9/93 K.4

Groundwater Remedial Design
Work Plan

WARZYN

PROJECT
10009712

GROUNDWATER REMEDIAL DESIGN WORK PLAN

WINNEBAGO RECLAMATION LANDFILL SITE
(PAGEL'S PIT)
WINNEBAGO COUNTY, ILLINOIS

SEPTEMBER 1993

PREPARED FOR:
WINNEBAGO RECLAMATION SERVICES, INC.
ROCKFORD, ILLINOIS

• • •

PREPARED BY:
WARZYN INC.
ADDISON, ILLINOIS

WARZYN

PROJECT
10009712

GROUNDWATER REMEDIAL DESIGN WORK PLAN

WINNEBAGO RECLAMATION LANDFILL SITE
(PAGEL'S PIT)
WINNEBAGO COUNTY, ILLINOIS

SEPTEMBER 1993

Alan J. Schmidt, CPG
Project Manager

Sandra C. Ihm
Project Hydrogeologist

TABLE OF CONTENTS

1

INTRODUCTION....1
1.1 Background....2
1.2 Analytical Results....3

2

RD PLANNING DOCUMENTS....6
2.1 Site Access and Permitting Plan....6
2.2 Quality Assurance Project Plan....6
2.3 Sampling and Analysis Plan....6
2.4 Health and Safety Plan....7
2.5 Predesign Studies Plan....7
2.5.1 Groundwater Sampling of Existing Wells....8
2.5.2 Placement of New Wells....9
2.5.3 Aquifer Pumping Test....10

3

REMEDIAL DESIGN....14

4

REPORTS AND SUBMISSIONS....15

5

SCHEDULE....16

6

PROJECT ORGANIZATION AND RESPONSIBILITY....17

LIST OF TABLES

Table 1	Analytical Results for Well MW106
Table 2	Analytical Results for Piezometer P1
Table 3	Analytical Results for Well G116
Table 4	Analytical Results for Well G116A
Table 5	Analytical Results for Piezometer P3R
Table 6	Analytical Results for Piezometer P4R
Table 7	Analytical Results for Well G115
Table 8	Analytical Results for Well G117
Table 9	Summary of Concentrations for Groundwater Treatment System
Table 10	Analytical Parameters

LIST OF FIGURES

Figure 1	Site Location Map
Figure 2	Site Features Map
Figure 3	Monitoring Well Location Map
Figure 4	Cross-Section C-C' & D-D' Location Map
Figure 5	Round 2 Total Ethenes (ug/L)
Figure 6	Round 2 Total Ethenes (ug/L)
Figure 7	Round 2 Chlorinated Ethenes
Figure 8	Project Schedule
Figure 9	Project Organization Chart

LIST OF APPENDICES

Appendix A	Sampling Plan

1

INTRODUCTION

This Groundwater Extraction and Treatment System Remedial Design Work Plan (Groundwater RD Work Plan) has been developed in accordance with the Consent Decree, Statement of Work, and the Remedial Design and Remedial Action (RD/RA) Work Plan for the Winnebago Reclamation Landfill (WRL) Site located in Winnebago County, Illinois (Figure 1). This Groundwater RD Work Plan provides supplemental information required specific to the design of the groundwater extraction and treatment system described in the RD/RA Work Plan. The purpose of this Groundwater RD Work Plan is to document the technical strategy and approach that will be used for predesign studies and the actions to be followed in integrating that information into and preparation of the Groundwater RD. The key elements of the Groundwater RD Work Plan are:

- Predesign studies to identify the extent of groundwater contamination in the vicinity of the western site boundary, and through a pumping test, identify aquifer characteristics to optimize design of the remedial system

- Preparation of the preliminary, pre-final, and final design documents leading to remedial action

The Work Plan (WP) includes:

- Project background information
- Identification of the RD project design documents
- Groundwater Remedial Design Approach
- A summary of required reports and submissions
- Schedule for Groundwater RD activities
- Organization Structure for the Groundwater RD

1.1 BACKGROUND

Containment of contaminated groundwater, by a groundwater extraction and treatment system, was identified in the WRL FS and selected in the ROD as the appropriate action to remediate affected groundwater attributable to the WRL Site. Conceptual layout of the groundwater extraction system in the FS includes a series of extraction wells generally oriented north-south near the western end of the landfill. However, to determine the required location and screened interval of extraction wells and to better establish the operating parameters of the system for design; additional information on the vertical and horizontal extent of affected groundwater and aquifer characteristics will be required.

To develop the approach to defining the horizontal and vertical extent of the contaminant plume in the vicinity of the western boundary of the WRL Site, Warzyn reviewed groundwater quality data collected during the Interim Groundwater Quality Evaluation and Remedial Investigation (RI). During this investigation, wells were installed along the western boundary of the site and groundwater was sampled during four sampling events. Figure 2 presents site features and monitoring well locations. The extent of contamination due to landfill leachate at that time was defined based on chloride concentrations and chlorinated ethenes. Low levels of several compounds were reported during the first two rounds of sampling conducted in 1988. During rounds three and four, the number of compounds detected and their concentrations lessened considerably. Based on those decreases, it appears that the groundwater contaminant plume has been adequately defined in the northwest and west portion of the Site in the vicinity of Killbuck Creek.

The first stage of the Groundwater RD will consist of sampling existing wells located around the perimeter of the site. Sampling will be performed to determine whether the nature and extent of contamination has changed since Remedial Investigation sampling was conducted during 1988. Analytical results will be reviewed, and based on that review, additional wells will be installed, if necessary as discussed below.

The area to the southwest of the landfill has not been fully investigated. Wells adjacent to the WRL Site which were sampled during the RI studies indicate that groundwater contaminants are present in that area. The horizontal and vertical extent of contaminated groundwater has not been identified. Placement of a limited number of new wells (Figure 3) as part of the predesign study will provide information needed to define the extent and magnitude of contaminant migration. If the sampling of existing wells indicates that well locations should be modified or additional wells installed (e.g., wells west of Killbuck Creek), U.S. EPA will be

notified. Information from new and existing wells will also be used to optimize the RD.

1.2 ANALYTICAL RESULTS

During the Interim Groundwater Quality Evaluation and RI conducted by Warzyn Inc. (Warzyn), four rounds of groundwater sampling were completed. Rounds 1 and 2 were conducted in April and June of 1988, and rounds 3 and 4 were conducted in February and April of 1990. Tables 1 though 8 present the volatile organic compounds (VOCs) which were detected during the four rounds of groundwater sampling at the wells and piezometers located in the vicinity of the proposed groundwater extraction system (G115, G117, P4R, P3R, P1,and MW106) and on the west side of Killbuck Creek (G116 and G116A). Tables 1 through 8 indicate the VOCs and detected concentrations during the RI for each individual well. A footnote to each table lists the screened interval of that well. Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) are also shown for the VOCs on Tables 1 through 8. Analytical results from the RI were compared to MCLs and non-zero MCLGs as a preliminary evaluation of the extent of groundwater that needs to be addressed in the groundwater extraction system. The Consent Decree and SOW indicate that groundwater cleanup performance standards (GCPS) will be based partly on MCLs and non-zero MCLGs as discussed in the RD/RA Work Plan.

Water table wells G117, G116, G115, and P3R had no reported VOC concentrations above the MCLs or non-zero MCLGs with the exception of vinyl chloride which was detected at wells P3R and G115. Well G116 had no reported VOCs during any of the four sampling rounds. Generally, vinyl chloride concentrations were higher during rounds 1 and 2, and lower during rounds 3 and 4. Groundwater samples collected April 1990 (round 4) from well G115 had a vinyl chloride concentration of 5.00 micrograms per liter (ug/L) and from piezometer P3R had a vinyl chloride concentration of 2.00 ug/L. The MCL for vinyl chloride is 2 ug/L.

Wells and piezometers screened at deeper intervals (P1, P4R, MW106, and G116A) had few compounds with concentrations above the MCLs and MCLGs. A groundwater sample collected from piezometer P1 contained trichloroethene at a concentration of 5.20 ug/L during round 1 and 6.70 ug/L during round 2. Trichloroethene was not detected during round 3 sampling, and the reported concentration for round 4 was 1 ug/L. The MCL for trichloroethene is 5 ug/L. Vinyl chloride was detected during round 4 at piezometer P1 with a concentration of 6.00 ug/L, exceeding the MCL (2 ug/L).

Groundwater collected from piezometer P4R had reported concentrations above the MCLs for tetrachloroethene during each round of sampling (8.70 ug/L. 7.40 ug/L, 7.00 ug/L, and 7.00 ug/L). The MCL for tetrachloroethene is 5 ug/L.

Groundwater collected from well MW106 during rounds 1 and 2 had two compounds with concentrations above the MCLs in both rounds; vinyl chloride (5.20 ug/L and 3.10 ug/L) and trichloroethene (5.20 ug/L and 6.70 ug/L). The MCL for vinyl chloride is 2 ug/L and for trichloroethene is 5 ug/L.

Based on these results, placement of additional wells in the northwest corner of the property at this time seems unnecessary. Based on a comparison of measured concentrations with MCLs and non-zero MCLGs, the plume is well defined along the northwest corner and west of the site. The groundwater extraction system will be designed to contain VOCs passing beneath the landfill base and to remediate VOCs which remain in the groundwater above GCPS in areas off-site.

The groundwater sampling round which resulted in the most VOC detections was round 2 (June 1988). Figure 4 shows the locations of two cross sections which show chlorinated ethenes detected during round 2. These cross sections, Figures 5 and 6 display the chlorinated ethene concentration over two areas of the site along with the approximate depth of each well screen. Figure 6 (Cross Section D-D') indicates that the chlorinated ethene concentrations along the south boundary of the landfill were relatively high at that time. Figure 7 presents a plan view of the entire site with chlorinated ethene concentrations reported for the second round of groundwater sampling. The following paragraph presents a discussion of round 2 results.

Monitoring wells B13 and P6 are located approximately 1000 ft east of well G115. While these wells are not part of the southwest corner area, they provide the closest geographic sampling point for analytical information at intermediate depths. B13 is screened at a depth of 35.6 ft (below ground surface) and P6 at 52.5 ft. Monitoring well B13 had a Round 2 reported chlorinated ethenes concentration of 268.1 ug/L. Piezometer P6 had a reported concentration of 160 ug/L. Well B13 is screened from 703.86 to 708.86 feet above mean sea level (MSL), and Piezometer P6 is screened between 689.69 and 694.69 feet MSL. Based on these results contaminants are present at depth in this area. Currently subsurface conditions at depth to the southwest of this area have not been investigated. The shape of the contaminant plume in the southwest area of the site was not defined by results obtained during the four rounds of groundwater sampling. It appeared that shallow groundwater (at depths from ground surface to approximately 30 ft) contained low levels or no contamination while at depth concentrations increased. Placement of a limited number of new wells (see

Section 2.5) will aid in defining contaminant transport in the southwest corner of the site.

[chi 609 86]

2

RD PLANNING DOCUMENTS

Planning documents required for the conduct of the Groundwater RD are identified and discussed below.

2.1 SITE ACCESS AND PERMITTING PLAN

The Site Access and Permitting Plan (SAPP) for the WRL Site is included in the RD/RA Work Plan. No additional permits for the Groundwater RD/RA are anticipated at this time.

2.2 QUALITY ASSURANCE PROJECT PLAN

The Quality Assurance Project Plan (QAPjP) for the WRL Site has been prepared as a single RD/RA QAPjP. No changes or additions to the sampling methods described in the RD/RA QAPjP will be required for the Groundwater RD.

2.3 SAMPLING PLAN

The sampling plan (SP) for field activities to be conducted as part of the Groundwater RD is presented in Appendix A.

2.4 HEALTH AND SAFETY PLAN

The Health and Safety Plan (HASP) for the WRL Site has been prepared as a single RD/RA HASP. No changes or additions to the health and safety procedures described in the RD/RA HASP will be required for the Groundwater RD.

2.5 PREDESIGN STUDIES PLAN

Groundwater studies will be conducted as an aid in designing the groundwater extraction and treatment system. The objectives of the groundwater studies are to:

- Determine the extent of VOCs which are potentially in the groundwater along the west boundary of the WRL Site
- Define the vertical and horizontal extent of the contaminant plume west of the WRL Site
- Provide information which will optimize the extraction system to remediate groundwater which contains contaminant concentrations above regulatory limits on both sides of Killbuck Creek

The purpose of the predesign studies plan is to present detailed descriptions of the testing and field activities associated with these studies. Field efforts will be divided into three phases:

- Groundwater sampling of existing wells (Phase I)
- Placement and sampling of new wells (Phase II)
- Definition of aquifer characteristics via a pumping test (Phase III)

A preliminary evaluation of contaminant concentrations for chemicals of potential concern in a combined groundwater extraction system was performed as a part of the Feasibility Study (FS). Table 9 presents a summary of the data presented in the FS and includes concentrations of additional inorganics and indicators. Table 9 also includes preliminary effluent objectives, which were used to aid in re-evaluating treatment options and the potential need for groundwater treatability studies. MCLs were used as preliminary effluent objectives for organics and Illinois General Water Quality Criteria were used as preliminary effluent objectives for inorganics. Constituents listed in Table 9 were identified based on criteria in 35 IAC 811.319(a)(2) and criteria in the Safe Drinking Water Act

Maximum Contaminant Levels (MCL) and non-zero Maximum Contaminant Level Goals (MCLG). The actual effluent requirements will be established as a part of the NPDES permitting process for discharge of treated groundwater. Vinyl chloride is the only organic compound which is expected to be found in a concentration exceeding preliminary effluent objectives. Iron and zinc are the only inorganics which are expected to be found in concentrations exceeding General Water Quality Criteria.

Based on the low contaminant levels and proven ability of the proposed treatment methods (air stripping, carbon adsorption, or other potentially viable treatment methods) to remove desired compounds, treatability studies will not be necessary to design the groundwater treatment system. Data collected as a part of the predesign studies presented in Sections 2.5.1, 2.5.2, and 2.5.3 will be used to further evaluate treatment options.

