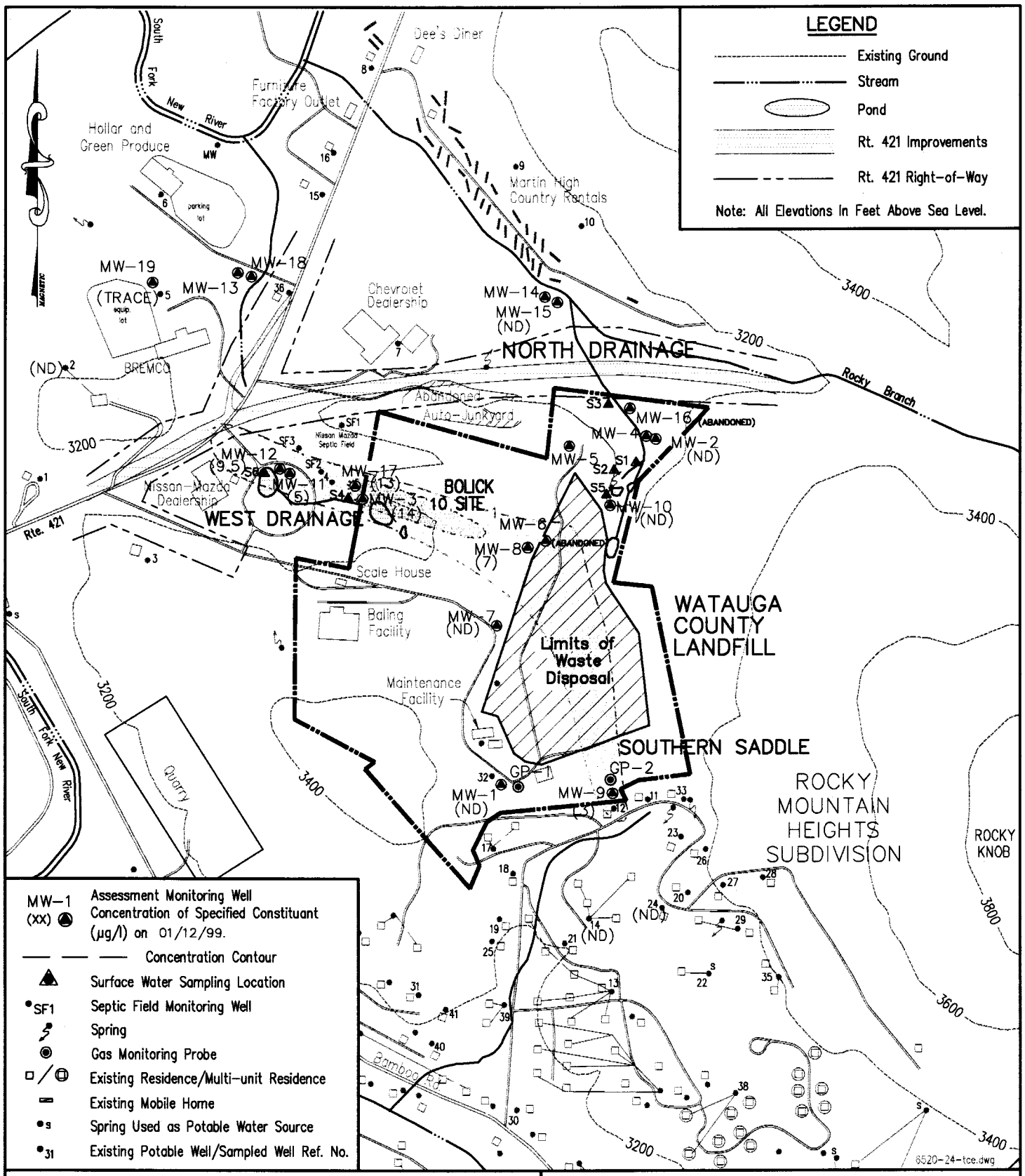
JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