2.5.1 Groundwater Sampling of Existing Wells

The last round of groundwater sampling conducted in the southwest portion of the Site was in April, 1990. At that time not all of the existing wells in the area were sampled. Review of existing analytical data (see Section 1.2) suggests contaminant concentrations decreased in some cases during the four rounds of RI sampling. It is important that the groundwater extraction/treatment system be designed based on current data. Because three years have passed since the last sampling event, the need exists to update the older analytical results and to expand the list of wells to be sampled to include those now present along the southwest, west and northwest areas of the property and new wells which will be installed as part of this Groundwater RD Work Plan (new wells are discussed in Section 2.5.2).

Groundwater quality and movement at the WRL Site will be evaluated to assess the present conditions prior to installing additional monitoring wells. Groundwater movement and quality at the WRL Site will be determined by taking water level measurements in all monitoring wells in the vicinity of the landfill and collecting samples for analysis from many of the existing wells southwest, west, and northwest of the landfill. Water levels in Killbuck Creek will be included in the measurements by means of existing staff gauges. The following wells and piezometers (a total of 19) will be sampled during this effort:

B10	B15R	G116A	MW106
B10A	BG118A	G117	P1
B14	G107	G118R	P3R
B14A	G115	G119	P4R
B15P	G116	G119A	

Groundwater samples will be analyzed for target compound VOCs, Bis(2-ethylhexyl) phthalate, and for selected inorganic target analyte list (TAL) for metals and indicator compounds (Table 10). The groundwater analytical parameters was selected by reviewing groundwater analytical results between 1988 and 1990, and a listing of chemicals of potential concern in the baseline risk assessment (Remedial Investigation, Warzyn 1991). Results obtained from these analyses will be used to confirm the locations of the two proposed well nests (Section 2.5.2) along the western boundary of the site in the vicinity of Killbuck Creek. This data will also be used to evaluate the potential for migration of contaminants below Killbuck Creek. Analytical data will also be used to aid in design of a treatment system for extracted groundwater. Data will also be used to further determine the extent of contamination and implement remedial action as required by 35 IAC 811.319(b)(3).

2.5.2 Placement of New Wells

Groundwater analytical data presented in the Interim Groundwater and Quality Evaluation and in the RI indicated a small quantity of landfill leachate impacted groundwater may have passed beneath Killbuck Creek. Although the contaminants detected in groundwater (Tables 1 through 8) were at low levels and generally below listed MCLs and MCLGs, additional investigation is required to confirm contaminant levels and evaluate potential migration of contaminants west of Killbuck Creek.

Two well nests, each consisting of one water table and one deep well, will be constructed to further evaluate extent of groundwater contamination west of the landfill and provide input into design of the groundwater extraction and treatment system. Appendix A presents drilling procedures. The two well nests, G130/G130A and G131/G131A, west and south of well G115, respectively, are intended to determine the vertical and horizontal extent of the groundwater contaminants present between the site and Killbuck Creek (Figure 3). Data collected from these locations will better define the direction of groundwater flow in the southwest corner, both horizontally and vertically. Groundwater will be sampled during the drilling of wells G130A and G131A. Appendix A presents procedures used when sampling while drilling. If, based on screening laboratory analytical results, contaminants are reported in the groundwater at the surface of bedrock, wells G130A and G131A will be extended and screened in bedrock. If concentrations of contaminants are significant in the unconsolidated materials, a third well may be added to the well nests (G130B and G131B) to better monitor the effectiveness of the remedial system at depth within the unconsolidated sediments as well as in bedrock.

The preliminary well locations are proposed based on data collected during the RI. These locations may be revised based on the results of the groundwater

sampling of existing wells. In the areas west and south of well G115, elevations of the bedrock surface are not known. It is believed, based on data collected during the RI, that the dolomite bedrock drops off sharply under the landfill and trends north-south to form a sediment-filled valley. It is therefore not known if the deeper wells installed during this study will extend into bedrock or be screened in unconsolidated materials. Well screens will be installed based on field observations and laboratory results obtained during drilling activities in order to define the vertical extent of contamination at each location.

Upon completion of the proposed well nests, wells will be developed and sampled. Three to six existing wells in the southwest corner will be sampled concurrently. Groundwater samples will be analyzed as specified in the Sampling Plan (SP) for field activities (Appendix A) and the RD/RA QAPjP.

2.5.3 Aquifer Pumping Test

An aquifer pumping test will be performed to collect information necessary to refine the conceptual design of the groundwater extraction and treatment system which was presented in the FS. The test will consist of installing and pumping an extraction well while monitoring water level drawdown in adjacent monitoring wells. Data collected during the test will be analyzed to determine aquifer characteristics (hydraulic conductivity, storage coefficient, transmissivity) necessary to optimize the extraction system design.

Prior to the test, field investigation activities described in Section 2.5.1 and 2.5.2 will be performed to confirm the extent of the groundwater contamination which must be remediated. The groundwater extraction system layout will be established based on the results of the field investigation and the system design will be presented in the Preliminary Design submission to the U.S. EPA (30% complete Remedial Design). Upon receipt of U.S. EPA comments on the Preliminary Design, one of the extraction wells in the system will be installed and the pumping test will be conducted. This extraction well will be located so that it can be incorporated into the groundwater extraction system during RA construction.

Conceptual Model - Based on data collected during the RI, unconsolidated sand and gravel is present from ground surface to depths ranging from 15 feet below ground surface near the eastern edge of the landfill to over 60 feet below ground surface along the western border of the landfill (See Figures 5 and 6). The sand and gravel is underlain by fractured dolomite.

Groundwater generally flows from east to west beneath the site. Depth to groundwater varies from one to two feet near Killbuck Creek to approximately fifteen feet at the western border of the landfill. The water table occurs within the

dolomite aquifer beneath the eastern portion of the landfill and is within the sand and gravel beneath the western portion of the landfill. The saturated thickness of the sand and gravel deposits exceeds 45 feet at the western border of the landfill. The sand and gravel deposits are hydraulically connected to the dolomite aquifer.

Potential hydrogeologic boundaries that could influence a pumping test include Killbuck Creek and the dolomite aquifer. Killbuck Creek is located approximately 300 to 1,000 feet west of the landfill and is probably a hydraulic boundary to shallow groundwater flow. However, based on the RI data, deeper groundwater flow may pass beneath the creek.

Groundwater contaminants are present primarily in the sand and gravel deposits along the western border of the landfill in the area of the proposed groundwater extraction system. Therefore, it is expected that the extraction wells will be screened primarily in the sand and gravel.

In order to design and conduct a pumping test and evaluate the resulting data, certain assumptions about the aquifer system must be made. In most cases, not all of the assumptions are met in reality. The assumptions used to design this pumping test and any departures from those assumptions are discussed below. The assumptions are:

- The aquifer is unconfined
- The aquifer is infinite in areal extent
- The aquifer is homogeneous and of uniform thickness over the area influenced by the test
- The pumping well fully penetrates the unconsolidated aquifer
- The aquifer will be pumped a a constant rate

In fact, the unconsolidated aquifer pinches out against the dolomite bedrock to the east and the dolomite may act as a boundary in this direction (See Figures 5 and 6). Therefore the unconsolidated aquifer is not infinite in extent and the saturated thickness is not uniform. However it is expected that the cone of depression will not extend to this boundary during the pumping test.

Test Procedures - One extraction well will be installed for the test. This well will be constructed so that it can be used as part of the final groundwater extraction remedy. The well will likely be installed in the northwestern corner of the Site so that existing monitoring wells can be used for water level

measurements during the test. The actual location and screened interval will be chosen after the horizontal and vertical extent of groundwater contamination has been defined.

The extraction well will be constructed of 6-inch diameter stainless steel well screen and steel riser and will be screened from approximately 25 to 75 feet (estimated base of unconsolidated material) below ground surface (fully penetrating the unconsolidated deposits). The extraction well will be developed by on-and-off pumping, or surging until drilling mud and fine sediments are removed. If the pre-design investigation indicates that bedrock is contaminated, the well screen will be extended into the bedrock.

In advance of the pumping test, a step-drawdown test will be performed. The step-drawdown test will consist of three successive periods of pumping. The pumping rate will be increased for each period, and will be approximately one-third, two-thirds, and equal to that of the constant rate pumping test.

During the pumping test, water levels will be measured at existing monitoring wells P1, MW106, P3R, P4R, G116, G116A, and G117. In addition, depending on the chosen location for the extraction well, one additional water level piezometer may need to be installed. If an additional well is necessary it will be constructed of Schedule 40 PVC and will be screened at the midpoint of the extraction well screen. Water levels will be measured using pressure transducers and a digital recording device.

The extraction well will be equipped with a submersible pump and, based on preliminary analysis, the well pumped for approximately 24 hours at a pumping rate of approximately 25 to 35 gallons per minute (gpm). Drawdown data will be evaluated in the field before termination of the test to determine whether an extended period of pumping will be necessary. Because of the high permeability of the sand and gravel aquifer, it is anticipated that a 24 hr period will be adequate to generate a sufficient drawdown and radius of influence. It is expected that approximately 36,000 to 50,400 gallons of water will be extracted during the pump test. Water extracted during the pump test will be discharged into the leachate treatment system, because NPDES permitting will not be completed prior to the test.

Groundwater quality samples will be collected from the extraction well during the test and will be analyzed for VOCs, metals, and indicator parameters to assess treatment system requirements. It is anticipated that approximately 8 samples will be analyzed.

After the end of the scheduled pumping test, recovery measurements will be made in wells P1, MW106, P3R, P4R, G116, G116A, and G117. The test will be considered complete when water levels have recovered to pre-test conditions.

Pumping Test Analysis Methods - Data collected during the pumping test will be analyzed to estimate aquifer transmissivity and storativity. These parameters will be used to predict the groundwater capture zone that can be achieved using the complete extraction well system. Groundwater modeling may be conducted, using these aquifer characteristics as input, to optimize extraction well locations and pumping rates.

[chi 609 86]

3

REMEDIAL DESIGN

Design plans and specifications will be prepared for the Groundwater RD in accordance with Section 5 of the RD/RA Work Plan. Design plans and specifications will be developed and submitted for U.S. EPA review and approval as requested by the U.S. EPA. It is anticipated that the Groundwater RD will be submitted in three phases: preliminary design, pre-final design, and final design. The design submittal requirements following preliminary design will be determined by the U.S. EPA based upon previous submittals. The U.S. EPA will determine during design the groundwater treatment process that will be used based on the effectiveness of the groundwater treatment process in removing contaminants of concern from the extracted groundwater and on other appropriate factors such as the costs of construction, operation, and maintenance. The general level of effort required for the design phases is described in Sections 5.1 through 5.4 of the RD/RA Work Plan. This section contains a summary of specific components required for the groundwater extraction and treatment system design.

The design submittals to the U.S. EPA for the groundwater extraction and treatment system will include, as appropriate for the design phase:

- Results of predesign studies described in Section 2
- Locations, depths, and sizing of extraction wells
- Sizing and configuration of treatment system components
- Location, type, and sizing for groundwater conveyance piping
- Monitoring system to determine effectiveness of the extraction system

The design phase submissions will contain details appropriate to the level of completion for that design phase. The design submittals for the groundwater extraction and treatment system design will include the components identified for the preliminary design, intermediate design (if required), pre-final design (if required), and final design, based upon U.S. EPA requirements and the RD/RA Work Plan.

[chi 609 86]

4

REPORTS AND SUBMISSIONS

Reports and submissions for the groundwater extraction and treatment system design will be consistent with Section 7 of the RD/RA Work Plan.

The results of groundwater sampling and monitoring well installation predesign studies will be included in the preliminary design submittal. The groundwater pump test will be conducted following U.S. EPA comment on the preliminary design submittal, so that U.S. EPA comments regarding specifics of the pump test can be addressed prior to installation of the extraction well and operation of the test. Results of the pump test will be included in the pre-final design.

[chi 609 86]

5

SCHEDULE

Figure 8 depicts the schedule for the groundwater extraction and treatment system. This schedule is consistent with the schedule submitted in the RD/RA Work Plan, and provides detail specific to the Groundwater RD. The schedule assumes a 45 calendar day U.S. EPA review time for all submittals. Review periods greater than 45 calender days will change the dates associated with following activities, and will not be counted against WRS for purposes of stipulated penalties. The schedule assumes the U.S. EPA will require preliminary, pre-final, and final design submittals, and is based on Warzyn's experience with design of similar projects. Changes in the design submissions requirements will alter the schedule consistent with the provisions of the RD/RA Work Plan.

[chi 609 86]

6

PROJECT ORGANIZATION AND RESPONSIBILITY

Figure 9 presents the proposed project team and structure for the Groundwater RD. The team includes qualified technical management, engineering design, treatability studies, field investigation, and support staff with significant experience with groundwater extraction and treatment systems for this project. Team personnel have direct experience with previous investigations and engineering evaluations associated with the WRL Site, have existing relationships with regulatory officials assigned to the project, have experience in Illinois landfill regulatory compliance, and have recent applicable experience and technical expertise with other RD/RA projects under CERCLA. Key project personnel and responsibilities, and qualifications include:

Project Coordinator: Gary Marzorati, or his designate, will serve as the Project Coordinator for Winnebago Reclamation Services, Inc. (WRS) for the Groundwater RD. He will be the focal point for communications, both oral and written, with the U.S. EPA/IEPA. He will be responsible for the overall RD/RA schedule, as approved by the U.S. EPA, and compliance with stated provisions of the Consent Order and Statement of Work.

Project Manager: Alan J. Schmidt, CPG, project manager, is responsible for the successful completion of all project elements, including the technical quality, cost and schedule. He is the focus for communications with WRS. He will keep close contact with the U.S. EPA Region V RPM and as appropriate with IEPA to maintain compliance

with the provisions of the Consent Decree and SOW, transfer of required information and project status, timely approval of plans and reports, and aggressive identification and resolution of issues potentially impacting project progress.

Mr. Schmidt, with 12 years experience in environmental program areas, has extensive experience in project management and conduct of Superfund projects. He has served as the project manager on major site characterization/remedial design/remedial action projects.

Predesign Studies:

Mr. Schmidt, will also be responsible for the successful design and execution of the predesign studies including site sampling, coordination of sample analysis, data evaluation and interpretation, including modeling, if required. He will design data collection activities with the other project leaders so that appropriate data is gathered to satisfy project objectives. Mr. Schmidt will be responsible for documenting the data collected in the predesign studies.

Mr. Schmidt is a senior hydrogeologist and has been the principal investigator for hydrogeolic investigations at more than 20 sites under both state and federal programs. He is also experienced in work plan development and will contribute to its preparation.

Remedial Design:

Mr. Ed Cote P.E., senior treatment system design engineer, will be responsible for the design of the groundwater extraction and treatment system. At the request of WRS he can provide review and/or oversight of the design of the other elements of the selected remedy. He will work closely with Mr. Schmidt regarding attainment of treatment levels compliant with U.S. EPA and IEPA requirements, and regarding required system flow rates and capacities.

Mr. Cote has more than 8 years experience in the design and installation of groundwater recovery systems.

QA/QC-Technical Advisors: Dan Hall, Director, will be responsible for overall quality assurance/quality control (QA/QC) of the project. Part of the QA/QC function is the technical review of documents. Mr. Hall may call upon the following listed individuals, as required, to assist in the review of specific project elements or deliverable products. If not providing independent technical peer review, these individuals are also available to serve as technical advisors to the project team to address special issues related to their area of expertise. Identified individuals include: Ken Quinn, Senior Hydrogeologist; Jan Kucher, Landfill Gas Expert; John Belken, Senior Solid Waste Design Engineer; and Mark Rothas, Senior Chemical Engineer.

SCI/njt/GEP
[chi 609 86]
10009711

TABLES

TABLE 1

Analytical Results for Well MW 106
Groundwater Sampling Rounds 1 - 4

Chemical	Sample Collected 4/88 Round 1 (ug/L)	Sample Collected 6/88 Round 2 (ug/L)	Sample Collected 2/90 Round 3 (ug/L)	Sample Collected 4/90 Round 4 (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level - Goal (MCLG) (ug/L)
Benzene	2.60	ND	Not	Not	5	
Chlorobenzene	ND	0.79	Sampled	Sampled	100	100
Chloroethane	ND	5.40				
1,2-Dichlorobenzene	0.48	0.55			600	600
1,4-Dichlorobenzene	7.30	7.10			75	75
1,1-Dichloroethane	2.40	6.00				
1,2-Dichloroethane	ND	0.48			5	
Cis-1,2-Dichloroethene	8.50	10.00			70	70
Trans-1,2-Dichloroethene	ND	0.63			100	100
1,2-Dichloropropane	2.10	3.00			5	
Trichloroethene	5.20	6.70			5	
Toluene	ND	0.60			1,000	1,000
1,1,1-Trichloroethane	0.65	3.10			200	200
1,1,2-Trichloroethane	ND	2.30			5	
Vinyl Chloride	5.20	3.10			2	

General Notes:

ND = Not Detected
NA = Not Analyzed
MCLs and non-zero MCLGs (40 CFR 141) in effect as of 11/92
Well MW 106 screened between 664.39 and 674.39 feet above mean sea level.

[CHI 609 86a]
SCI/mjt/CAW

TABLE 2

Analytical Results for Piezometer P1
Groundwater Sampling Rounds 1 - 4

Chemical	Sample Collected 4/88 Round 1 (ug/L)	Sample Collected 6/88 Round 2 (ug/L)	Sample Collected 2/90 Round 3 (ug/L)	Sample Collected 4/90 Round 4 (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level - Goal (MCLG) (ug/L)
Benzene	2.08	2.30	0.80	ND	5	
Chlorobenzene	1.30	0.60	ND	ND	100	100
Chloroethane	ND	5.40	1.00	ND		
1,2-Dichlorobenzene	1.00	0.55	ND	ND	600	600
1,4-Dichlorobenzene	5.20	7.10	ND	ND	75	75
1,1-Dichloroethane	6.90	6.00	10.00	ND		
1,2-Dichloroethane	0.53	0.48	ND	10.00	5	
Cis-1,2-Dichloroethene	5.60	10.00	NA	NA	70	70
Trans-1,2-Dichloroethene	ND	0.63	NA	NA	100	100
Total 1,2-Dichloroethene	5.60	10.63	4.00	3.00		
1,2-Dichloropropane	3.10	3.00	ND	ND	5	
Ethylbenzene	ND	0.79	ND	ND	700	700
Tetrachloroethene	ND	ND	1.00	ND	5	
Trichloroethene	0.44	6.70	ND	1	5	
1,1,1-Trichloroethane	ND	3.10	ND	ND	200	200
Vinyl Chloride	6.00	3.10	2.00	6.00	2	

General Notes:

ND = Not Detected
NA = Not Analyzed
MCLs and non-zero MCLGs (40 CFR 141) in effect as of 11/92
Piezometer P1 screened between 689.69 and 694.69 feet above mean sea level.

[CH1 609 86a]
SCI/ajt/CAW

TABLE 3

Analytical Results for Well G116
Groundwater Sampling Rounds 1 - 4

Chemical	Sample Collected 4/88 Round 1 (ug/L)	Sample Collected 6/88 Round 2 (ug/L)	Sample Collected 2/90 Round 3 (ug/L)	Sample Collected 4/90 Round 4 (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level - Goal (MCLG) (ug/L)

No Volatile Organic Compounds were detected at Well MW 116 in any of the four rounds of sampling.

NOTES:
1. MCLs and non-zero MCLGs (40 CR 141) in effect as of 11/92
2. Well MW 116 screened between 697.96 and 707.96 feet above mean sea level.

[CHI 609 86a]
SCI/up/CAW

TABLE 4

Analytical Results for Well G116A
Groundwater Sampling Rounds 1 - 4

Chemical	Sample Collected 4/88 Round 1 (ug/L)	Sample Collected 6/88 Round 2 (ug/L)	Sample Collected 2/90 Round 3 (ug/L)	Sample Collected 4/90 Round 4 (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level - Goal (MCLG) (ug/L)
Chloroethane	0.53	ND	ND	ND		
1,1-Dichloroethane	1.90	3.50	3.00	4.00		
Cis-1,2-Dichloroethene	9.84	18.00	NA	NA	70	70
Total 1,2-Dichloroethene	9.84	18.00	8.00	15.00		
Tetrachloroethene	ND	5.40	4.00	5.00	5	
1,1,2,2-Tetrachloroethane	4.52	ND	ND	ND		
Trichloroethene	2.50	4.10	ND	2.00	5	
1,1,1-Trichloroethane	3.71	4.90	2.00	3.00	200	200

General Notes:

ND= Not Detected
NA= Not Analyzed
MCLs and non-zero MCLGs (40 CFR 141) in effect as of 11/92
Well MW G116A screened between 668.45 and 673.46 feet above mean sea level.

[CHI 609 86a]
SCI/mjt/CAW

TABLE 5

Analytical Results for Piezometer P3R
Groundwater Sampling Rounds 1 - 4

Chemical	Sample Collected 4/88 Round 1 (ug/L)	Sample Collected 6/88 Round 2 (ug/L)	Sample Collected 2/90 Round 3 (ug/L)	Sample Collected 4/90 Round 4 (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level - Goal (MCLG) (ug/L)
Benzene	1.46	0.68	0.60	ND	5	
Chloromethane	4.00	ND	ND	ND		
Chloroethane	ND	1.90	ND	2.00		
1,4-Dichlorobenzene	ND	1.40	ND	ND	75	75
1,1-Dichloroethane	10.70	10.00	8.00	8.00		
1,2-Dichloroethane	0.38	0.38	ND	ND	5	
Cis-1,2-Dichloroethene	9.69	8.30	ND	ND	70	70
Trans-1,2-Dichloroethene	ND	0.34	ND	ND	100	100
Total 1,2-Dichloroethene	9.69	8.64	5.00	4.00		
1,2-Dichloropropane	1.19	1.10	ND	ND	5	
Ethylbenzene	ND	0.75	ND	ND	700	700
Trichloroethene	2.55	1.60	ND	1.00	5	
1,1,1-Trichloroethane	ND	0.47	ND	ND	200	200
Vinyl Chloride	4.00	1.90	1.00	2.00	2	

General Notes:

ND= Not Detected
NA= Not Analyzed
MCLs and non-zero MCLGs (40 CFR 141) in effect as of 11/92.
Piezometer P3R screened between 699.18 and 709.18 feet above mean sea level.

[CHI 609 86a]
SCI/mj/CAW

TABLE 6

Analytical Results for Piezometer P4R
Groundwater Sampling Rounds 1 - 4

Chemical	Sample Collected 4/88 Round 1 (ug/L)	Sample Collected 6/88 Round 2 (ug/L)	Sample Collected 2/90 Round 3 (ug/L)	Sample Collected 4/90 Round 4 (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level - Goal (MCLG) (ug/L)
Benzene	1.40	0.83	ND	ND	5	
Chloromethane	4.00	ND	ND	ND		
Chlorobenzene	ND	0.34	ND	ND	100	100
Chloroethane	ND	2.70	ND	ND		
1,4-Dichlorobenzene	1.00	1.40	ND	ND	75	75
1,1-Dichloroethane	6.80	6.70	3.00	3.00		
1,2-Dichloroethane	0.43	0.45	ND	ND	5	
1,1-Dichloroethene	0.33	ND	ND	ND	7	7
Cis-1,2-Dichloroethene	35.00	31.00	NA	NA	70	70
Trans-1,2-Dichloroethene	ND	0.32	NA	NA	100	100
Total 1,2-Dichloroethene	35.00	31.32	20.00	20.00		
1,2-Dichloropropane	0.78	0.47	ND	ND	5	
Ethylbenzene	ND	0.44	ND	ND	700	700
Tetrachloroethene	8.70	7.40	7.00	7.00	5	
Trichloroethene	7.90	7.40	3.00	3.00	5	
1,1,1-Trichloroethane	7.90	6.80	3.00	3.00	200	200
Vinyl Chloride	2.00	0.95	ND	ND	2	

General Notes:

ND= Not Detected
NA= Not Analyzed
MCLs and non-zero MCLGs (40 CFR 141) in effect as of 11/92
Piezometer P4R screened between 679.80 and 684.80 feet above mean sea level.

[CHI 609 86a]
SCI/mj/CAW

TABLE 7

Analytical Results for Well G115
Groundwater Sampling Rounds 1 - 4

Chemical	Sample Collected 4/88 Round 1 (ug/L)	Sample Collected 6/88 Round 2 (ug/L)	Sample Collected 2/90 Round 3 (ug/L)	Sample Collected 4/90 Round 4 (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level - Goal (MCLG) (ug/L)
Benzene	2.80	0.51	2.00	1.00	5	
Carbon Tetrachloride	ND	8.00	ND	ND	5	
Chlorobenzene	ND	ND	1.00	ND	100	100
Chloroethane	19.00	30.00	13.00	15.00		
1,4-Dichlorobenzene	4.50	3.10	ND	ND	75	75
1,1-Dichloroethane	2.75	2.60	24.00	20.00		
1,1-Dichloroethene	ND	0.39	ND	ND	7	7
Cis-1,2-Dichloroethene	5.36	6.60	NA	NA	70	70
Total 1,2-Dichloroethene	5.36	6.60	1.00	3.00		
1,2-Dichloropropane	0.51	0.67	ND	ND	5	
Ethylbenzene	2.13	0.28	ND	ND	700	700
Vinyl Chloride	16.00	16.00	ND	5.00	2	

General Notes:

ND = Not Detected
NA = Not Analyzed
MCLs and non-zero MCLGs (40 CFR 141) in effect as of 11/92.
Well G115 screened between 706.03 and 716.03 feet above mean sea level.

[CHI 609 86a]
SCI/mjt/CAW

TABLE 8

Analytical Results for Well G117
Groundwater Sampling Rounds 1 - 4

Chemical	Sample Collected 4/88 Round 1 (ug/L)	Sample Collected 6/88 Round 2 (ug/L)	Sample Collected 2/90 Round 3 (ug/L)	Sample Collected 4/90 Round 4 (ug/L)	Maximum Contaminant Level (MCL) (ug/L)	Maximum Contaminant Level - Goal (MCLG) (ug/L)
Carbon Tetrachloride	Not Sampled	2.10	Not Sampled	Not Sampled	5	

NOTES:
1. MCLs and no-zero MCLGs (40 CFR 141) in effect as of 11/92
2. Well G117 screened between 697.25 and 707.25 feet above mean sea level.