TCE HORIZONTAL DISTRIBUTION JANUARY 12, 1999

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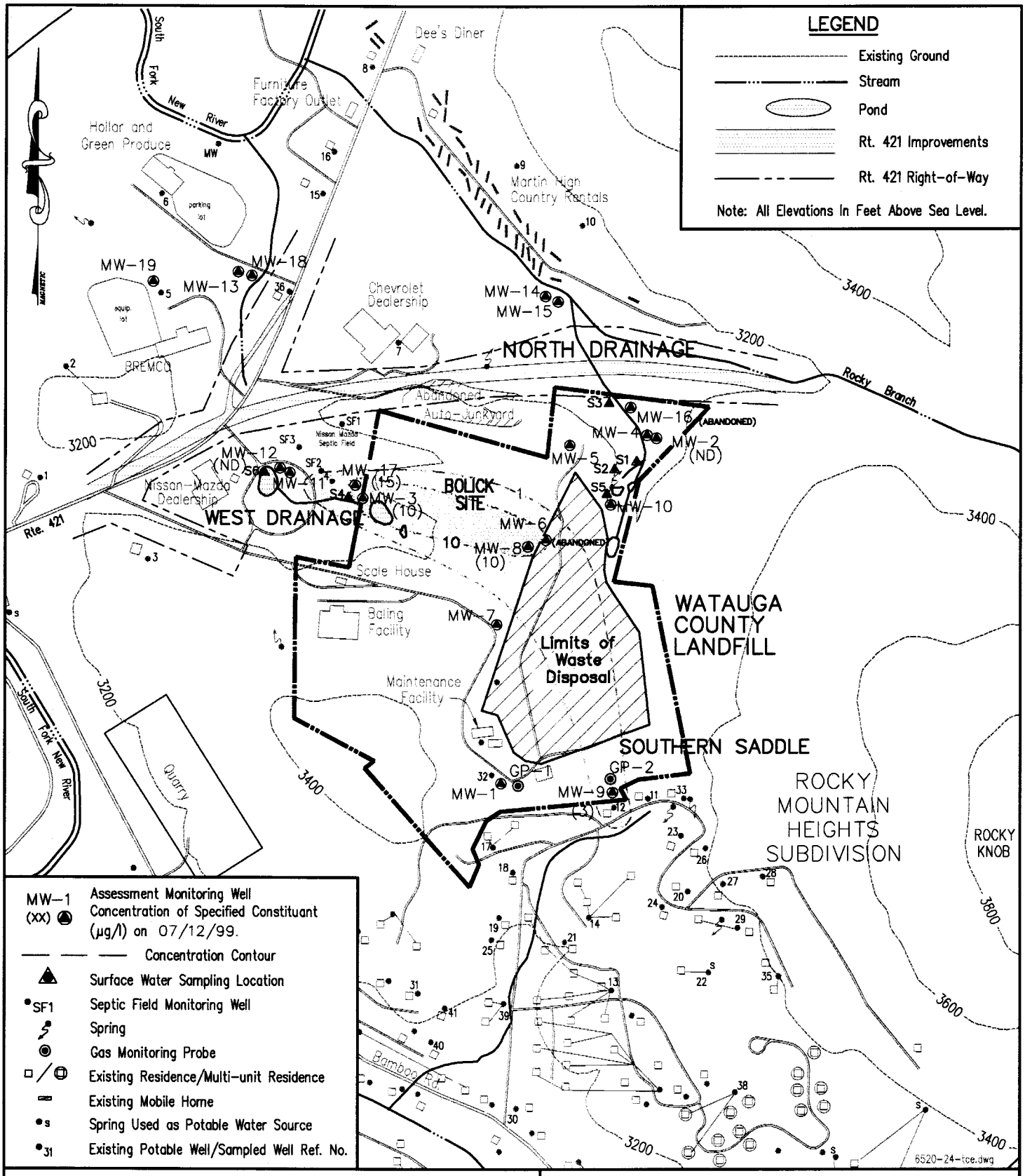
JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