[CHI 609 86a]
SCI/njt/CAW

Table 9

Summary of Concentrations for Groundwater Treatment System
Winnebago Reclamation Landfill Site
Winnebago County, Illinois

Compound	Average Influent to Treatment (ug/L)	Maximum Influent to Treatment (ug/L)	Preliminary Effluent Objective (ug/L)
Volatile & Semi-Volatile Organic Compounds			
Chloromethane	4.00	4.00	
Vinyl Chloride	4.47	9.85	2
Chloroethane	6.82	16.74	
Methylene Chloride	3.00	3.00	
Acetone	11.00	11.00	
1,1-Dichloroethene	0.34	0.39	7
1,1-Dichloroethane	7.60	10.21	
1,1,1-Trichloroethane	2.76	4.70	200
Carbon Tetrachloride	2.80	8.00	5
Bromodichloromethane	0.24	0.24	100
1,2-Dichloropropane	2.14	3.28	5
Trichloroethene	2.96	4.15	5
Dibromochloromethane	0.24	0.24	100
Benzene	2.13	3.18	5
Tetrachloroethene	3.10	7.53	5
Toluene	0.24	0.24	1,000
Chlorobenzene	0.97	1.36	100
Ethylbenzene	1.18	1.66	700
trans-1,2-Dichloroethene	0.65	0.83	100
cis-1,2-Dichloroethene	12.02	24.60	70
1,2-Dichlorobenzene	2.23	3.00	600
1,4-Dichlorobenzene	6.43	11.02	75
total Xylenes	2.83	2.83	10,000
bis(2-ethylhexyl)phthalate	8.50	11.00	6
Total Organics	88.7	143.1	

TABLE 10

Analytical Parameters
Groundwater RD Work Plan

Volatile Organics

Chloromethane
Bromomethane
Vinyl chloride
Chloroethane
Methylene chloride
Acetone
Carbon disulfide
1,1-Dichloroethene
1,1-Dichloroethane
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
2-Butanone
Bromochloromethane
1,1,1-Trichloroethane
Carbon tetrachloride
Bromodichloromethane
1,2-Dichloropropane
cis-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
trans-1,3-Dichloropropene
Bromoform
1,2-Dibromoethane
4-Methyl-2-pentanone
2-Hexanone
Tetrachloroethene
1,1,2,2-Tetrachloroethane
Toluene
Chlorobenzene
Ethylbenzene
Styrene
Xylenes (total)
1,2-Dibromo-3-chloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene

Semi-Volatile Compounds

Bis(2-ethylexyl) Phthalate

Indicators

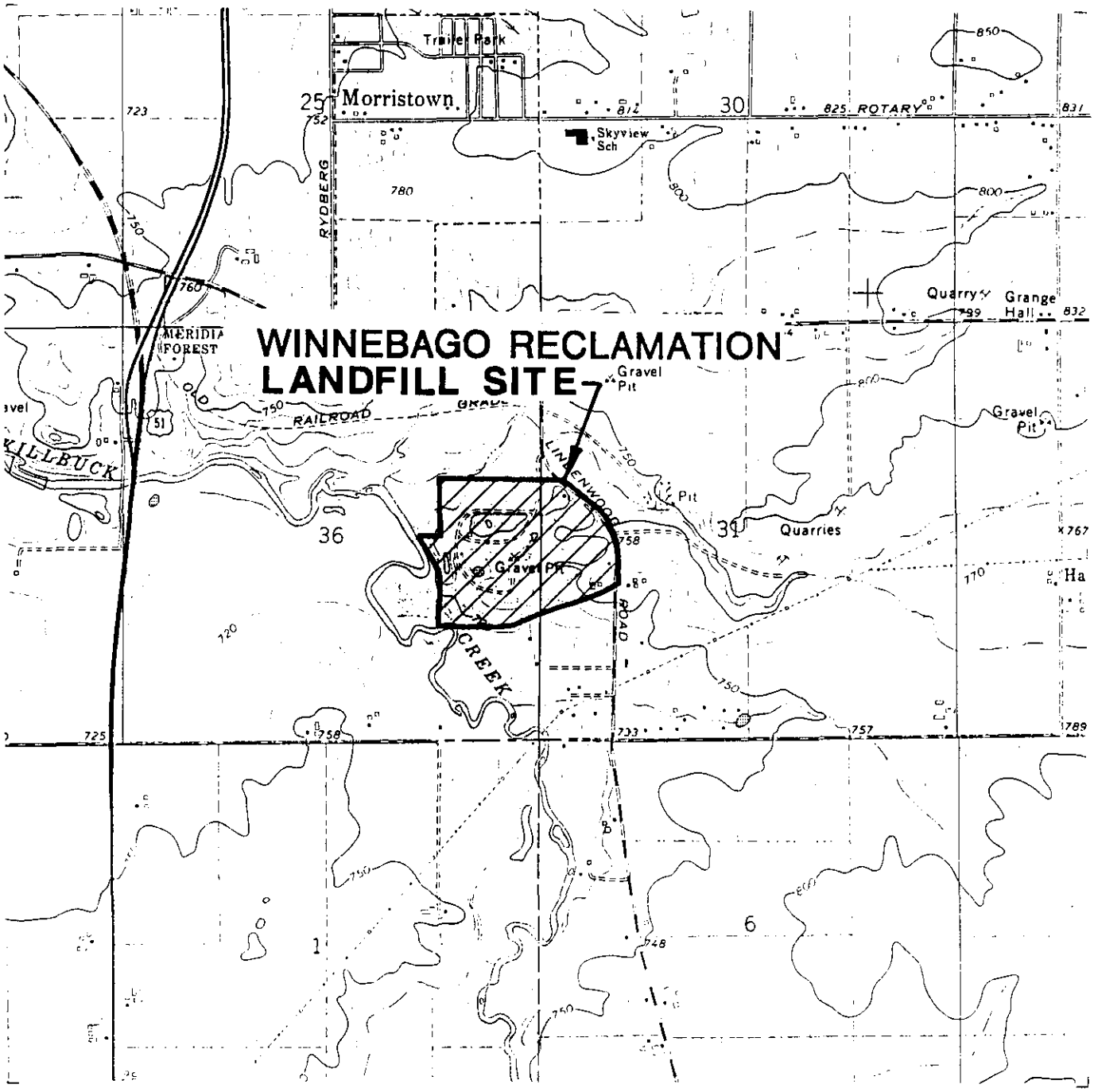
Alkalinity
Chloride
Sulfate
TSS
TDS
Ammonia
BOD
COD
TOC
Nitrate + Nitrite

Metals/Inorganics

Arsenic
Barium
Cadmium
Calcium
Cobalt
Iron
Magnesium
Potassium
Manganese
Nickel
Sodium
Thallium
Zinc
Cyanide

{chi 609 86}
SCI/njt/GEP

FIGURES



NOTES

1. BASE MAP DEVELOPED FROM THE ROCKFORD SOUTH, ILLINOIS 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAP DATED 1971, PHOTOREVISED 1976.

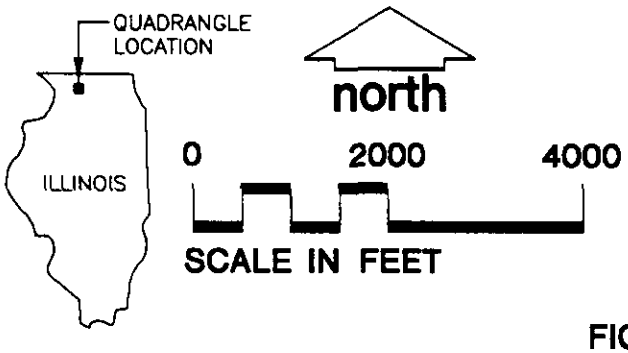


FIGURE 1

Developed By: CWB Drawn By: ELR	SITE LOCATION MAP	Drawing Number 10009721 A2
Approved By: Gary E. Parker Date: 2/10/93	GROUNDWATER EXTRACTION AND TREATMENT SYSTEM RD WORK PLAN WINNEBAGO RECLAMATION LANDFILL SITE WINNEBAGO COUNTY, ILLINOIS	WARZYN
Reference:		
Revisions:		

WARZYN INC.

Management Review
Other
Technical Review
Project Manager
Graphic Standards
Lead Professional
QUALITY CONTROL

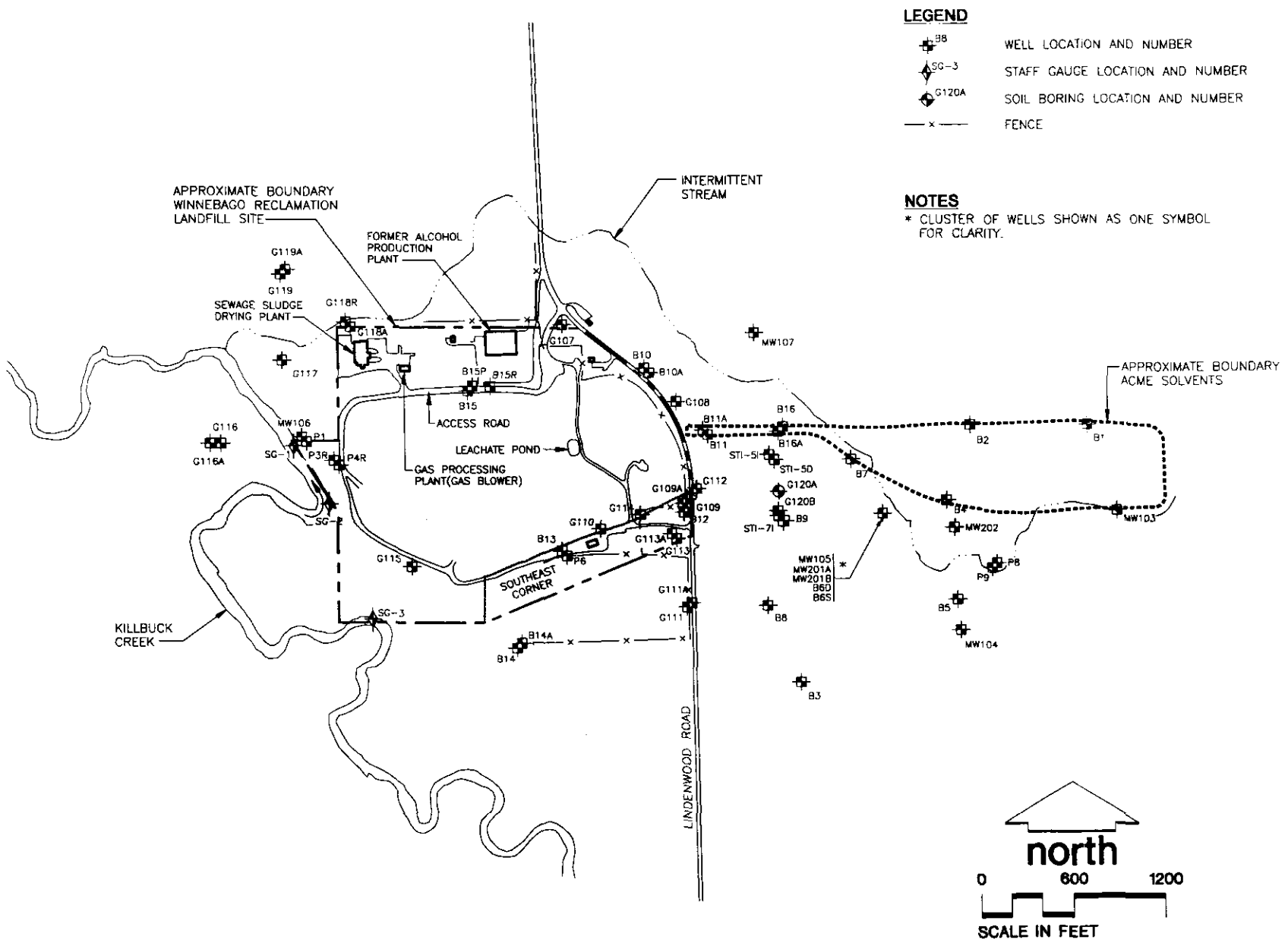


FIGURE 2

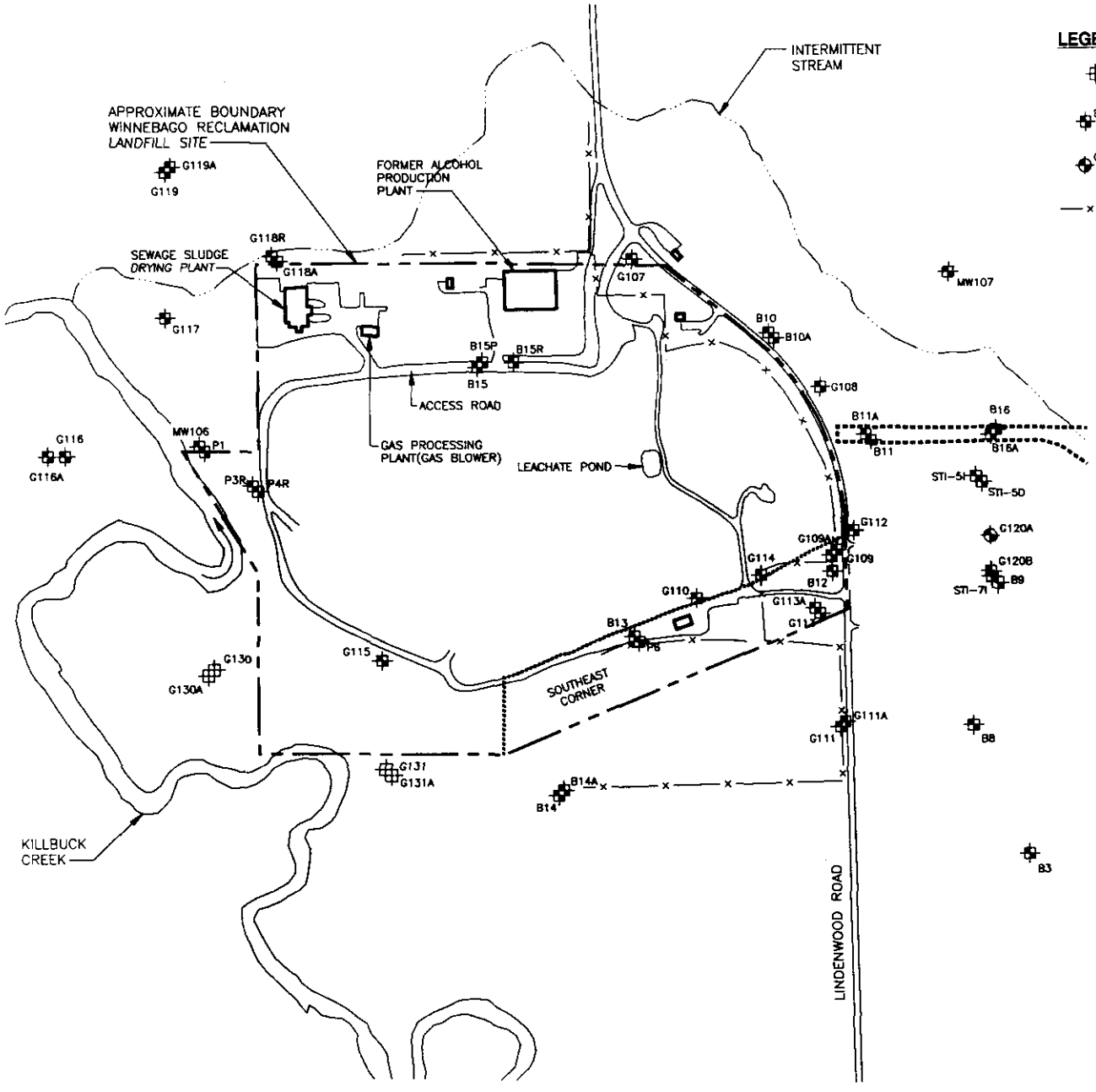
SITE FEATURES MAP

GROUNDWATER EXTRACTION AND TREATMENT SYSTEM RD WORK PLAN
WINNEBAGO RECLAMATION LANDFILL SITE
WINNEBAGO COUNTY, ILLINOIS

Drawing Number 10009721 B2

WARZYN

Developed By: CWH
Drawn By: ELR
Approved By:
Date
Reference
Revisions



Developed By: CWB
Drawn By: ELR
Approved By: Allan Schmidt
Date: 7/8/93
Reference:
Revisions:

MONITORING WELL LOCATION MAP
GROUNDWATER EXTRACTION AND TREATMENT SYSTEM RD WORK PLAN
WINNEBAGO RECLAMATION LANDFILL SITE
WINNEBAGO COUNTY, ILLINOIS

Drawing Number: 10009721 B3

WARZYN

FIGURE 2

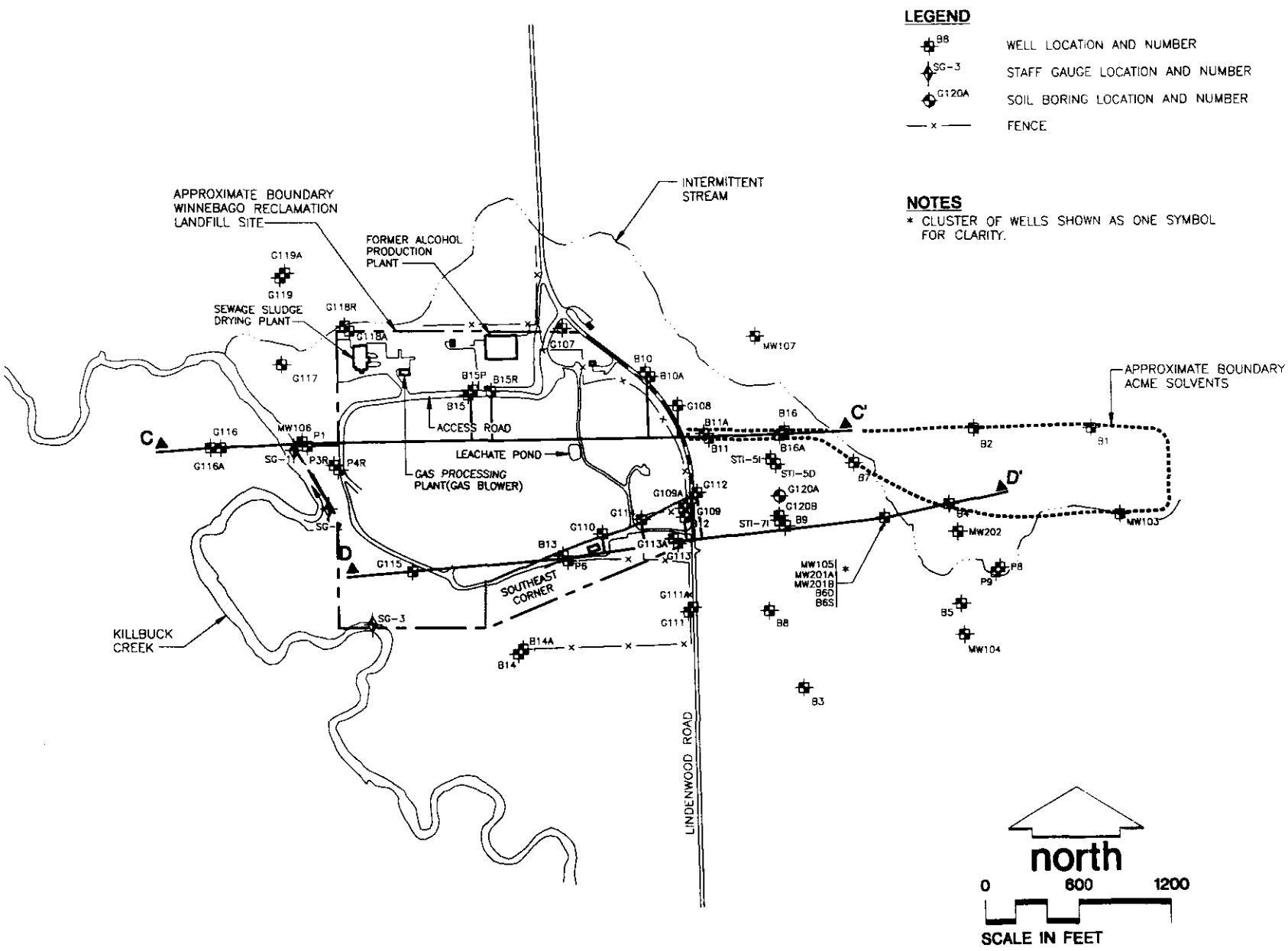


FIGURE 4

CROSS SECTION C - C' & D - D'
LOCATION MAP

GROUNDWATER EXTRACTION AND TREATMENT
SYSTEM RD WORK PLAN
WINNEBAGO RECLAMATION LANDFILL SITE
WINNEBAGO COUNTY, ILLINOIS

Developed By: CWB
Drawn By: ELR
Approved By:
Date:
Reference:
Revisions

Drawing Number
10009721 B5

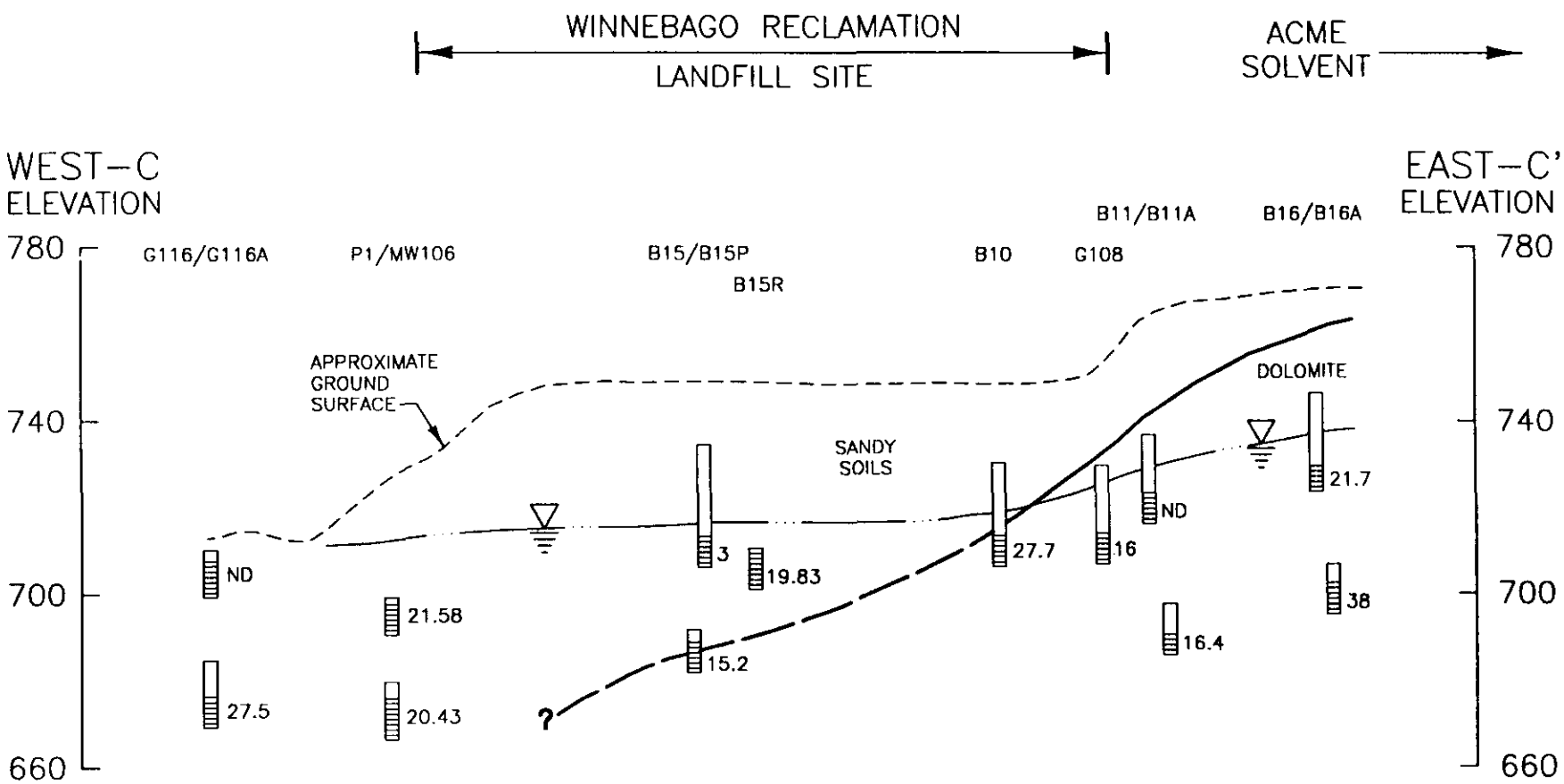
WARZYN

Graphic Standards
Lead Professional
Technical Review
Project Manager GEP
Management Review
Editor

WARZYN INC.

QUALITY CONTROL	Graphic Standards	Technical Review	Management Review
	Lead Professional	Project Manager	Other

WARZYN INC.



NOTES

1. SEE FIGURE 4 FOR CROSS SECTION LOCATION.

LEGEND

21.58 — LOCATION OF WELL SCREEN AND TOTAL CONCENTRATION OF CHLORINATED ETHENES(ug/L)

WATER TABLE SURFACE

0 600 1200

SCALE IN FEET

Developed By: SCI

Drawn By: ELR

Approved By: Ryan G. Parker

Date: 2/10/93

Reference:

Revisions:

ROUND 2 TOTAL ETHENES (ug/L)

GROUNDWATER EXTRACTION AND TREATMENT SYSTEM RD WORK PLAN
WINNEBAGO RECLAMATION LANDFILL SITE
WINNEBAGO COUNTY, ILLINOIS

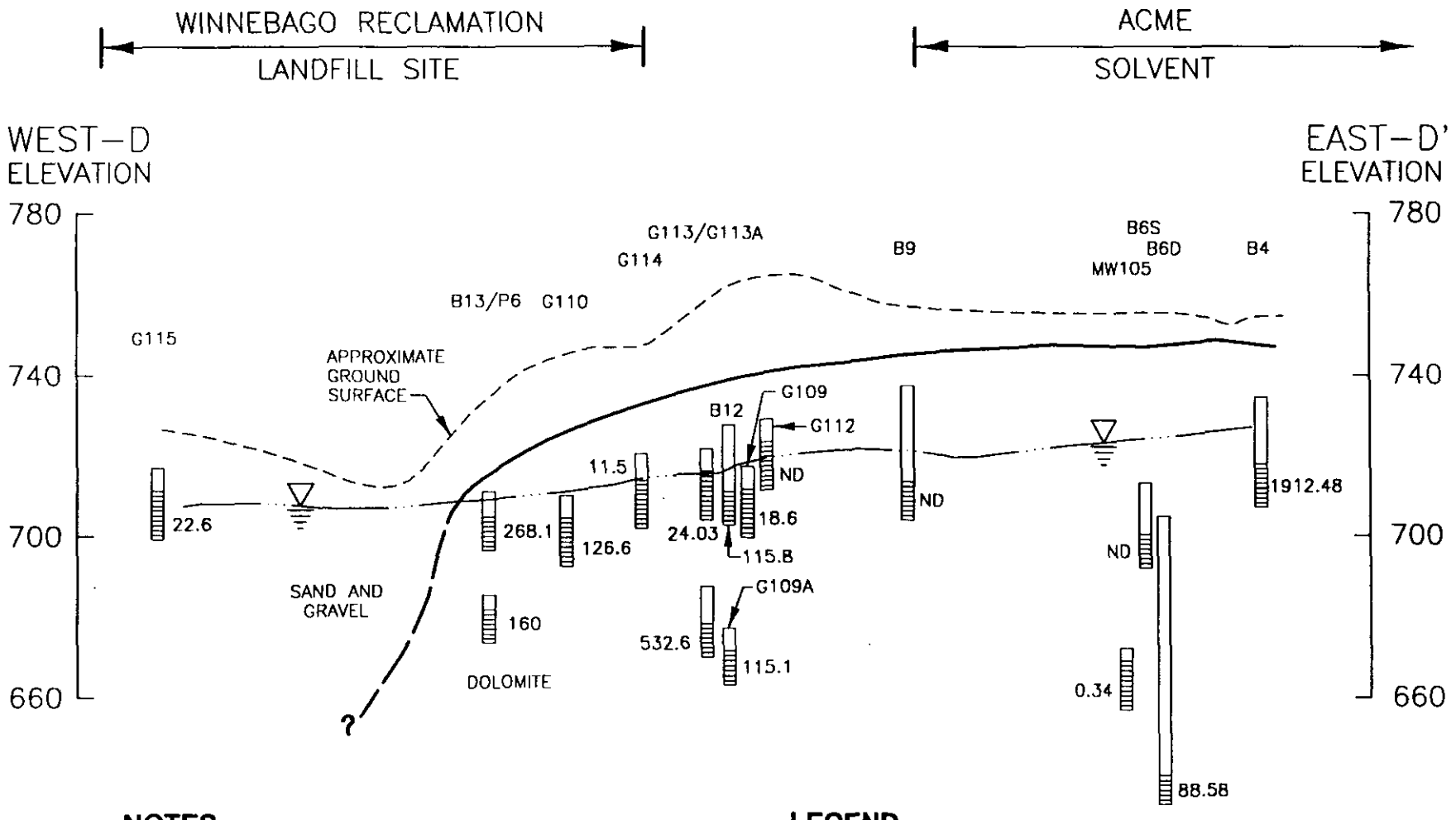
WARZYN

Drawing Number 10009721 A5

FIGURE 5

QUALITY CONTROL	Graphic Standards	Technical Review	Management Review
	Lead Professional	Project Manager	Other

WARZYN INC.