TCE HORIZONTAL DISTRIBUTION JULY 12, 1999

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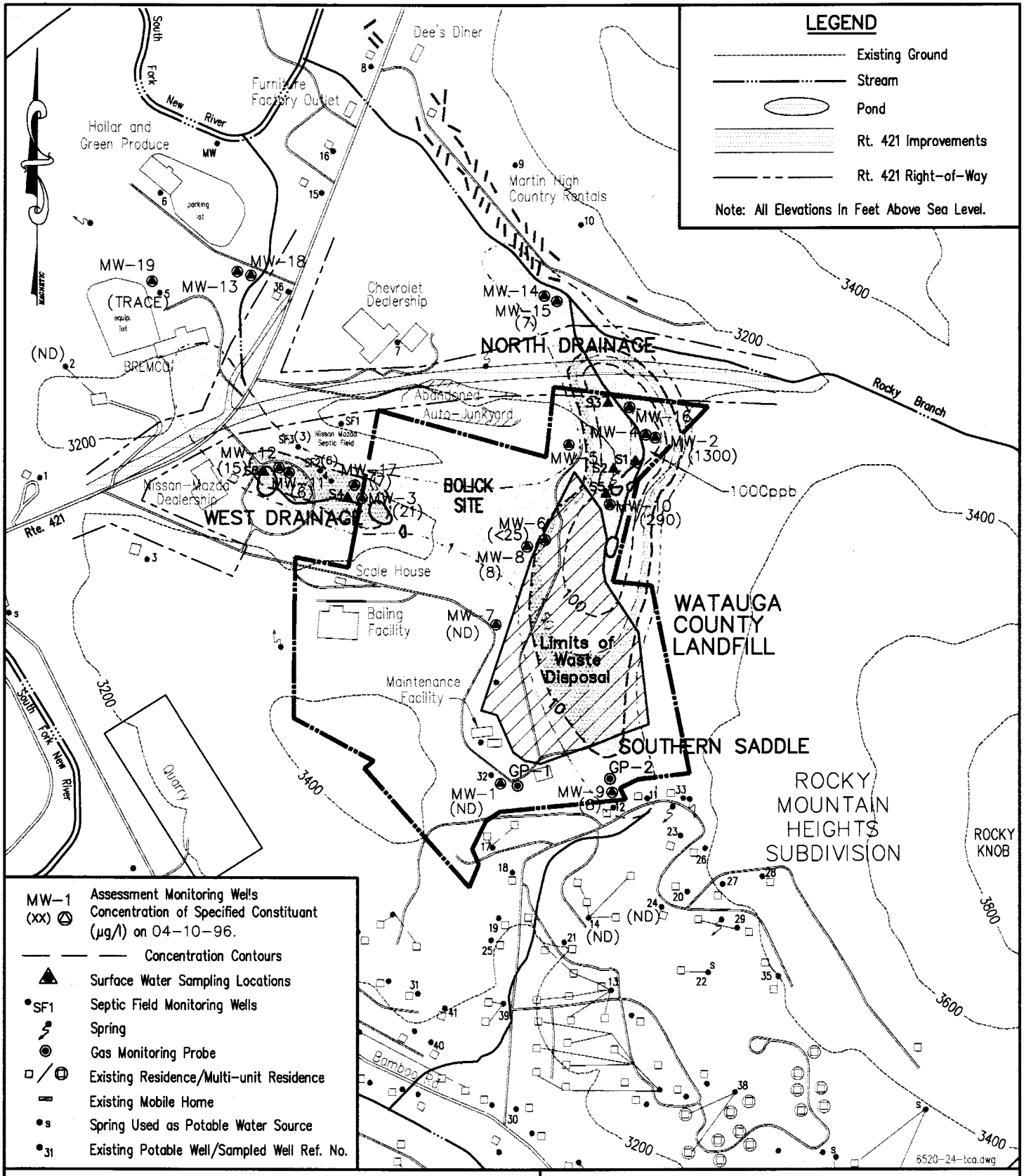
JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±

1,1,1-TCA Delineation Maps

April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution
July 12, 1999 Horizontal Distribution
April 10, 1996 Vertical Distribution - North Drainage
January 12, 1999 Vertical Distribution - North Drainage
July 12, 1999 Vertical Distribution - North Drainage