NOTES

1. SEE FIGURE 4 FOR CROSS SECTION LOCATION.

LEGEND

21.58 — LOCATION OF WELL SCREEN AND TOTAL CONCENTRATION OF CHLORINATED ETHENES(ug/L)

WATER TABLE SURFACE

0 600 1200

SCALE IN FEET

Developed By: SCI
Drawn By: ELR
Approved By: [signature]
Date: 2/15/93
Reference:
Revisions:

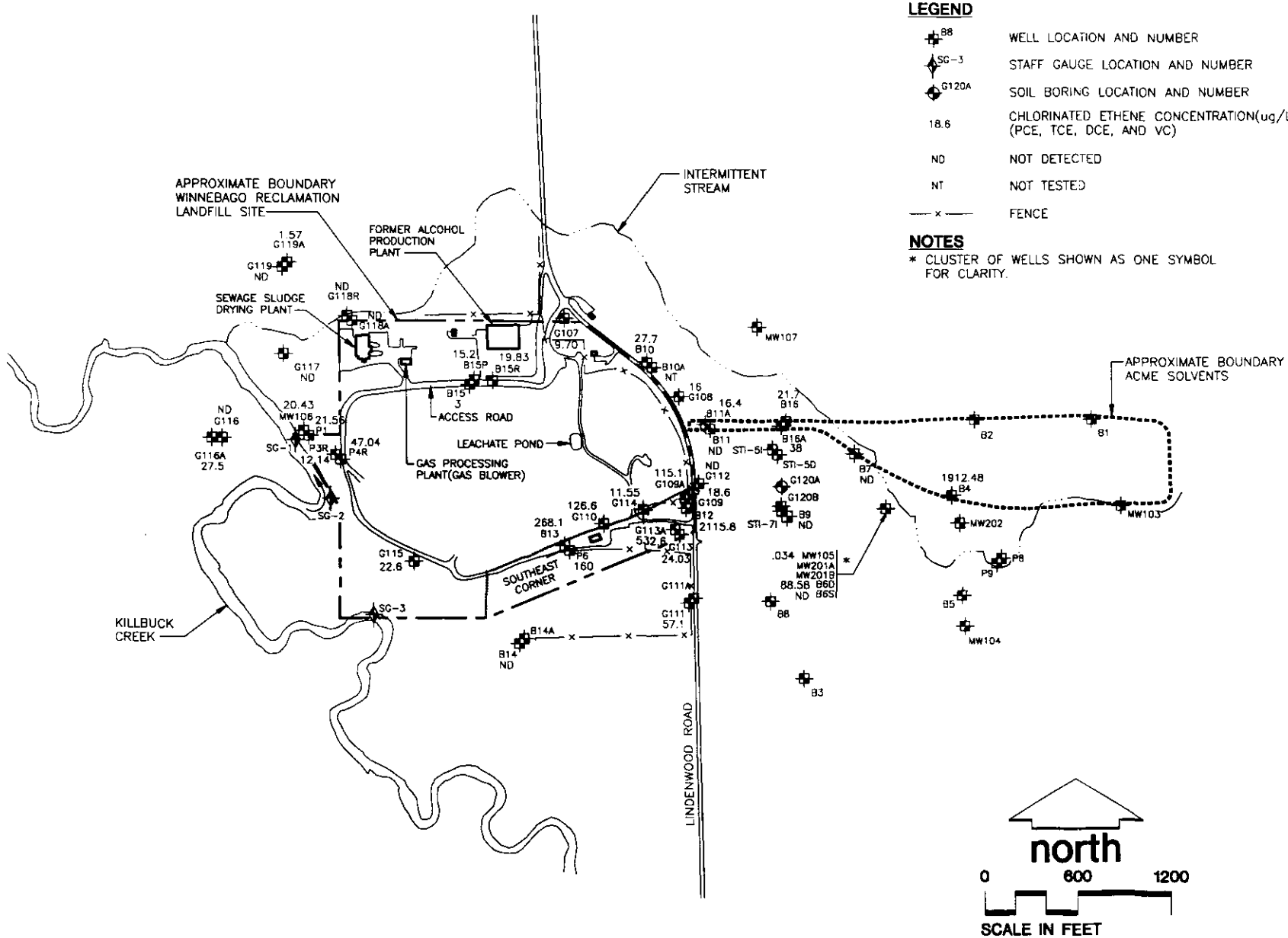
ROUND 2 TOTAL ETHENES (ug/L)

GROUNDWATER EXTRACTION AND TREATMENT SYSTEM RD WORK PLAN
WINNEBAGO RECLAMATION LANDFILL SITE
WINNEBAGO COUNTY, ILLINOIS

WARZYN

Drawing Number 10009721 A6

FIGURE 6



Developed By: CWB
Drawn By: ELR
Approved By: Gary E. Vanden
Date: 2/10/93
Reference:
Revisions:

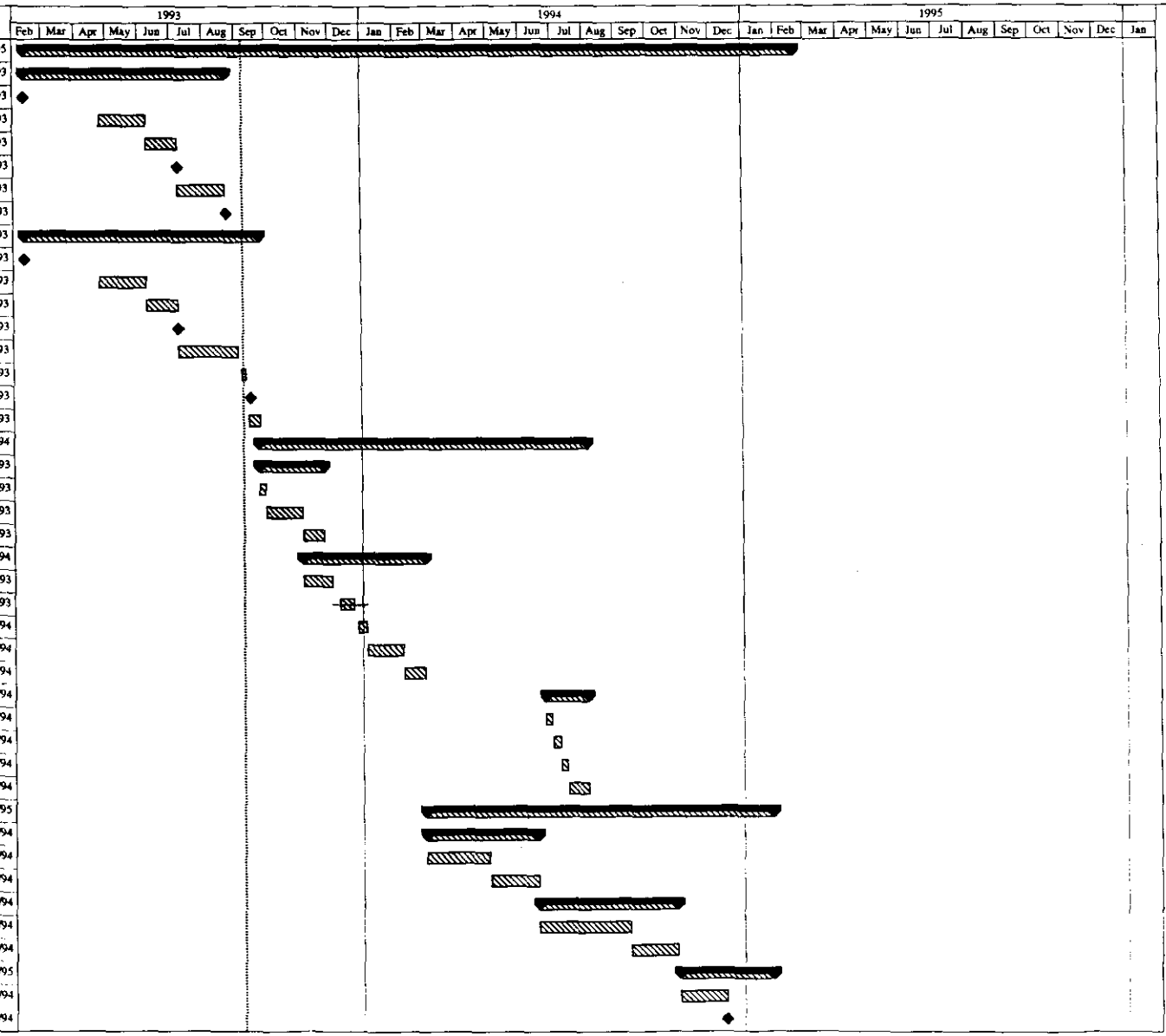
ROUND 2 CHLORINATED ETHENES
GROUNDWATER EXTRACTION AND TREATMENT SYSTEM RD WORK PLAN
WINNEBAGO RECLAMATION LANDFILL SITE
WINNEBAGO COUNTY, ILLINOIS

Drawing Number
10009721 B7

WARZYN

FIGURE 8 PROJECT SCHEDULE
WRL Groundwater Remedial Design
Winnebago Reclamation Landfill Inc.

ID	Name	Duration	Start	Finish
1	WRL GROUNDWATER REMEDIATION	738ed	2/12/93	2/20/95
2	RD/RA Work Plan, HASP, and QAPP	192ed	2/12/93	8/23/93
3	Draft RD/RA Work Plan, HASP, and QAPP to EPA	0ed	2/12/93	2/12/93
4	EPA Review and Comment	45ed	4/24/93	6/8/93
5	Revise RD/RA Work Plan, HASP, and QAPP	30ed	6/8/93	7/8/93
6	Final RD/RA WP, HASP, and QAPP to EPA	0ed	7/8/93	7/8/93
7	EPA Review Final RD/RA Work Plan, HASP, and QAI	45ed	7/8/93	8/22/93
8	EPA Approve RD/RA Work Plan, HASP, and QAPP	0ed	8/23/93	8/23/93
9	Groundwater RD Work Plan	224.38ed	2/12/93	9/24/93
10	Draft GW RD Work Plan to EPA	0ed	2/12/93	2/12/93
11	EPA Review and Comment	45ed	4/24/93	6/8/93
12	Revise GW RD Work Plan	30ed	6/8/93	7/8/93
13	Final GW RD Work Plan to EPA	0ed	7/8/93	7/8/93
14	EPA Review Final GW RD Work Plan	57ed	7/8/93	9/3/93
15	Final Revisions to GW RD Work Plan	5d	9/6/93	9/10/93
16	EPA Conditionally Approve GW RD Work Plan	0d	9/15/93	9/15/93
17	EPA Approve GW RD Work Plan	10d	9/13/93	9/24/93
18	GW Predesign Investigations	315.38ed	9/23/93	8/4/94
19	PHASE I - Establish Existing Conditions	62.38ed	9/23/93	11/24/93
20	Sample 19 Existing Wells	1w	9/23/93	9/29/93
21	Analyze Samples (std turnaround)	5w	9/30/93	11/3/93
22	Evaluate Findings	3w	11/4/93	11/24/93
23	PHASE II - Define Horz/Vert Extent	117.38ed	11/4/93	3/1/94
24	Solicit/Select/Contract Driller	4w	11/4/93	12/2/93
25	Drilling/Monitoring well installation	2w	12/10/93	12/23/93
26	Sample Wells (New + 6 existing, and elevations)	6d	12/27/93	1/4/94
27	Analyze Samples (std turnaround)	5w	1/5/94	2/8/94
28	Compile/Summarize Data	3w	2/9/94	3/1/94
29	PHASE III - Aquifer Pumping Test	42.38ed	6/23/94	8/4/94
30	Mobilize Driller	1w	6/23/94	6/29/94
31	Install/Develop Extraction Well	1w	6/30/94	7/7/94
32	Conduct Pumping Test	1w	7/8/94	7/14/94
33	Evaluate Data	3w	7/15/94	8/4/94
34	GW Remedial Design	334ed	3/2/94	1/30/95
35	Preliminary Design (30%)	106ed	3/2/94	6/16/94
36	Prepare 30% Design	60ed	3/2/94	5/1/94
37	EPA Review and Comment	45ed	5/2/94	6/16/94
38	Pre-Final Design (95%)	135ed	6/16/94	10/29/94
39	Prepare 95% Design	90ed	6/16/94	9/14/94
40	EPA Review and Comment	45ed	9/14/94	10/29/94
41	Final Design (100%)	91ed	10/31/94	1/30/95
42	Prepare 100% Design	45ed	10/31/94	12/15/94
43	Submit Complete Final Design to EPA	0d	12/15/94	12/15/94

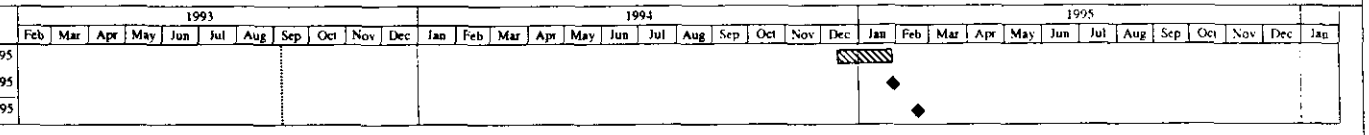


File Name: WRLGWRD.MPX

Summary | Scheduled Activity | Milestone

FIGURE 8 PROJECT SCHEDULE
WRL Groundwater Remedial Design
Winnebago Reclamation Landfill Inc.