1,1,1-TCA HORIZONTAL DISTRIBUTION APRIL 10, 1996

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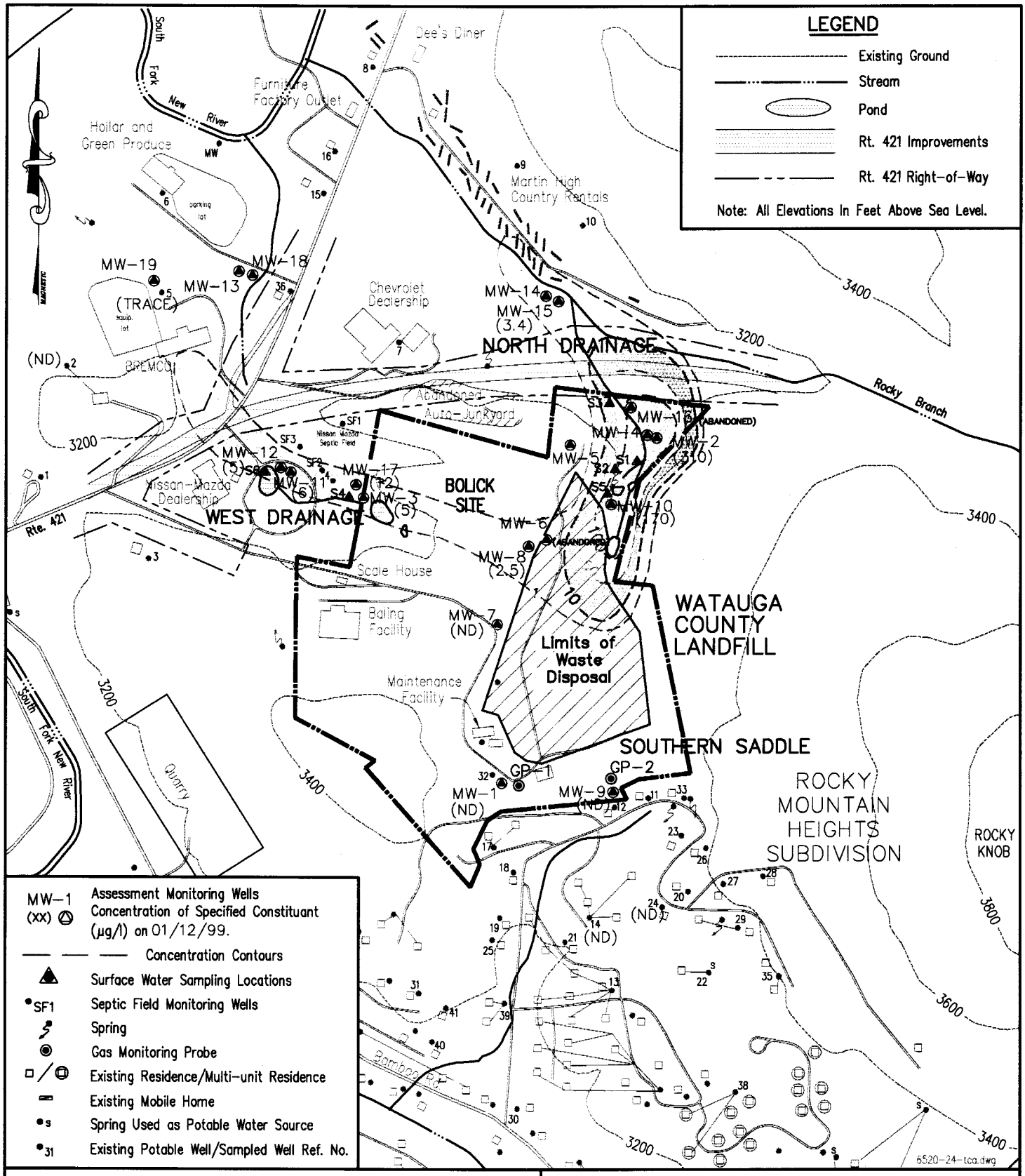
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1" = 840' ±



1,1,1-TCA HORIZONTAL DISTRIBUTION JANUARY 12, 1999

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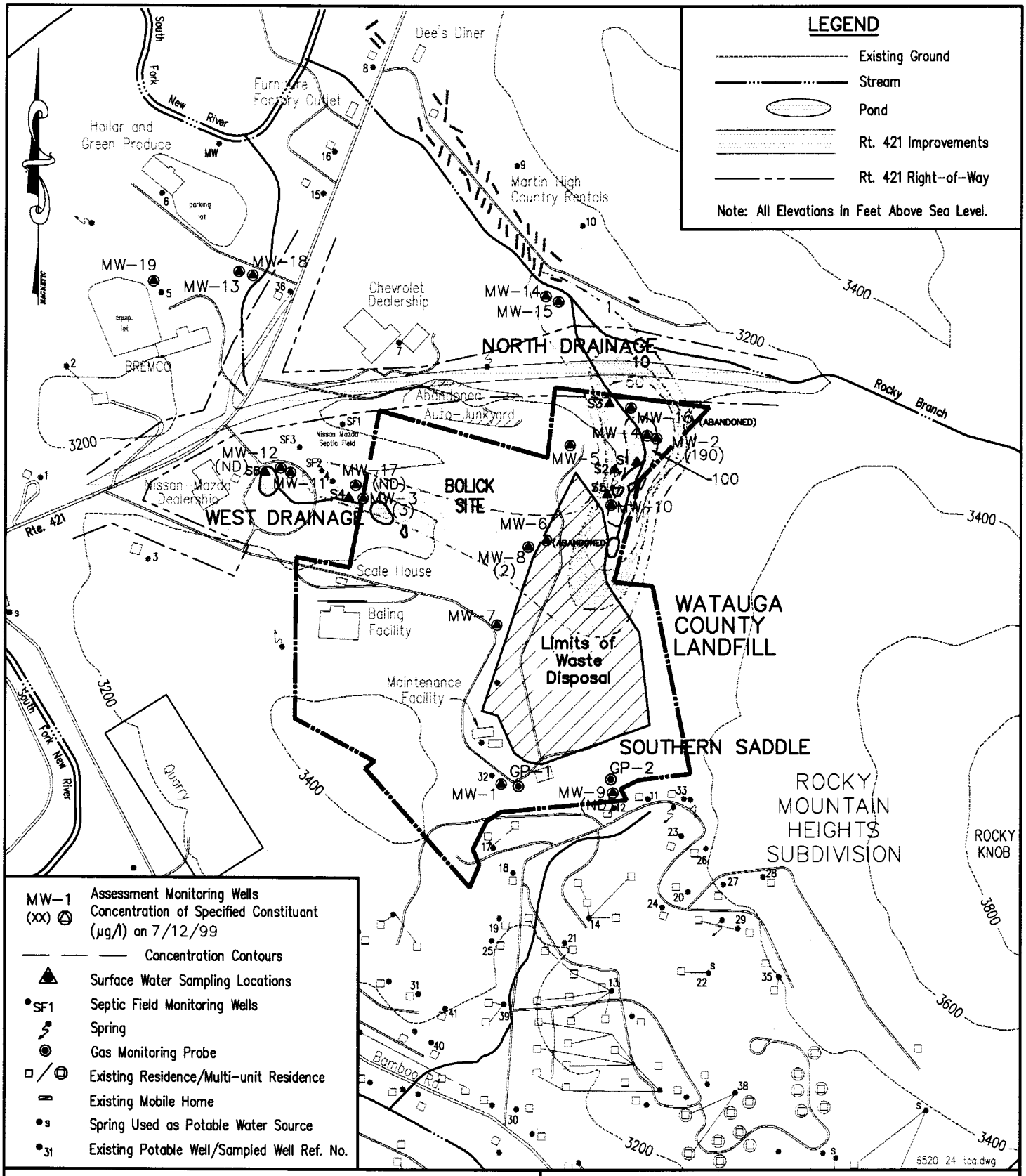
JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1" = 840' ±



1,1,1-TCA HORIZONTAL DISTRIBUTION JULY 12, 1999

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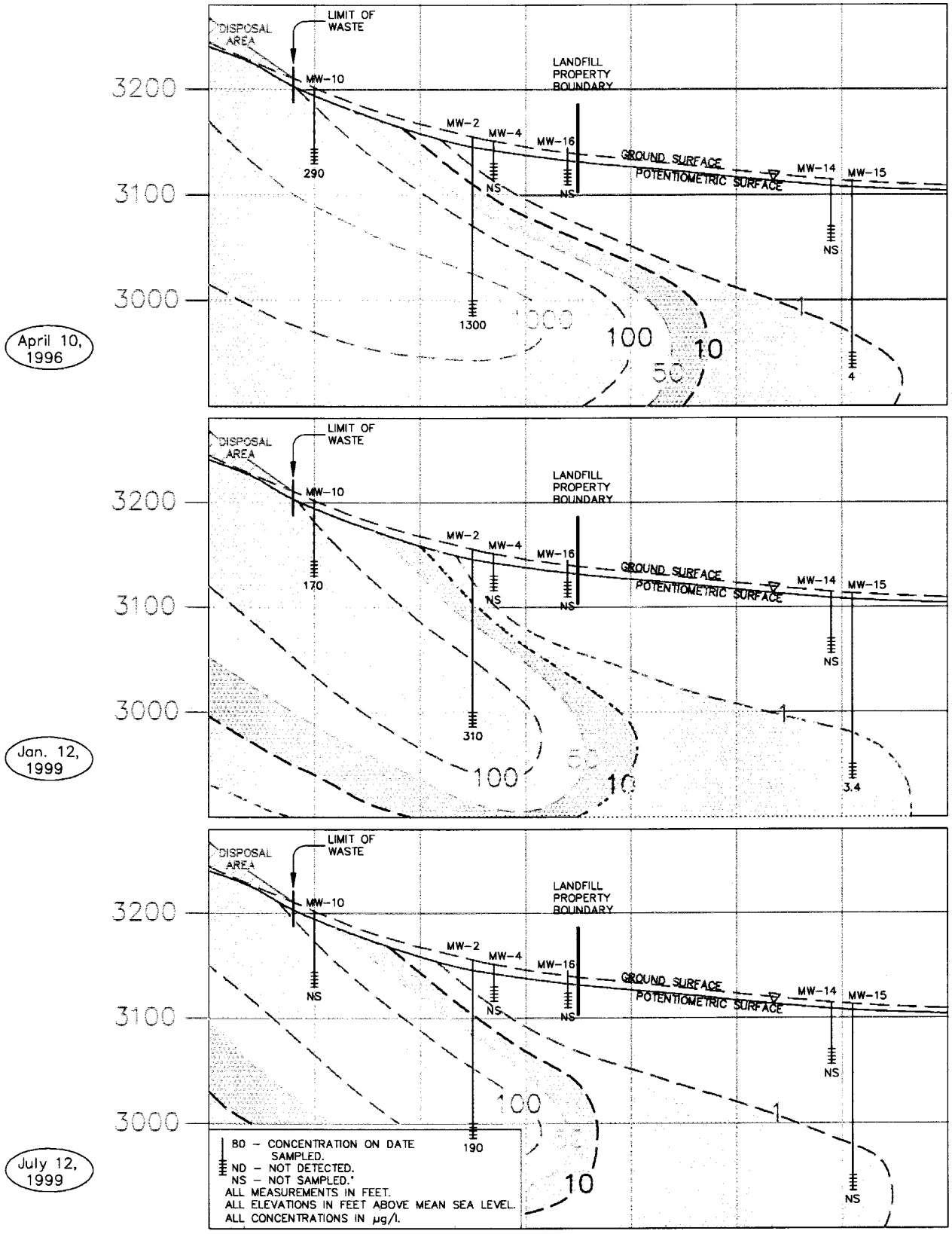
JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1" = 840' ±



1,1,1–TCA VERTICAL DISTRIBUTION NORTH DRAINAGE

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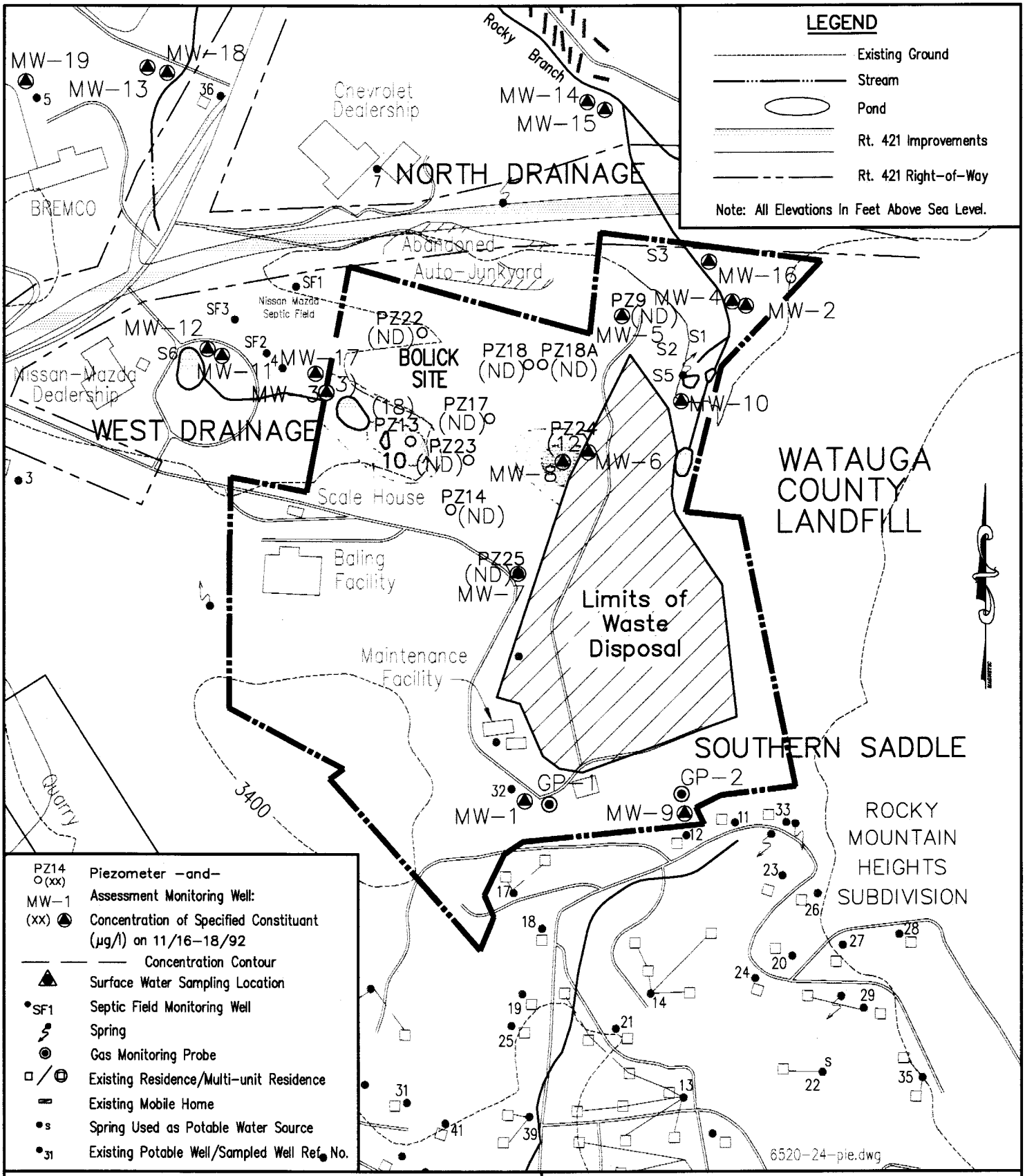
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520–24	15 NOV 99	VERT: 1"=100' HORIZ: 1"=300'

Vinyl Chloride Delineation Maps

November 16-18, 1992 Horizontal Distribution
April 10, 1996 Horizontal Distribution
January 12, 1999 Horizontal Distribution



VINYL CHLORIDE HORIZONTAL DISTRIBUTION NOVEMBER 16-18, 1992

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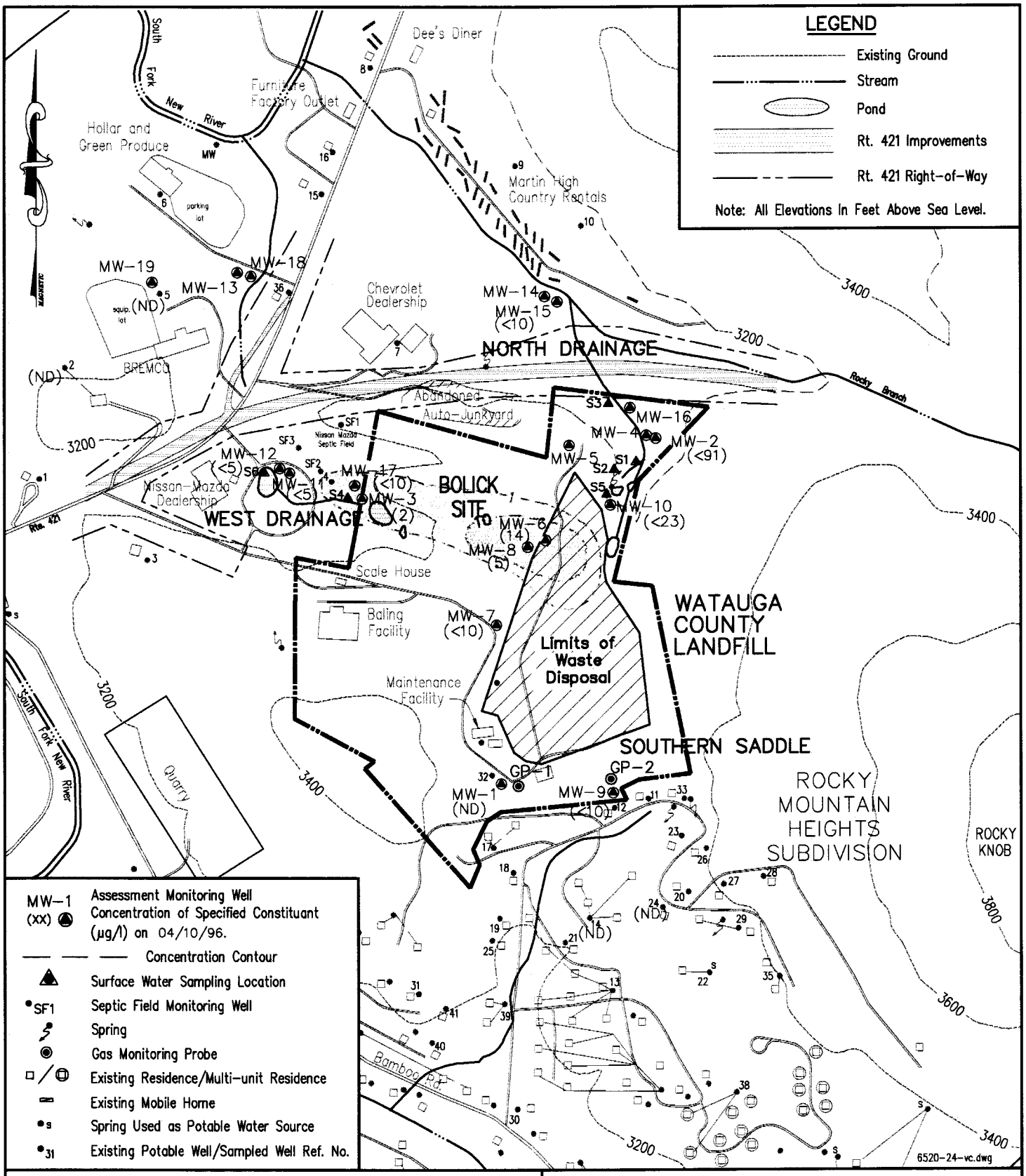
Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA - Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	NONE



VINYL CHLORIDE HORIZONTAL DISTRIBUTION APRIL 10, 1996

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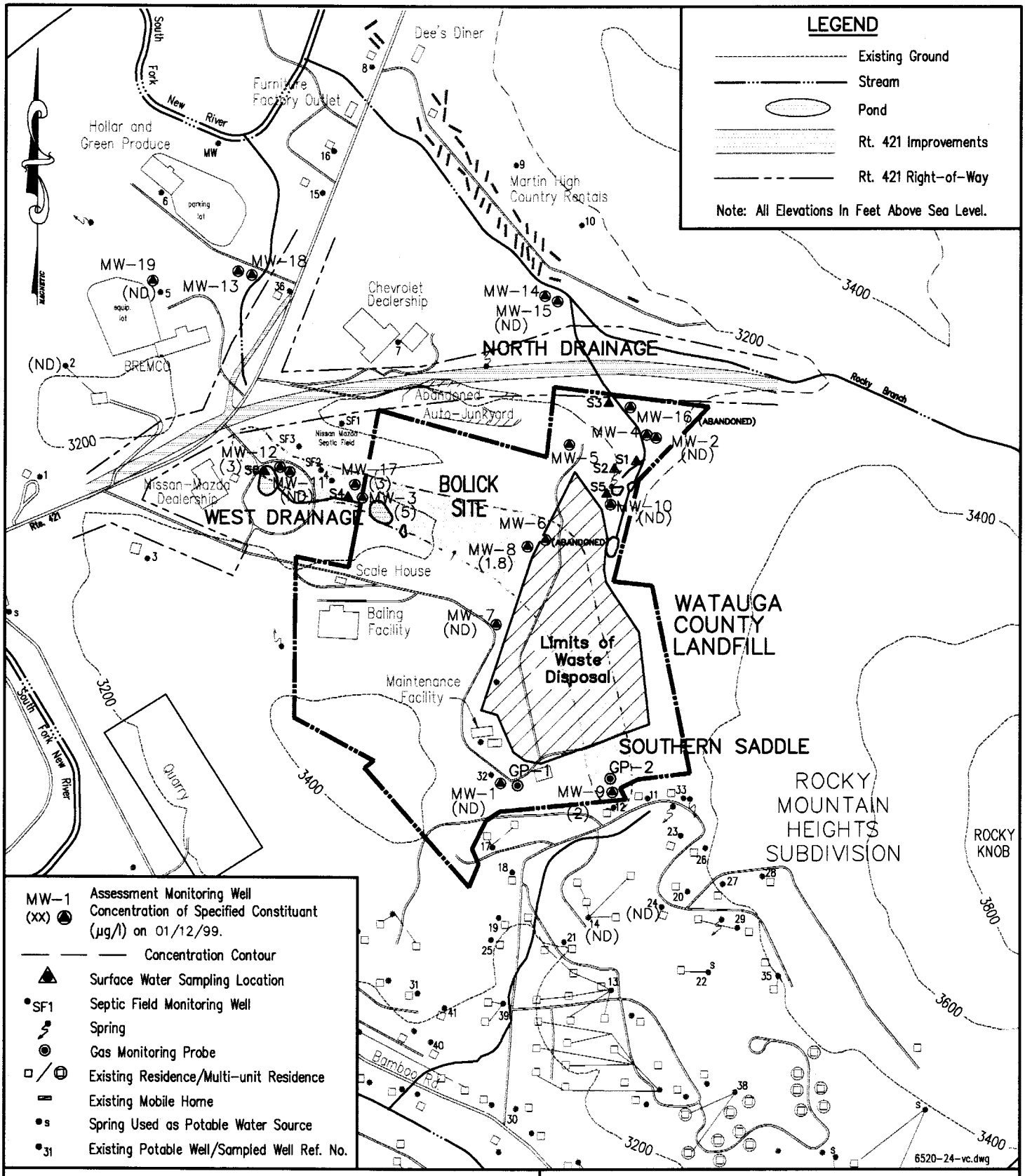
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±



VINYL CHLORIDE HORIZONTAL DISTRIBUTION JANUARY 12, 1999

WATAUGA COUNTY LANDFILL WATAUGA COUNTY, NORTH CAROLINA

Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, VA – Richmond, VA

JOB No.	DATE:	SCALE:
6520-24	15 NOV 99	1"=840'±