ID	Name	Duration	Start	Finish
44	EPA Review Design	45ed	12/15/94	1/29/95
45	EPA Approve Design	0ed	1/30/95	1/30/95
46	GW Remedial Action Begins	0ed	2/20/95	2/20/95



File Name: WRLGWRD.MPX
Revision Date:9/7/93

Summary Scheduled Activity Milestone

Project Organization
Winnebago Reclamation Landfill RD
Groundwater Extraction and Treatment

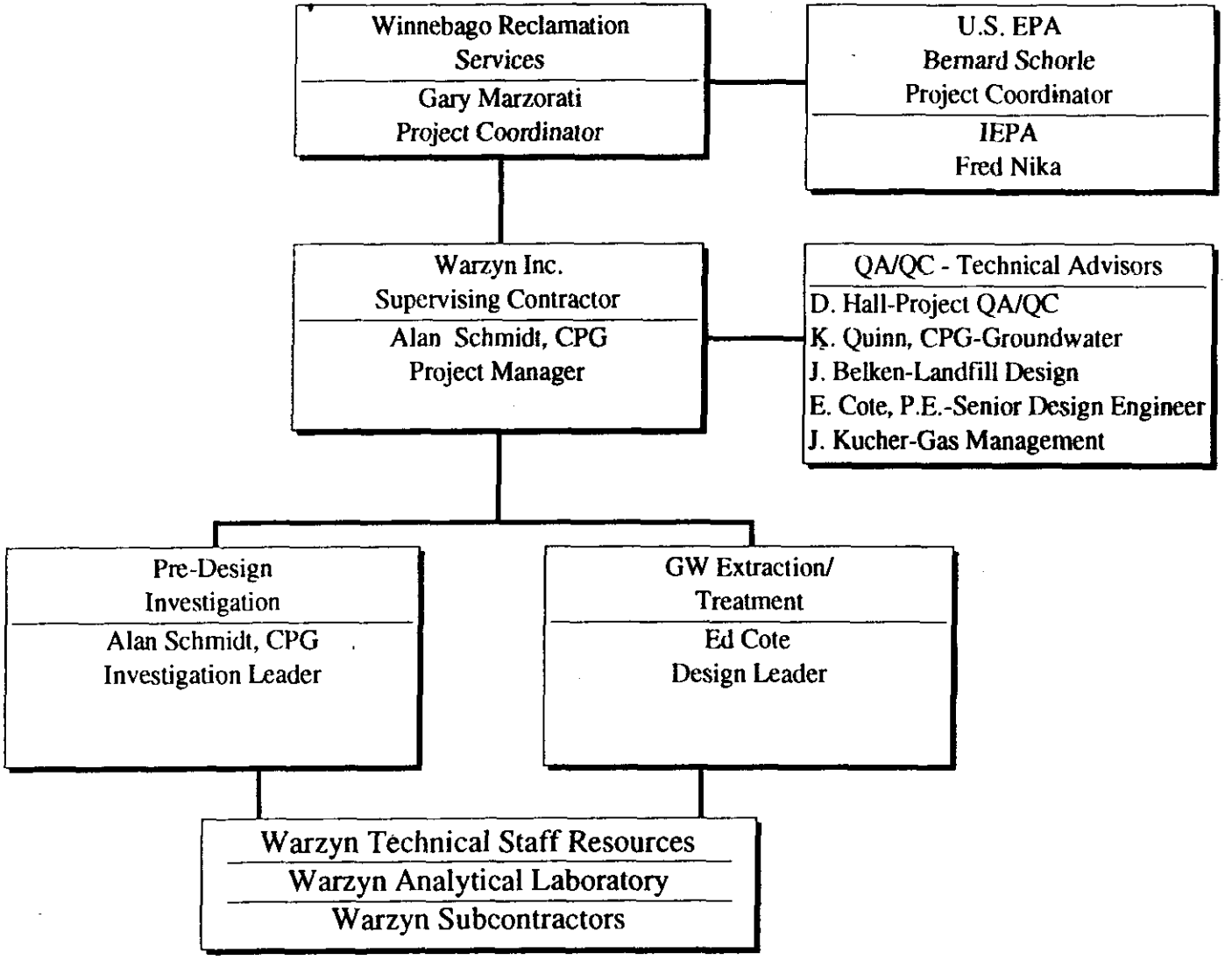


Figure 9

A

A

FIELD SAMPLING PLAN

TABLE OF CONTENTS

1

INTRODUCTION....1-1
1.1 Field Sampling Plan Objectives....1-2

2

SCOPE....2-1

3

SAMPLING LOCATIONS AND NUMBERS OF SAMPLES....3-1
3.1 Phase I Groundwater Sampling Locations....3-1
3.2 Phase II Monitoring Well Nests....3-2
3.2.1 Groundwater Sampling....3-2
3.2.2 Soil Sampling....3-2
3.3 Groundwater Sampling During Pumping Test....3-2
3.4 Quality Assurance Sampling....3-3
3.4.1 Field Blanks....3-3
3.4.2 Trip Blanks (TB)....3-3
3.4.3 Matrix Spike and Matrix Spike Duplicates (MS/MSD)....3-3
3.4.4 Sample Duplicate....3-3

4

SAMPLE DESIGNATION....4-1
4.1 Project Identifier Code....4-1
4.2 Sample Type and Location Code....4-1
4.3 Sampling Round Code/Duplicate Code....4-2
4.4 Examples of Sample Numbers....4-2

5

GENERAL SAMPLING EQUIPMENT PROCEDURES.....5-1
5.1 Phase I Investigation
5.1.1 Groundwater Sampling.....5-1
5.1.2 Water Level Measurements.....5-2
5.2 Phase II Investigation.....5-2
5.2.1 Drill Boring(s)/Install Monitoring Wells.....5-2
5.3 Phase III Investigation.....5-3

6

DECONTAMINATION PROCEDURES.....6-1
6.1 Site Personnel Decontamination Procedure.....6-1
6.2 Equipment and Vehicle Decontamination Procedure.....6-2

7

SAMPLING HANDLING AND ANALYSIS.....7-1
7.1 Parameters and Methods.....7-1
7.2 Sample Preservation.....7-2
7.3 Sample Container Requirements.....7-2

8

SAMPLE DOCUMENTATION.....8-1

LIST OF TABLES

Table A-1 Analytical Parameters (Screening)

1

INTRODUCTION

This Sampling Plan (SP) for field activities describes the procedures to be used in collecting site investigation data for the Groundwater Extraction and Treatment System Remedial Design (Groundwater RD). The site investigation will be conducted in three phases.

Phase I

- Groundwater sampling and analysis of 19 wells along the western boundary

Phase II

- Groundwater and soil sampling and analysis during boring of deep wells
- Placement of two monitoring well nests in the southwest corner of the site
- Groundwater sampling and analysis of the new wells plus sampling of 3 to 6 selected existing wells

Phase III

- Installation of an extraction well
- Conducting a pumping test
- Groundwater sampling and analysis during the pump test

1.1 FIELD SAMPLING PLAN OBJECTIVES

Objectives of the proposed field activities are to:

- Establish the current quality of groundwater west (downgradient) of WRL through sampling and analysis of select existing monitoring wells

- Better define/confirm the horizontal and vertical extent of groundwater contamination west of the landfill by installing two well nests

- Define and confirm aquifer characteristics to be used in system design. by conducting a pumping test

The objective of the groundwater sampling phase of field activities is to determine the horizontal and vertical extent of contamination in the groundwater along the west boundary of the WRL Site. Wells and piezometers in that area will be sampled, and the results will be used to select the locations of two monitoring well nests to be installed west and south of monitoring well G115.

The second phase of field activities is to install the two monitoring well nests described above. The shallow well at each location will be a water table well. The groundwater in the deeper well will be sampled while drilling to define the vertical extent of contamination in the southwest corner of the site, and to select the optimum depth to place the well screen. The deep borings will be extended into materials which exhibit no detectable contamination. Wells will be screened in the contaminated zone based on analytical results. It is expected that wells will terminate in a sand and gravel aquifer which extends into a bedrock valley west of the site. If concentrations of contaminants are significant in the unconsolidated materials a third well may be added to the well nests to better monitor the effectiveness of the remedial system at depth within the unconsolidated sediments as well as bedrock. Information collected during the drilling and sampling of the two well nests will be used to optimize the screen locations of the groundwater extraction system wells in the southwest WRL Site area.

[mad-607-262q]

2

SCOPE

The Groundwater RD will consist of three phases: groundwater sampling of selected wells, placement of two well nests, and a pumping test.

Phase I Groundwater sampling will include:

- Sampling groundwater from 19 wells along the northwest, west, and southwest portions of the site
- Sample analysis
- Measuring water levels in those 19 wells and other site wells

Phase II Placement of two well nests will include:

- Construction of two well nests in the southwest corner of the site. Each nest will consist of a water table well and a deeper well, the depth to be determined by results of the purgeable GC VOC analysis.
- Collection of groundwater samples from respective intervals of the deeper borings using a single packer method.
- Collection of soil from the borings to be analyzed for grain size to aid in extraction well filter pack designs.
- Analysis of groundwater samples collected while drilling on a 24-hour turnaround basis (screening).
- Development and groundwater sampling of the newly installed wells and groundwater sampling of selected existing wells.

Phase III Pump Test will include:

- Installation of one extraction well to be used in the pumping test
- Performing a pumping test
- Collecting and analyzing groundwater samples during the test

[mad-607-262r]

3

SAMPLING LOCATIONS AND NUMBERS OF SAMPLES

3.1 PHASE I GROUNDWATER SAMPLING LOCATIONS

Phase I will include collecting a groundwater sample from each of the following 19 existing wells:

B10	B15R	G116A	MW106
B10A	G118A	G117	P1
B14	G107	G118R	P3R
B14A	G115	G119	P4R
B15P	G116	G119A	

Water level measurements will be collected in these and other existing monitoring wells. Samples will be analyzed for the following analytical parameters:

- TCL VOCs and SVOCs analyzed by Warzyn's Subcontract Laboratory, IEA in Triangle Park, North Carolina, using SOW OLMO1.8 with data validation

- Selected TAL metals and cyanide (Table 10, Groundwater RD Work Plan) analyzed by Warzyn Analytical Laboratory, Madison, Wisconsin with data validation using SOW ILMO3.0

- Indicator parameters (Table 10) analyzed by Warzyn Analytical Laboratory, Madison, Wisconsin using SOPs found in Appendix B of the QAPjP.

3.2 PHASE II MONITORING WELL NESTS

During Phase II, two monitoring well nests (G130 and G130A, G131 and G131A) will be installed to the west and south of monitoring well G115. Groundwater samples will be collected while drilling at approximately 20-ft intervals for purgable GC VOCs analysis in the deeper boring at each location. VOCs were selected for sampling during drilling because VOCs tend to migrate more quickly than other more conservative parameters, and chlorinated VOCs have been determined to be the primary compounds of concern at this site. The VOC samples will be analyzed on a 24-hr turnaround time and used for the purpose of determining screen placement for the well. The screen will be placed in the zone of highest VOC contamination. The deeper borings will terminate at a depth where VOCs are low or non-detectable.

Groundwater collected during drilling will be analyzed for the following analytical parameters:

- VOCs (Table A-1), analyzed by Warzyn's Analytical Laboratory (with no data validation) using methods indicated in the QAPjP

3.2.1 Groundwater Sampling

Each well in the newly installed well nests will be developed. Following development, the newly installed wells will be sampled. Additionally, the following five wells along the west boundary will be sampled.

- .G115
- P3R
- P4R
- P1
- MW106

Samples will be analyzed for the analytical parameters using the analytical laboratories and methods stated in Section 3.1.

3.2.2 Soil Sampling

Two soil samples will be collected from each well nest location during drilling. A total of four soil samples will be collected and submitted to Warzyn's Geotechnical Laboratory for grain size analysis.

3.3 PHASE III GROUNDWATER SAMPLING DURING PUMPING TEST

During the pumping test approximately 8 groundwater samples will be collected and analyzed for TCL VOCs and SVOCs, selected TAL metals and cyanide, and indicator parameters. Groundwater samples will be analyzed by Warzyn's Analytical Laboratory and Subcontract Laboratory (with data validation) using methods indicated in the QAPjP.

3.4 QUALITY ASSURANCE SAMPLING

Quality Control samples will be collected during Phase I and Phase II sampling activities associated with the chemical characterization of groundwater. Quality control samples will consist of sample duplicates, field blanks, trip blanks, and matrix spike/matrix spike duplicate (MS/MSD) samples as described below.

3.4.1 Field Blanks

For water samples, one field blank will be prepared (for each type and container size). Field blanks will be prepared according to the following schedule for each sampling activity:

- One field blank for every 10 or fewer samples of groundwater collected
- For each sample period, a minimum of one blank for each group of parameters per sample matrix

The field blank samples will be prepared using deionized water stored in polyethylene containers. The water will be routed through the bailer or submersible pump for groundwater sample field blanks.

3.4.2 Trip Blanks (TB)

A trip blank for TCL VOC analysis will be included in each sample shipment container containing water VOC samples. The trip blank will consist of two 40-ml VOC vials filled with deionized water and preserved with 1+1 HCL. It will be prepared in the office or laboratory, transported to the field, and shipped with the other samples to the designated laboratory without being opened. It will be packaged using standard procedures as for other sample bottles.

3.4.3 Matrix Spike and Matrix Spike Duplicates (MS/MSD)

For water samples, one MS/MSD is required per group of 20 or fewer samples collected for VOC and SVOC analysis during each sampling activity. For TCL

VOCs, triple the normal sample volume will be collected (i.e., 12 40-ml VOC vials.

3.4.4 Sample Duplicate

One duplicate sample will be collected for each group of 10 or fewer samples collected for each matrix during each sampling period. A duplicate sample will consist of a sample obtained from the same sampling device as the original sample, by alternately filling the sample and duplicate bottles until the samples are collected.

[mad-607-262s]

4

SAMPLE DESIGNATION

A sample numbering system will be used to identify each investigative and quality control sample. Each sample identifier will include the project identifier code, sample type and location code, and a sampling event code. The sampler will maintain a log book containing the sample identification listings.

4.1 PROJECT IDENTIFIER CODE

A two-letter designation will be implemented to identify the sampling site. The project identifier will be "WRRD" to signify the Winnebago Reclamation Landfill Remedial Design investigation.

4.2 SAMPLF TYPE AND LOCATION CODE

Each sample collected will be identified by a two-letter code corresponding to the sample type. Sample type codes to be used for the subtasks covered in this sampling plan include:

- GW - groundwater sample from monitoring well
- FB - field blank
- TB - trip blank
- SB - soil sample from monitoring well boring

Other letter designators may be added for sample activities of later subtasks.

The location code will follow the sample type code. The location code consists of a two- to five-digit numeric or alpha-numeric code that indicates the sample location. Field blanks and trip blanks will use a consecutive numbering system starting at 01, assigned in the field.

4.3 SAMPLING ROUND CODE/DUPLICATE CODE

A two or three-digit numerical code will be used to designate additional location information. For groundwater and soil samples collected while drilling (Phase II), the Round code will represent the depth of the sample in feet below the ground surface. Duplicate samples will be designated by the Round code preceded by a 9. Matrix spike and matrix spike duplicate samples are collected as additional sample volume at selected locations.

Although identified as such on chain-of-custody records, specific sampling codes will not be provided for matrix spikes or matrix spike duplicates samples.

4.4 EXAMPLES OF SAMPLE NUMBERS

Examples of sample number codes are as follows:

- WRRD-GWG116A-01 = Winnebago Reclamation Landfill Remedial Design, groundwater sample from monitoring well G116A, Round 1
- WRRD-GWG116A-91 = Winnebago Reclamation Landfill Remedial Design, duplicate groundwater sample from monitoring well G116A
- WRRD GWG123A-30/42 = Winnebago Reclamation Landfill Remedial Design, groundwater sample collected from boring G123A using single packer method at a depth of 30 to 42 feet

[mad-607-262t]

5

GENERAL SAMPLING EQUIPMENT PROCEDURES

5.1 PHASE I INVESTIGATION

5.1.1 Groundwater Sampling

One round of groundwater samples will be collected from the following 19 wells:

B10	B15R	G116A	MW106
B10A	G118A	G117	P1
B14	G107	G118R	P3R
B14A	G115	G119	P4R
B15P	G116	G119A	

Groundwater elevations will be measured in the above wells and other existing WRL Site monitoring wells.

The procedure for groundwater sampling is described below. A groundwater level measurement will be taken using a decontaminated electric water level indicator. Three to five well volumes of water will be removed from the well prior to sampling using a clean bailer and cable or submersible pump. If a pump is used, the pump will be decontaminated between wells by pumping a soap solution followed by deionized water through the pump and tubing and washing the outside tubing which comes in contact with well water. The sample will be collected using a stainless steel bailer attached to stainless steel cable. Samples will be transferred from the bailer directly to the appropriate sample containers. Samples will be filtered and preserved (as described in Table 1-2 of the QAPjP) in the field, within 15 minutes of sample collection, and field parameters will be analyzed as soon as possible after sample collection. Samples will be kept on ice in coolers and shipped to the analytical laboratory at the end of each day. Well

locations are shown in the Groundwater RD Work Plan. The samples will be collected and analyzed as specified in Section 7.

5.1.2 Water Level Measurements

Groundwater levels will be measured at identified WRL Site wells during Phase I activities. Measurements will be taken using an electric water level indicator.

5.2 PHASE II INVESTIGATION

5.2.1 Drill Boring(s)/Install Monitoring Wells

The procedures used to drill borings are described in the following paragraphs.

Borings will be advanced through the unsaturated zone using a rotary drill with temporary casing and drilling mud or clean water. Drilling mud will not have an adverse effect on sampling to be conducted while drilling.

After entering the saturated zone, groundwater samples will be collected during the drilling at intervals of approximately 20 feet. Two soil samples will be collected from each well nest location and submitted for grain size analysis.

A packer system will be inserted into the temporary steel well casing and the packer will be inflated to test the system. If the packer inflates properly and seats against the casing, the packer will be deflated and the system will be lowered to the appropriate sampling depth. The packer system will be reinflated to isolate a 20-foot long interval of the borehole. A submersible pump will be lowered down the steel tubing attached to the packer system to a point just below the packer. Two to three borehole volumes of water will be removed prior to sampling, if possible (the amount removed will depend on the rate that the borehole will produce water).

A groundwater sample will be collected in 40-ml. VOC vials directly from the discharge line of the submersible pump and analyzed for VOCs for screening purposes to determine the zone of highest VOC contamination in the aquifer. The well screen will be installed in the zone of highest VOC contamination. A low discharge rate will be used to minimize the potential for volatilization of contaminants. The sample will be kept on ice and maintained under standard chain-of-custody procedures. Samples will be shipped via overnight express courier to Warzyn's Analytical Laboratory in Madison, Wisconsin. Sample will be analyzed within 24 hours of sample collection.

The submersible pump will be decontaminated between sample intervals by pumping a soap solution followed by deionized water through the pump and

associated tubing. The packer system will be decontaminated by steam cleaning between sample intervals. The groundwater at these wells will be analyzed for the parameters specified in Section 7 using the procedures specified in the RD/RA Quality Assurance Project Plan.

Wells will be constructed of stainless steel screen (5 to 10 ft nominal depending on the vertical dimensions of the contaminated zone) and steel riser pipe. Wells will be constructed with reference to 77 IAC 920 Illinois Water Well Construction Code. The boring will be backfilled with No. 30 flint sand to approximately two feet above the top of the well screen. One to two feet of fine silica sand will be placed above the sandpack to prevent migration of the bentonite seal into the sandpack. A 2 ft bentonite chip seal will be placed above the fine sand. The remainder of the borehole annulus will be backfilled with thick bentonite slurry. A protective locking casing will be installed at ground surface. Granular bentonite will be placed around the protective casing.

The wells will be developed, after construction, using a clean bailer or submersible pump. A minimum of 10 well volumes will be purged and containerized. Purge water will be disposed of in the WRL leachate treatment system. Specific conductivity and pH measurements will be measured during well development to assess well stabilization. Development will continue until pH and specific conductance have stabilized.

The wells will be surveyed for location (+/- 1 ft) and elevation (+/- 0.01 ft). Drilling equipment will be decontaminated in accordance with the procedures in Section 6.

5.3 PHASE III INVESTIGATION

An extraction well will be installed and equipped with a submersible pump. Groundwater quality samples will be collected from the extraction well during the pump test and will be analyzed for TCL VOCs and SVOCs selected TAL metals and cyanide, and indicator parameters (Table 10, Groundwater RD Work Plan) to assess treatment system requirements. It is anticipated that approximately 8 samples will be collected and analyzed using procedures stated in Section 7.

[mad-607-262u]

6

DECONTAMINATION PROCEDURES

Procedures to be followed to decontaminate equipment and personnel are described in the RD/RA Site Health and Safety Plan. The procedures are summarized below.

6.1 SITE PERSONNEL DECONTAMINATION PROCEDURE

- Dispose of outer latex booties
- Wash boots in Liquinox bootwash
- Clean outer gloves in Liquinox wash solution (discard if too soiled to clean thoroughly)
- Dispose of polycoated tyvek suits
- Dispose of surgical gloves
- Wash hands in hand wash
- Wash face and neck in face wash
- Clean and sanitize face mask

Site personnel will perform the above mentioned decontamination procedure prior to leaving the site.

Discarded clothing and other articles will be collected in double-lined, heavy duty garbage bags.

6.2 EQUIPMENT AND VEHICLE DECONTAMINATION PROCEDURE

- Decontamination will be performed prior to site entry
- Decontamination will be performed on-Site
- Gross contamination will be removed with a brush and Liquinox solution
- Steam cleaning or hot water high pressure washing will follow

The drilling equipment and the backhoe will be steam cleaned or high pressure hot water washed between boring/excavation locations at the borehole/excavation prior to exiting the site. Another area, located away from the equipment decon area, will be designated as a site personnel decon area.

Decontamination will include steam-cleaning or hot water high pressure washing the drilling equipment, and tools between boreholes and detergent washing and water rinsing the split spoon samplers after each collected sample. The drill rig and equipment may also require scrubbing of accessible parts with a detergent/water solution. Well materials will also be steam-cleaned or hot water high pressure washed and wrapped in plastic until installed. The bailer cable and water level measurement tape will be cleaned with Liquinox or another non-phosphate detergent solution, and rinsed with deionized water.

Potentially contaminated equipment remaining on-Site overnight, and in areas accessible to the public, will be decontaminated by the end of the day.

Decontamination water will be contained and disposed of in the WRL leachate treatment system.

[mad-607-262v]

7

SAMPLE HANDLING AND ANALYSIS

7.1 PARAMETERS AND METHODS

Groundwater samples collected from specified existing and new wells during Phase I, II and III activities will be analyzed for the chemical parameters specified in Table 10 of the Groundwater RD Work Plan using the following laboratories and methods.

- TCL VOCs, and SVOCs analyzed by Warzyn's subcontract Laboratory IEA in Triangle Park, North Carolina using CLP SOW OLMO1.8 (or most current).

- TAL selected metals and cyanide are analyzed by Warzyn using CLP SOW ILMO3.0 (or most current)

- Purgeable VOCs by GC for screening purposes and indicators are analyzed by Warzyn Analytical Laboratory, Madison, Wisconsin using SOPs found in Appendix B of the QAPjP.

Measurement of pH, specific conductance, and temperature will be performed in the field.

Groundwater samples collected from borings using the packer method during Phase II will be analyzed for the parameters listed in Table A-1 of this Sampling Plan by Warzyn Analytical Laboratory, Madison, Wisconsin using Methods 8010/8020 (no data validation). This analysis is for screening purposes. only, to determine the zone of highest VOC contaminants where the well screen

will be placed.

7.2 SAMPLE PRESERVATION

VOC samples will be collected with either a stainless steel bailer or a submersible pump after three to five well volumes have been purged. VOC samples are collected immediately upon completion of purging. VOC samples are collected with no headspace and preserved with 1+1 HCL.

Samples will be collected and preserved in a manner appropriate for the analyses they receive (see Table 1-2 of the RD/RA QAPjP). The metals and TDS portion of the sample requiring field filtering prior to analysis (see Table 1-2 of the RD/RA QAPjP) will be filtered, using a pressure filtration device, through a 0.45 micron filter within 15 minutes after collection. Filtered portions of the sample, field blank, and field duplicate will be preserved, as appropriate, for metals analysis, immediately after filtration. Preservatives added to the samples will be prepared using reagent grade chemicals. Table 1-2 of the RD/RA QAPjP should be consulted for details regarding sample packaging and shipping. Non-filtered metal samples will not be collected.

Indicator parameters are not filtered prior to analyses. Indicators will be collected in this order: TSS, alkalinity, sulfate, chloride, BOD, COD, TOC and ammonia nitrogen.

7.3 SAMPLE CONTAINER REQUIREMENTS

Contaminant-free sample containers (bottles) will be used for analyzing VOCs, metals and indicators for this sampling effort. The bottles will be prepared according to the procedures specified in U.S. EPA's "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers, April 1990". Bottles used for sampling will not contain target organic and inorganic contaminants exceeding the level specified in the above mentioned document. Specifications for the bottles will be verified by checking the supplier's certified statement and analytical results for each bottle lot, and will be documented on a continuing basis. This data will be maintained in the project evidence file and will be available, if required, for EPA review.

In addition, the data for field blanks, rinsate blanks, and trip blanks, etc., will be monitored for contamination, and corrective actions will be taken if a problem is identified, to determine whether the analytical data is usable. This corrective action may include discontinuing the use of a specific bottle lot, contacting the

bottle supplier(s) for retesting the representative bottle from a suspect lot, re-sampling the suspected samples, validating the data taking into account that the contaminants could be introduced by the laboratory (i.e., common lab solvents, sample handling artifacts, etc.) or could be bottle QC problem.

[mad-607-262w]

8

SAMPLE DOCUMENTATION

Field sampling activities will be documented using a bound notebook/logbook. Information recorded in the field notebook will include date of sampling, sampler, weather conditions, observations and methods of preservation. Additional data pertaining to sampling may also be included in the logbook.

Samples will be collected under chain-of-custody procedures. Standard forms including sample labels, sample tags, chain-of-custody forms, and custody seals used for sample tracking will be maintained (see attachments). A brief description of sample documents follow:

A. Chain of Custody Form

1. One Form per shipping container (cooler).

2. Carrier service does not need to sign form, if custody seals remain intact.

3. Use for all samples.

B. Chain of Custody Seals

1. Two seals per shipping container to secure the lid and provide evidence that samples have not been tampered with.

2. Cover seals with clear tape.

3. Record seal numbers on Chain of Custody Form.

4. Use for all samples.

C. Sample Tags

1. Each sample container must have a sample tag affixed to it.
2. Sample tag numbers are recorded on the Chain of Custody Forms.
3. Use for all samples.

D. Sample Identification Record Form:

1. Provide means of recording crucial sample shipping and tracking information.

2. Contain information such as:

- Sample number
- Sample matrix
- Sample location code
- Sample round
- Chain of custody number
- Lab code
- Date sampled
- Date shipped
- Airbill number
- Sampling tag number

Paperwork accompanying the samples being shipped to the laboratory will be sealed in a plastic bag that is taped to the inside of the cooler lid. Copies of the chain-of-custody forms, and other paperwork (if possible), will be retained with the field files.

Two sample seals will be placed on opposite sides of the lid and extending down the sides of the cooler. The lid will be securely taped shut prior to shipment.

SGW/cah/AJS
[mad-607-262ww]
10009721/157

TABLE A-1

Analytical Parameters (Screening)
Groundwater RD Work Plan

Volatile Organics
Chloromethane
Bromomethane
Vinyl chloride
Chloroethane
Methylene chloride
1,1-Dichloroethene
1,1-Dichloroethane
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
Bromochloromethane
1,1,1-Trichloroethane
Carbon tetrachloride
Bromodichloromethane
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
Bromoform
1,2-Dibromoethane
Tetrachloroethene
1,1,2,2-Tetrachloroethane
Toluene
Chlorobenzene
Ethylbenzene
Styrene
Xylenes (total)
1,2-Dibromo-3-chloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene