9285.9-26A
EPA540/R-94/107
PB95-963214

HRS DOCUMENTATION RECORD TRAINING

Site Assessment Branch
Hazardous Site Evaluation Division
Environmental Protection Agency

Documentation Record Training Course Agenda

DAY 1--Morning

Duration	
	Section 1: Introduction
0:15	-Trainers/attendees introduction
0:20	-Pre-test
0:10	-The role of the documentation record in site assessment
0:10	-Introduction to guidance materials
0:15	-Break
	Section 2: Review and organization of site information
0:15	-Getting started
0:15	-Organization of site information
0:15	-Preliminary HRS scoring
0:15	-Identifying data gaps and major issues
0:15	-Break
	Exercise 1: Review and organization of site information
1:00	-Organize site information by pathway and list sources (references provided)
0:30	-Summarize pathways not evaluated (cover sheet)
1:00	Lunch

DAY 1--Afternoon

Duration	
	Section 3: Writing the documentation record
0:10	-Selecting a format
0:10	-Documentation requirements
0:10	-References
0:10	-Common problem areas
0:10	-The site summary
0:10	-Assembling the completed HRS package
0:15	-Break
	Exercise 2: Documentation record writing
1:00	-Characterize sources (section 2.2)
0:15	-List hazardous substances (section 2.4.1)
0:45	-Calculate source hazardous waste quantities (section 2.4.2)

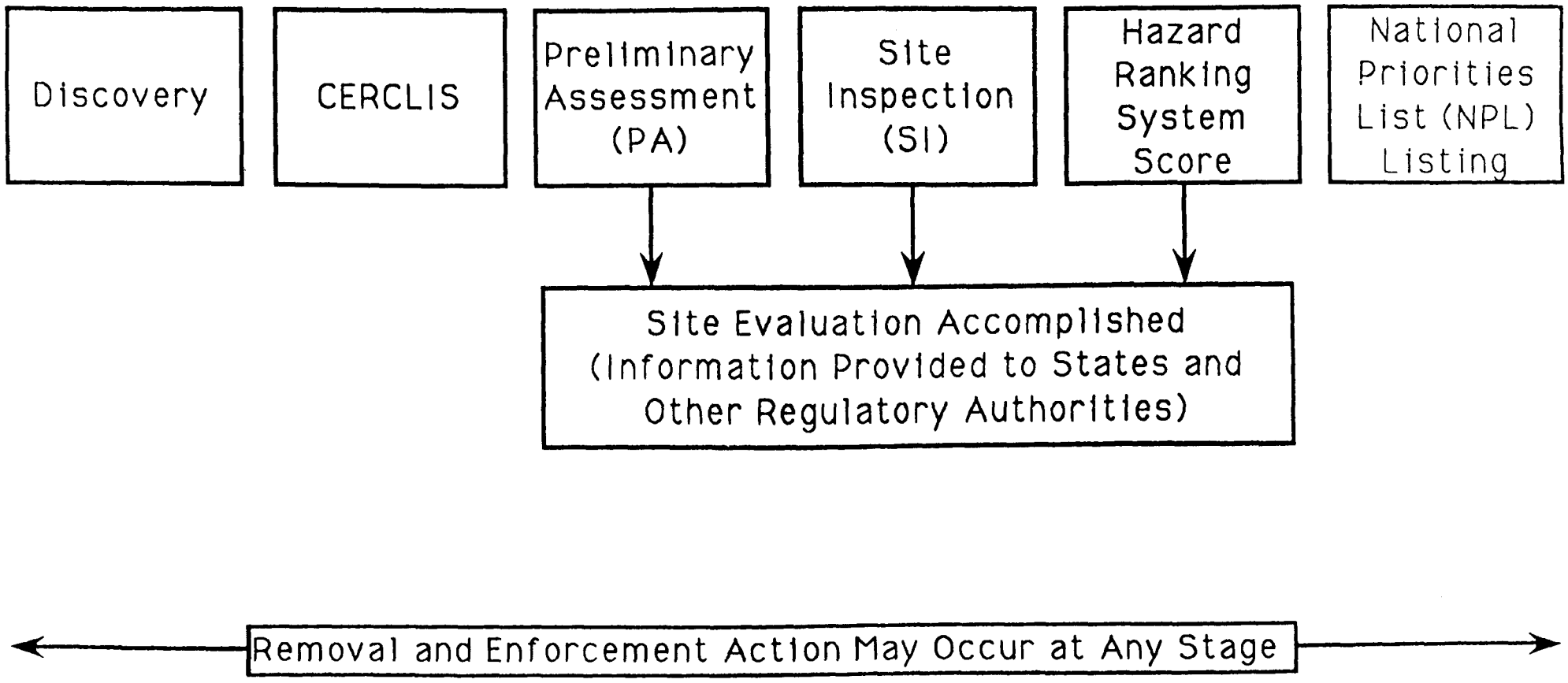
DAY 2--Morning

Duration	
	Section 4: Overview of the NPL listing process
0:05	-Regional quality control
0:05	-Headquarters quality assurance review
0:05	-Proposal to the NPL and public comment period
0:05	-NPL listing
	Exercise 3: Quality assurance and public comment review
0:45	-Review ground water pathway description (section 3.0)
0:15	-Break
0:30	-Review likelihood of release (section 3.1)
0:30	-Review waste characteristics (section 3.2)
0:30	-Review targets (section 3.3)
0:15	-Break
	Conclusion
0:20	-Post-test
0:20	-Pre-test/post-test review
0:20	-Questions and answers

Section 1

Introduction

The Site Assessment Process



The NPL Listing Process

- EPA region identifies site as NPL candidate.
- Region develops HRS scoring package.
- EPA region conducts QC review and submits scoring package to EPA HQ.
- EPA HQ conducts QA review, and site is proposed to the NPL.
- Site undergoes 60-day public comment period, and EPA HQ evaluates and responds to comments.
- Site listed as final on the NPL, dropped, or reproposed.
- 90-day period to enter legal challenge to listing of the site.

The HRS Scoring Package

- HRS documentation record (hard copy/disk).
- HRS scoresheets (hard copy/disk; from PREscore).
- Complete copies of references and maps.
- RCRA status documentation or aggregation memo, if applicable.
- NPL site narrative summary.

The Documentation Record

- Explains and records the EPA's basis for assigning the HRS site score.
- Is available for public review and comment.
- Must be legally defensible.

Introduction to Guidance Materials

- HRS rule: 40 CFR 300, Appendix A.
- HRS Guidance Manual: Interim Final, November 1992.
- Regional Quality Control Guidance for NPL Candidate Sites, December 1991.
- HRS preliminary resolutions.
- WordPerfect File: electronic documentation record format.
- PREscore Users Manual and Tutorial, Version 2.0, July 1992.

Section 2

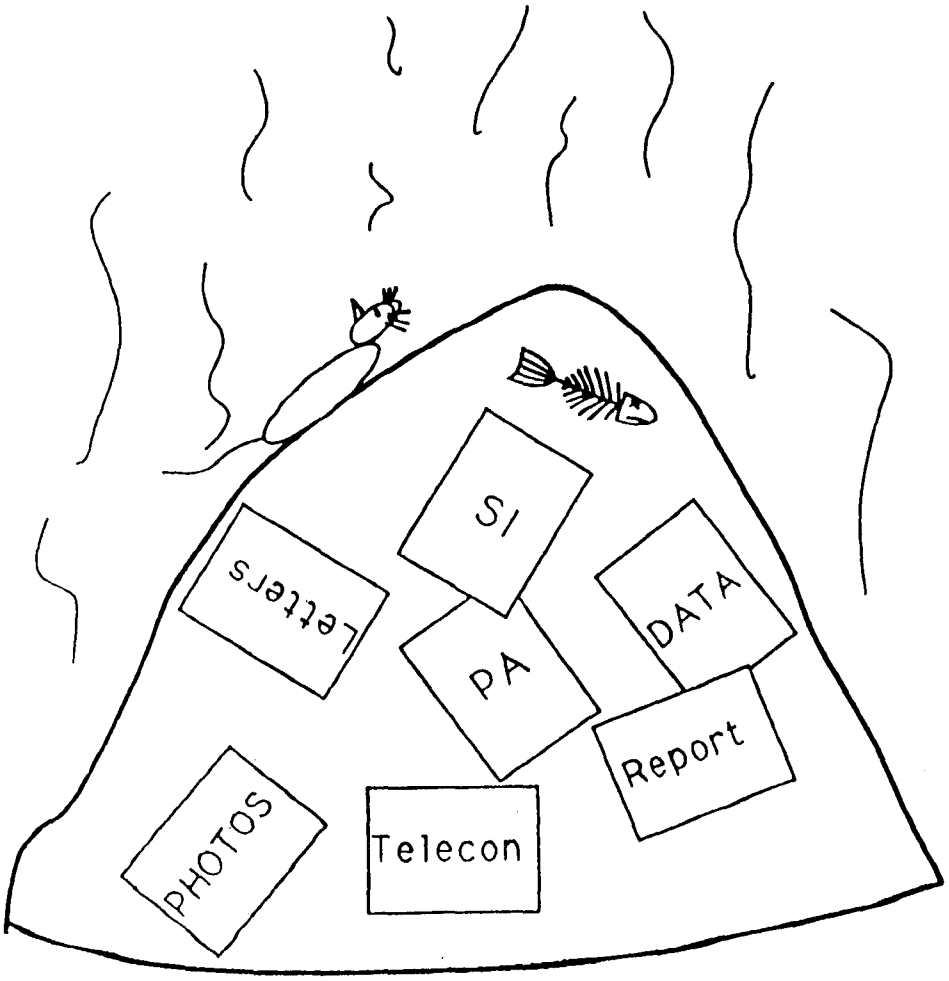
Review and Organization of Site Information

Guidance on HRS Package Preparation

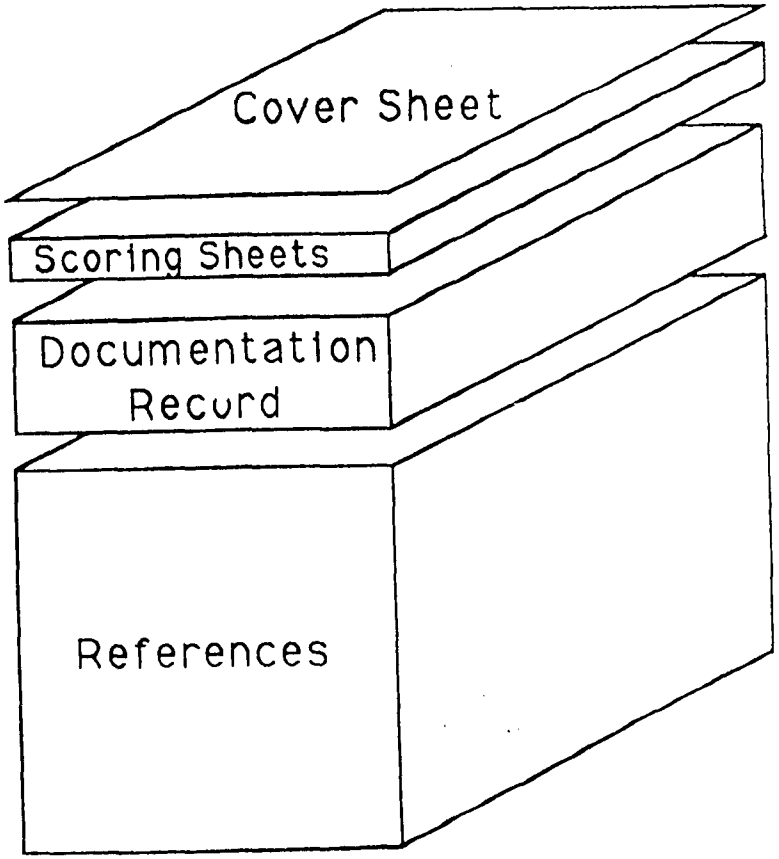
Please turn to section 3.1, page 21, of the HRS Guidance Manual.

The Task

What you start with...



What you deliver...



Bringing Order Out of Chaos

- This briefing is organized around the following tasks:

  A. Read <u>all</u> site information.

  B. Take notes and organize them by source or pathway.

  C. Keep a running score.

  D. Identify sources and significant pathways.

  E. Gather maps and diagrams.

  F. Identify HRS data gaps.

- When you document a site, you'll move back and forth between these tasks.

Read All Site Information

- Start off with the PA and SI reports to get a sense of:

  - What has been done?
  - How well it has been done?
  - What is important about the site?

- Read all of the PA and SI references.

  - The PA and SI narrative reports are secondary references. You'll need to quote from the primary references.

- Review the CERCLA file.

  - Are there useful tidbits that were missed by the PA and SI?
  - Is there contradictory information that must be resolved?

Take Notes and Organize Them

- Horror Story 1:

  The pile of documents you've read is 28" deep. Somewhere in there is a vital fact you read, but you can't remember just where. What do you do?

  - Dummy through the documentation without it.
  - Read everything again until you find it.
  - Vent your frustration on an unsuspecting coworker.

- Horror Story 2:

  So you've scribbled 43 pages of notes to avoid horror story 1. Now how do you pull it all together into an HRS documentation record?

Take Notes and Organize Them (Continued)

- Organize your notes by HRS source and by HRS pathway and factor.

  - File cards that can be sorted.
  - Blank copy of the HRS documentation record.
  - PREscore or an electronic database.

- Include a note on where the information came from, both document and page number.

  - You'll also need a <u>clean</u> copy of each reference you expect to use.

- Include a note on the quality of the information.

- Keep notes on any discrepancies or conflicting information.

Take Notes and Organize Them (Concluded)

3.3.1 Nearest Well

Local geology + aquifers (Ref. 8, pp. 41-48)

Cottages @ bend in river within 1000′ (Ref. 3) ← Transient?

Residences on Willow Rd within 16000′ (Ref. 3)

Private wells "mostly" in shallow aquifer (Ref. 8, p. 44) — S

On-site well closed in 1986 (Ref 12)

" screened @ 90′ (Ref 14)

(should be in deeper aquifer – Ref 8, p. 46)

" within 400′ of source 2 (Ref 6)

" contamination alleged by former worker (Ref 21) — S

Any background in deeper aquifer? " contaminated – 22 ppb TCE 8/14/92 (Ref 24 sample ABG1-13, p. 11)

QA looks good (Ref 25 p 7-8)

" Level I vs. 3.2 ppb benchmark (Ref 2 p B-34 3/6/93)

Keep a Running Score

- Back-of-the-envelope scoring will focus your attention on the HRS implications of the information you are gathering.
  - Is a number "at risk" because it lies near a breakpoint on an HRS table?
  - The more important an item of information is to the score, the firmer the quality of information should be.
  - "Killer issues" are those that can drop the score under 28.50.
- The attempt to score the site will also focus attention on what information is still missing.

Identify Sources and Significant Pathways

- Identify all known sources and characterize each, insofar as data are available.
  - Source characterization requires considerable information. Be sure to take notes on all the information required in the HRS documentation record.

Please turn to page 43 of the HRS Guidance Manual.

Identify Sources and Significant Pathways (Concluded)

- Focus your efforts on the significant pathways.

Please turn to section 2.2, page 11, of the HRS Guidance Manual.

Please turn to section 3.4, page 31, of the HRS Guidance Manual.

- Some SI reports have missed the most significant pathway.

Gather Maps and Diagrams

- The variety and quality of maps will be discussed later.
- For now, photocopy maps or diagrams from technical reports.
  - Sources, the site, geological formations, surface water bodies, locations of targets.
- Obtain other maps such as USGS 7.5-minute topographic maps, tax assessors parcel maps, geological cross sections, and Wetland Inventory Maps.
- Obtain aerial photographs to show historical and current site conditions.

Identify HRS Data Gaps

- Review each HRS factor for completeness of documentation.

Discussion question:

What elements of information will you need to have on hand to document the distance to the nearest well?

Identify HRS Data Gaps (Concluded)

- Are any data of inadequate quality?
  - Pay particular attention to the significant pathways and to data that are important to the site score.
  - Look at all data against the breakpoints in the HRS tables.
  - Look for conflicting assertions or for differences in the numbers that are reported.
  - Review the analytical data carefully for all critical samples.
- The identification of data gaps will focus further information-gathering.

Site Eligibility Issues

- The issue of site eligibility should have been resolved during the PA and the SI.

Please turn in the Regional Quality Control Guidance to section 2.1, page 9.

- States, tribes, and contractors: If you identify an eligibility issue, contact your EPA SAM immediately.

HRS Scoring Issues

- Sometimes the site conditions simply don't fit the HRS or the HRS guidance very well.

- When this happens, the procedure is:

  - Discuss the issue in-house with HRS experts.

  - Discuss the issue with your EPA regional contact.

  - The EPA region can present the issue to the EPA HQ regional coordinator.

  - If the issue is still not resolved, the region can prepare an Issue Submittal Form (Regional QC Guidance Manual, appendix C). The EPA HRS Core Group meets monthly to resolve issues.

In Summary...

- Read, organize, rough out scores, and identify data gaps.
  - Develop a plan for closing the data gaps.
- Watch for eligibility issues that haven't been caught.
- Ask for guidance for special cases.

Section 3

Writing the Documentation Record

Notes on the Final Product

- The HRS score begins at zero and rises as you present evidence that supports a higher score.
- Every assertion of fact must be referenced and every professional judgment presented with a clear, documented rationale.
- You are writing for the general public...which includes everyone from local citizens to lawyers and consulting engineers.
- Weave the facts together into a "story" that states EPA's case for placing the site on the NPL.

Elements of Writing

A. Choose a documentation record format.

B. Describe and present sources.

C. Describe and present pathways.

D. Weave technical information and HRS factors.

E. Choose and prepare maps and figures.

F. List and cite references.

G. Copy and attach references.

Choose a Documentation Record Format

- The WordPerfect format:

  - Spell checker.
  - Comment/Instruction blocks.
  - Modifications to the WordPerfect format.

- Other formats:

  - PREscore with a supplemental WordPerfect document.

Describe and Present Sources

- Use terminology for source type, description, and containment directly from the HRS rule and the HRS Guidance Manual.
- Assign a name and stick with it.
- Describe the boundaries of the source and show locations on a map.
- List hazardous substances, pollutants, or contaminants.
- Describe source containment using HRS terminology.
- Summarize the information for the appropriate tiers for hazardous waste quantity.
- Discuss additional potential sources that were not quantified in the Source Description section.

Describe and Present Pathways

- Document all significant pathways.
- Qualitatively describe the rationale for not evaluating the other pathways, components, or threats.
- Use the WordPerfect format and HRS guidance to help you present information.

Weave Technical Information and HRS Factors

- Translate report information into HRS terms.
- Use HRS terminology and reference the HRS rule frequently.
- Carefully document rationale behind professional judgements.
- Be technically accurate, but remember you're writing for the layman.
- Provide calculations for HRS factor values in text or as references (e.g., hazardous waste quantity, target apportionment).
- Do not hide, conceal, or deliberately omit information, especially if it conflicts with information in another reference.

Choose and Prepare Maps and Figures

- Refer to appendix D of the Regional QC Guidance.
- Choose a base map.
- Maps should be reproducible, legible, and to scale.
- Use USGS topographic maps as references and submit originals with the documentation record.
- Present pathway-specific maps.
- Refer to maps within the text of the documentation record.
- Aerial photographs may be useful.

List and Cite References

- List only the references you use in the documentation record.
  - Be sure to use all references that EPA might need to justify listing the site.
- Every assertion of fact must be referenced in the documentation record. Example: (Ref. 9, p. 43; Ref. 24, p. B-158).
- Use a recognized style for the list of references in the documentation record.
- The HRS rule is always Reference 1 and the Superfund Chemical Data Matrix (SCDM) is always Reference 2.
- References should be numbered sequentially as they appear in the documentation record.

Copy and Attach References

- For publications and reports, copy the title page, the table of contents, and the full chapter or section cited to provide the reader with the context from which the statement was made.

- Attach a copy of each reference unless it is widely available.

  - Submit copies free of all hand-written notes or comments.

- Keep a clean copy of each reference free of ink and highlighters for future reproduction.

Common Problem Areas

- Source aggregation.
- Referencing.
- Maps and figures.
- Aquifer interconnection.
- Analytical data quality.
- Background levels.

Prepare an NPL Site Summary

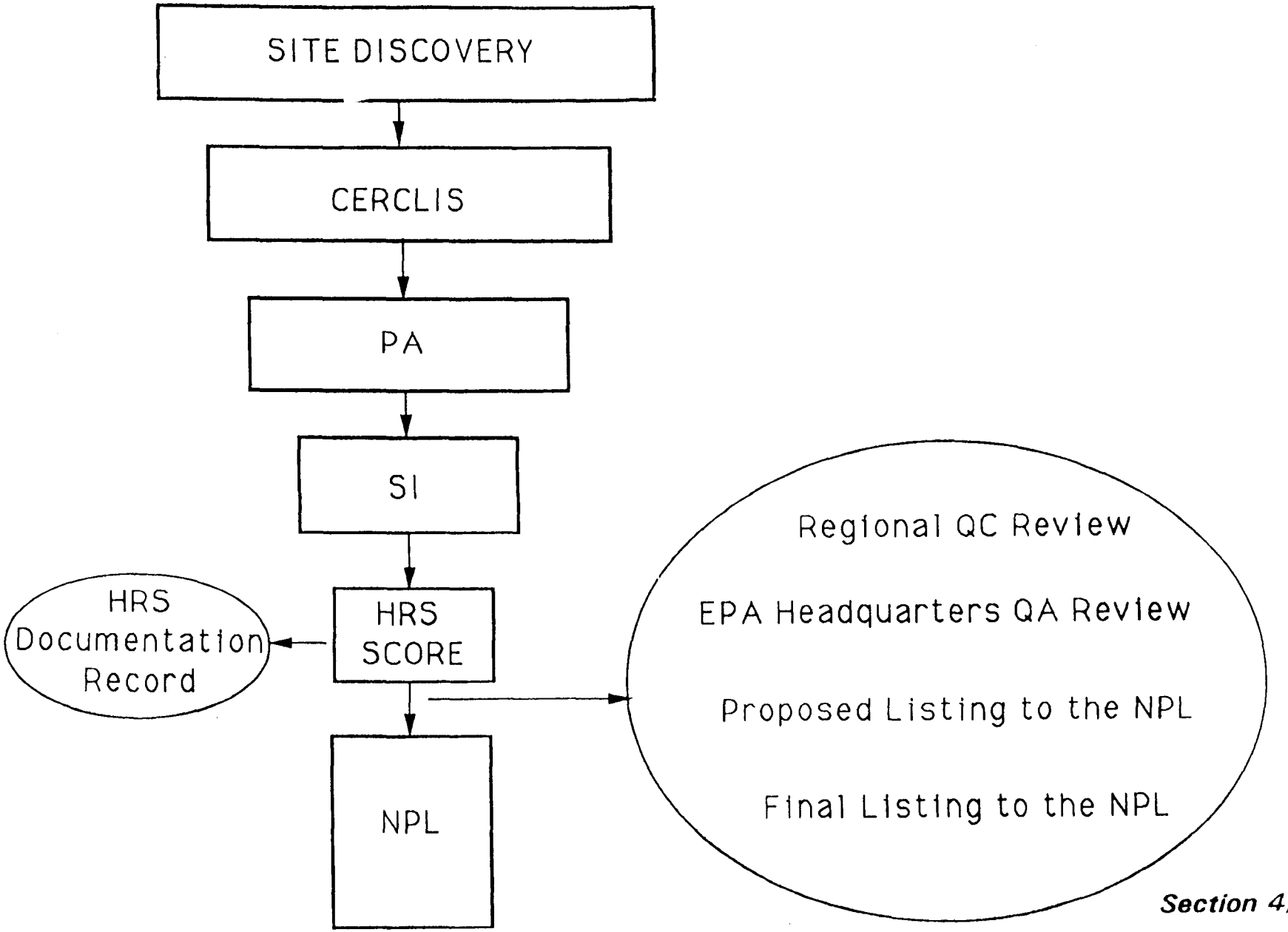
The NPL site summary is a one-page summary of the site that accompanies the HRS package. It is not a part of the documentation record, but is what the public most frequently sees.

- Prepare the NPL site summary last.
- Refer tc appendix E of the Regional QC Guidance for directions on preparing NPL site summaries.
- Refer to appendix F of the Regional QC Guidance for directions on naming NPL sites.

Section 4

Overview of the NPL Listing Process

Overview of the NPL Listing Process



Regional Quality Control Review

- The HRS Package QC Checklist
  - The Regional NPL Coordinator:
    - Reviews NPL eligibility issues.
    - Checks accuracy.
    - Evaluates documentation and ensures legibility.
    - Ensures that every statement of fact is referenced.
  - The Regional Branch Chief:
    - Signs and facilitates first HRS package submittal to Headquarters.

Headquarters Quality Assurance Review

After regional QC is complete, the EPA region submits the package (with references) to EPA HQ and the package undergoes an in-depth QA review.

The purpose of the QA review is to :

- ensure correct the application of the HRS rule and guidance to the site-specific information;
- ensure that the HRS package contains all necessary information and is appropriately presented to support a successful EPA rulemaking; and
- ensure accuracy and consistency in HRS application among the EPA and State offices participating in scoring sites.

Headquarters Quality Assurance Review (Continued)

The QA review identifies both minor and major issues.

- Minor issues include:
  - Mathematical errors.
  - Incorrect referencing.
  - Illegible photo copies.
  - Typographical or transcription errors.
  - Poor map quality.

- Major issues include:
  - Technical errors due to inadequate PAs or SIs.
  - Background samples and site attribution.
  - Similarity of samples.
  - Documentation of observed release criteria.
  - Geologic description and definition of aquifers.
  - Documentation of targets.
  - Interpretation of guidance.

Headquarters Quality Assurance Review (Concluded)

At the conclusion of the review, a QA letter is drafted.

The purpose of the QA letter is to provide a list of factors to be settled so that the site can be proposed to the NPL.

The QA review is reiterative; several rounds of QA may occur and several QA letters may be drafted.

Sites that score $\geq$ 28.5 are proposed to the NPL.

Site Proposal to the NPL

Sites are placed on the NPL in a two-step process:

- First, sites are proposed and public comments are solicited.
  - 60-day public comment period.
  - EPA HQ evaluates and responds to comments, watchful of new information or alternate interpretations that could affect the site score.
  - Historically, 60% of the proposed sites receive comments from the public.
- Second, sites still meeting the scoring criteria after consideration of comments are listed in a Final Rule.
  - 90-day period to initiate a legal challenge to final listing.

Site Proposal to the NPL (Concluded)

- EPA intends to issue four Federal Register (FR) notices per year.
  - Two proposals (February and August).
  - Two finals (November and May).
- The process is based on continuous package submission; review is done on a first-come, first-served basis.

HRS DOCUMENTATION RECORD TRAINING

EXERCISES 1-3

Exercise 1: Review and Organize Site Information

Review References 1 through 6, attached to the back of the enclosed documentation record. Remember, start by reviewing the SI (Ref. 4) to get an overview of the site. During your review, make notes on facts that characterize sources or that could be used to document factor values. Create a list of sources, with notes on each, and a separate list of notes for each of the four pathways. Be sure to record the reference number and page number for each fact noted. Divide these tasks among the members of your group, if you like.

The attached references have been summarized. Any missing references (Ref.3) or reference sections (Ref.4, appendices A, B, and C) may be assumed to be extant and valid.

Exercise 2: Documentation Record Writing

Use References 1 through 6, attached, to complete the Source Characterization section of this documentation record (cover pages and sections 2.2 through 2.4.2.1.5). As you move through each section of the documentation record, refer to the cross-referenced copy of the WordPerfect format. This format contains directions (in shaded blocks) and refers to appropriate sections of the SAB guidance materials (in italics).

Exercise 3: Quality Assurance and Public Comment Review

The class will be divided into three groups for this exercise; the regional QC team, the Headquarters QA team, and the PRP public comment team. All three teams will critically review the completed sections of this documentation record (sections 3.0 through 3.3.4, ground water pathway).

The focus of each team's review will be as follows:

- Regional QC team: Ensure that all of the requirements contained in the Regional QC Guidance Manual have been met. Complete the HRS package QC checklist (p. 5) found in the manual.

- Headquarter QA team: Ensure that the HRS rule has been properly interpreted and applied, and that the documentation record and attached references legitimately support each factor value.

- PRP public comment team: Identify all errors and shortcomings in the documentation record. Try to find "killer issues" that would prevent the EPA from listing the site.

HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site:

Contact Persons

Site Investigation:

(Name) (Telephone)

Documentation Record:

(Name) (Telephone)

Pathways, Components, or Threats Not Evaluated

HRS DOCUMENTATION RECORD

Name of Site:

EPA Region: Date Prepared:

Street Address of Site:

County and State:

General Location in the State:

Topographic Map:

Latitude: Longitude:

Scores

Air Pathway
Ground Water Pathway
Soil Exposure Pathway
Surface Water Pathway

HRS SITE SCORE

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S	S^2
1. Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	_____	_____
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	_____	
2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	_____	
2c. Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	_____	_____
3. Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	_____	_____
4. Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	_____	_____
5. Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		_____
6. **HRS Site Score** Divide the value on line 5 by 4 and take the square root	_____	

REFERENCES

Reference Number	Description of the Reference
1.	U.S. Environmental Protection Agency, Revised Hazard Ranking System, Final Rule, 40 CFR 300, App. A, December 14, 1990.
2.	U.S. Environmental Protection Agency, Superfund Chemical Data Matrix, 9 March 1993, 833 pp., p. B-11, B-15, and B-17. (See following pages.)
3.	U.S. Department of the Interior, Geological Survey. 7.5 Minute Quadrangle Topographic Map: Podunk East, 1952, photorevised 1976; Podunk West, 1958, photorevised 1976; Podunk, 1953, photorevised 1976.
4.	Data-Quik Consultants, Inc., Site Investigation of A2Z Drycleaner's Site, 1989, 72 pp.
5.	Jones, David; former employee of A2Z Drycleaners. Telecon with Fred Fieldguy, Data-Quik Consultants Inc., July 3, 1992.
6.	Smith, Robert; former employee of A2Z Drycleaners. Telecon with Fred Fieldguy, Data-Quik Consultants Inc., July 5, 1992.
7.	Wermchopper, Sandy, Soil Survey of Podunk County, State Agricultural Extension Service, 1984, 322 pp.
8.	Facht, Art E., and Rex, T., The Geology and Paleontology of Podunk County, the State Consortium of Learned Scholars and Animal Husbandry, 1894, 392 pp.
9.	Clamper, Kelly, Podunk Well and Septic Service, Telecon with Fred Fieldguy, Data-Quik Consultants, Inc., June 31, 1992.
10.	Gneisskopf, Cliff, The Geology of Podunk County, the State University, Department of Geology, 1982, 319 pp.
11.	Rooter, Sue R., Supervisor, Podunk County Sewer and Water Authority, Interview with Fred Fieldguy, Data-Quik Consultants, Inc., June 17, 1992.
12.	U.S. Dept. of Commerce, Bureau of the Census, 1990 Summary of Vital Statistics: Podunk County, 150 pp., p.29.

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source:

Name and description of the source:

Location of the source, with reference to a map of the site:

Containment

Gas release to air

Particulate release to air

Release to ground water

Release via overland migration and/or flood

2.4.1 Hazardous Substances

Hazardous substance	Evidence	Reference

2.4.2. Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity

Hazardous Substance	Constituent Quantity (pounds) (Mass - S)	Reference

sum: (pounds)

Hazardous Constituent Quantity Value (S):

2.4.2.1.2. Hazardous Wastestream Quantity

Hazardous Wastestream	Quantity (pounds)	Reference

sum: (pounds)

Hazardous Wastestream Quantity Value (W):

2.4.2.1.3. Volume

Dimension of source (yd^3 or gallons):

References(s):

Volume Assigned Value:

2.4.2.1.4. Area

Area of source (ft^2):

Reference(s):

Area Assigned Value:

2.4.2.1.5. Source Hazardous Waste Quantity Value

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source:

Name and description of the source:

Location of the source, with reference to a map of the site:

Containment

Gas release to air

Particulate release to air

Release to ground water

Release via overland migration and/or flood

2.4.1 Hazardous Substances

Hazardous substance	Evidence	Reference

2.4.2. Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity

Hazardous Substance	Constituent Quantity (pounds) (Mass - S)	Reference

sum: (pounds)

Hazardous Constituent Quantity Value (S):

2.4.2.1.2. Hazardous Wastestream Quantity

Hazardous Wastestream	Quantity (pounds)	Reference

sum: (pounds)

Hazardous Wastestream Quantit. Value (W)

2.4.2.1.3. Volume

Dimension of source (yd^3 or gallons):

References(s):

Volume Assigned Value:

2.4.2.1.4. Area

Area of source (ft^2):

Reference(s):

Area Assigned Value:

2.4.2.1.5. Source Hazardous Waste Quantity Value

Source Hazardous Waste Quantity Value:

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source:

Name and description of the source:

Location of the source, with reference to a map of the site:

Containment

Gas release to air

Particulate release to air

Release to ground water

Release via overland migration and/or flood

2.4.1 Hazardous Substances

Hazardous substance	Evidence	Reference

2.4.2. Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity

Hazardous Substance	Constituent Quantity (pounds) (Mass - S)	Reference

sum: (pounds)

Hazardous Constituent Quantity Value (S):

2.4.2.1.2. Hazardous Wastestream Quantity

Hazardous Wastestream	Quantity (pounds)	Reference

sum: (pounds)

Hazardous Wastestream Quantity Value (W):

2.4.2.1.3. Volume

Dimension of source (yd^3 or gallons):

References(s):

Volume Assigned Value:

2.4.2.1.4. Area

Area of source (ft^2):

Reference(s):

Area Assigned Value:

2.4.2.1.5. Source Hazardous Waste Quantity Value

Source Hazardous Waste Quantity Value:

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value	Containment: Ground Water	Containment: Surface Water	Containment: Gas	Containment: Air Particulate

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Soils underlying the site are of the Balderdash silt-loam series, a member of the Spuria group. Spuria group soils are typic alfasols, developed in-situ from unconsolidated alluvial parent materials. The Balderdash series is characteristic of Spuric soils developed on level to gently sloping (less than 3%) terrain. In the Balderdash, the A_0 horizon extends to a depth of 8 to 12 inches, and is very dark gray to black in hue. The A_0 horizon overlies the A_1 horizon, which may extend to depths of 24 inches. The A_1 horizon changes hue gradually with depth, fading from nearly black to green-gray at its interface with the B horizon. The interface between the A_0 and A_1 horizon may be indistinct, and is usually absent if plowing or other surface disturbance has occurred. The B through E horizons are relatively undifferentiated, below the blanched spodic horizon; being a uniform gray-green throughout. Typically, Balderdash soils extend to a depth of 4 to 5 feet, before grading into the parent material (Ref. 7, p. 14).

The shallowest aquifer underlying the site is an un-named, unconsolidated alluvium. This alluvium is the parent material of the Balderdash soil, and extends to a depth of approximately 30 feet, onsite (Ref. 4, p. 3-2; Ref. 7, p.14; Ref 8, p.42; Ref 10, p.287, Fig. A). Groundwater occurs at a depth of about 20 feet below the site, within the unconsolidated alluvium. (Ref. 4, p. 3-2; Ref. 9; Ref 10, p.287, Fig. A).

Below the unconsolidated alluvium is the Sauber limestone. The Sauber limestone formation is Cretaceous in origin, and contains numerous fossilized dinosaur remains. This formation extends to a depth of approximately 100 feet below land surface (Ref. 8, p. 42). Wells drilled in the Sauber can yield water at rates of up to 10 gpm (Ref. 9). The Sauber is an important regional source of water, especially for private wells (Ref 8, p. 42; Ref. 9).

The Sauber limestone is underlain by the Leche de la Madre shale. This formation is highly fractured (Ref. 8, p. 42). Wells drilled in a fracture can yield water at rates of up to 25 gpm (Ref. 9). The Leche de la Madre shale rests atop the Machtsnichts basalt. The interface of these two units lies at a depth of approximately 200 feet below land surface throughout Podunk County, except along Blackstone Ridge, where the Machtsnichts formation extrudes above ground surface. The Machtsnichts basalt is essentially impermeable, and extends to a depth of approximately 2,000 feet below land surface throughout Podunk County (Ref. 8, p. 42; Ref. 10, p. 287, Fig. A).

An onsite boring, conducted during the 1989 SI, confirms the depths of the Sauber limestone, at 30 feet, and the Leche de la Madre shale, at 100 feet. The total depth of this boring was 125 feet below ground surface. Significantly, no clay layers or other confining units were encountered in this boring (Ref. 4, p. 3-2, Fig. 1-1). Therefore, the three aquifers underlying the site (the unconsolidated alluvium, the Sauber, and the Leche de la Madre) may be considered a single hydrologic unit for HRS scoring

purposes. These three aquifers can also be scored as a single hydrologic unit based on the fact that they are interconnected through the Cross-Border Quarry. The Cross-Border Quarry penetrates all the way down to the Machtsnichts basalt and is 20 acres in area (Ref. 3; Ref. 8, p. 42; Ref 10, Fig. A).

Aquifer/Stratum 1 (shallowest)

Aquifer/Stratum Name: Alluvium/Sauber/Leche de la Madre

Description: The alluvium extends from approximately 5 feet below ground surface (below the soil) to a depth of 30 feet. The Sauber limestone extends from 30 feet to 100 feet below ground surface. The Leche de la Madre shale extends from 100 to 200 feet below ground surface, where it meets the surface of the impermeable Machtsnichts basalt. Because the alluvium, Sauber, and Leche de la Madre formations are interconnected through the Cross-Border Quarry, and because no confining units separate these three aquifers, they have been combined into a single hydrologic unit for HRS scoring purposes.

References: 3, 4, 7, 8, 10.

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Alluvium/Sauber/Leche de la Madre

Chemical Analysis:

- Background Concentration

Sample ID	Top of Screened Interval	Date	Reference
BGW1	20' bgs	3/17/89	4, p.4-1

Sample ID	Hazardous Substance	Concentration	Sample Quantitation Limit	Reference
BGW1	Vinyl Chloride	ND	1.0E -5 ppm	4, p.4-1

- Contaminated Samples

Sample ID	Top of Screened Interval	Date	Reference
MW1	20' bgs	3/17/89	4, p.4-1

Sample ID	Hazardous Substance	Concentration	Sample Quantitation Limit	Reference
MW1	Vinyl Chloride	0.0002 mg/L	1.0E -5 ppm	4, p.4-1

Attribution:
Vinyl Chloride was not detected in the ground water sample taken from BGW1, which is located up-gradient (west) of all sources on site. Vinyl Chloride was detected, above the SQL, in samples taken from MW1, which is located down-gradient from all sources on site (Ref 4., p. 4-1, Fig 1-1). Therefore, the Vinyl Chloride detected in MW1 is at least partially attributable to the sources on this site.

Hazardous Substances Released
Vinyl Chloride

==========

Ground Water Observed Release Factor Value: 550

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Toxicity/ Mobility	Ref.
Vinyl Chloride	None*	10,000	1	10,000	2, p. B17
PCE	All	100	0.01	1	2, p. B15
Lead	All	10,000	0.01	100	2, p. B11

* Vinyl Chloride was not demonstrated to be in any source, through analysis of source samples. However, Vinyl Chloride is a degradation product of PCE, which is present in all sources. The presence of Vinyl Chloride in a release sample from MW1, above background, indicates that a hazardous substance attributable to site sources has been released to ground water. This constitutes an observed release to ground water, documented through chemical analysis.

==========

Toxicity/Mobility Factor Value: 10,000

3.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is source hazardous constituent quantity data complete? (yes/no)
1 (Sump)	102.5	NO
2 (UST)	20.0	NO
3 (Soil)	0.44	NO
4 (AST)	60.0	NO

Sum of Values: 182.94

3.2.3 Waste Characteristics Factor Category Value

Toxicity/Mobility Factor Value X Hazardous Waste Quantity Factor Value: 1,000,000

(10,000 x 100 = 1,000,000)

==========

Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 32

3.3 TARGETS

Well	Distance From Source	Aquifer	Level I Contam. (Y/N)	Level II Contam. (Y/N)	Potential Contam. (Y/N)	Ref.
1	3 - 4 mi.	*	N	N	Y	11, 12
2	2 - 3 mi.	*	N	N	Y	11, 12
3	3 - 4 mi.	*	N	N	Y	11, 12
4	1/4 - 1/2	*	N	N	Y	11, 12
5	0 - 1/4	*	N	N	Y	11, 12

Well 1 = Podunk Municipal
Well 2 = West Mountain Village
Well 3 = East Mountain Village
Well 4 = Agua Peligroso Ranch
Well 5 = A2Z Cleaners

* All wells draw from the Alluvial/Sauber/Leche de la Madre aquifer.

3.3.1 Nearest Well

Well: Agua Peligroso Ranch
Level of Contamination (I, II, or potential): Potential
If potential contamination, distance from source in miles: 1/4 (Ref. 11)

The closest well to the site is actually onsite, at A2Z Cleaners. But, this well was closed in 1983, for reasons other than site-related contamination (Ref. 11). Since no one uses this well any longer, the Agua Peligroso Ranch well was scored as the nearest well.

==========

Nearest Well Factor Value: 20

3.3.2 Population

3.3.2.1 Level of Contamination

3.3.2.4 Potential Contamination

Distance Category	# Connect's.	Population	Reference	Distance-Weighted Population Value
3 - 4	13,025	41, 680	11; 12, p. 29	4,171
2 - 3	35	112	11; 12, p. 29	7
0 - 1/4	3	9.6	11; 12, p. 29	4

Sum of Distance-Weighted Population Values: 4,182

The Podunk Municipal and East Mountain Village wells are in the 3 - 4 miles distance category. The West Mountain Village well is in the 2 - 3 mile category, and the Agua Peligroso Ranch well is in the 0 - 1/4 mile category (Ref. 11). The number of hook-ups for each well was multiplied by 3.2 (persons/household) to estimate populations (Ref 12, p.29).

==========

Potential Contamination Factor Value: 418

3.3.3 RESOURCES

Well	Aquifer	Resource Use	Reference
None identified.			

==========

Resources Factor Value:0

3.3.4 WELLHEAD PROTECTION AREA

Area	Use	Reference	Value
None identified.			

==========

Wellhead Protection Area Factor Value: 0

SUMMARY OF REFERENCES

REF

1. U.S. Environmental Protection Agency, Revised Hazard Ranking System, Final Rule, 40 CFR 300, App. A, December 14, 1990.

2. U.S. Environmental Protection Agency, Superfund Chemical Data Matrix, 9 March 1993, 833 pp., p. B-11, B-15, and B-17.

See the following pages.

3. U.S. Department of the Interior, Geological Survey. 7.5 Minute Quadrangle Topographic Map: Podunk East, 1952, photorevised 1976; Podunk West, 1958, photorevised 1976; Podunk, 1953, photorevised 1976.

Not provided with this exercise.

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
(329 Substances)

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Air Gas	Air Part
Hydrazine	000302-01-2	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	0.5	0.5	0.5	0.5	1000*	100	17	1.0000	Yes	No
Hydrochloric acid	007647-01-0	1000	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	1	1	NA	NA	No	Yes
Hydrogen cyanide	000074-90-8	100	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000*	0.0700	0.5	0.5	0.5	0.5	1000*	1000*	17	1.0000	Yes	No
Hydrogen sulfide	007783-06-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	0.5	0.5	1000	1000	17	1.0000	Yes	No
Indeno(1,2,3-CD)pyrene	000193-39-5	...*	1.0E+00*	1.0E-04*	2.0E-05*	2.0E-09*	1.0000*	1.0000*	50000.0*	50000.0*	50000.0*	50000.0*	...*	...*	NA*	NA *	No	Yes*
Ioxynil	001689-83-4	1000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	0.4000	0.0700	500.0	500.0	500.0	500.0	1000*	1000*	NA	NA	No	Yes
Iron	015438-31-0	...	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	10	10	NA	NA	No	Yes
Isobutanol	000078-83-1	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	0.5	0.5	0.5	0.5	10	1	17	1.0000	Yes	No
Isophorone	000078-59-1	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	5.0	5.0	5.0	5.0	1	1	11	1.0000	Yes	No
Kepone	000143-50-0	10000	1.0E+00*	1.0E-04*	2.0E-01*	2.0E-05*	0.4000	0.4000*	50000.0	5000.0*	50000.0	50000.0	10000*	10000*	0	0.0020	Yes	Yes
Lead	007439-92-1	10000	1.0E+00	1.0E-02	2.0E-03	2.0E-05	1.0000	1.0000	50.0	5000.0	5000.0	5000.0	1000	1000	NA	NA	No	Yes
Lindane	000058-89-9	10000	1.0E+00	1.0E-04	2.0E-01	2.0E-05	1.0000	1.0000	500.0	500.0	500.0	500.0	10000	10000	11	0.0200	Yes	Yes
Magnesium	007439-95-4	...*	1.0E+00*	1.0E+00*	... *	... *	1.0000*	1.0000*	0.5*	0.5*	0.5*	0.5*	...*	...*	NA*	NA *	No	Yes*
Malathion	000121-75-5	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	50.0*	50.0*	50.0*	50.0*	10000	10000	0	0.0020	Yes	Yes
Maleic anhydride	000108-31-6	10	1.0E+00	...	...	...	0.0007*	0.0007*	0.5	0.5	0.5	0.5	1	1	11	1.0000	Yes	No
Maleic hydrazide	000123-33-1	1	1.0E+00*	1.0E+00*	1.0E+00*	1.0E+00*	0.4000	1.0000	0.5	0.5	0.5	0.5	10*	10*	17	0.2000*	Yes	Yes*
Manganese	007439-96-5	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5*	0.5*	50000.0	50000.0	...	...	NA	NA	No	Yes
Mercury	007439-97-6	10000	1.0E+00	1.0E+00	2.0E-05	2.0E-05	1.0000	1.0000	50000.0	50000.0	50000.0	50000.0	10000	10000	11	0.2000	Yes	Yes
Methacrylonitrile	000126-98-7	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	1.0000	0.5	0.5	0.5	0.5	...	...	17	1.0000	Yes	No

* Indicates difference between previous version of chemical data (DEC91) and current version of chemical data.

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
(329 Substances)

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid: Karst	Ground Water Mobility: Liquid: Non-Karst	Ground Water Mobility: Non-Liquid: Karst	Ground Water Mobility: Non-Liquid: Non-Karst	Persistence: River	Persistence: Lake	Bioaccumulation: Food Chain: Fresh	Bioaccumulation: Food Chain: Salt	Bioaccumulation: Environmental: Fresh	Bioaccumulation: Environmental: Salt	Ecotoxicity: Fresh	Ecotoxicity: Salt	Air Gas Migration	Air Gas Mobility	Air Gas	Air Part
Pyridine	000110-86-1	1000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	1.0000	0.5	0.5	0.5	0.5	100	10*	11	1.0000	Yes	No
Quinoline	000091-22-5	1000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	50.0*	50.0*	1000	1000	11	0.2000	Yes	Yes
Resorcinol	000108-46-3	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	1000*	10*	6	0.0700	Yes	Yes
Ronnel	000299-84-3	10	1.0E+00	1.0E-04	2.0E-01	2.0E-05	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	10000*	10000*	NA	NA	No	Yes
Selenium	007782-49-2	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	5000.0	50.0	5000.0	50.0	100	100	NA	NA	No	Yes
Selenourea	000630-10-4	100	1.0E+00	...	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Silver	007440-22-4	100*	1.0E+00	1.0E-02	2.0E-05	2.0E-07	1.0000	1.0000	50.0	50.0	50.0	50.0	10000	10000	NA	NA	No	Yes
Silver Cyanide	000506-64-9	10	1.0E+00	1.0E-02	2.0E-05	2.0E-07	1.0000	1.0000	500.0*	500.0*	500.0*	500.0*	...	...	NA	NA	No	Yes
Sodium	007440-23-5	...	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	0.5	0.5	0.5	0.5	...	...	NA	NA	No	Yes
Strychnine	000057-24-9	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	1000	1000	NA	NA	No	Yes
Styrene	000100-42-5	10	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	1.0000	50.0	50.0	50.0	50.0	100*	10	17	1.0000	Yes	No
Sulfuric Acid	007664-93-9	1000	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	10	10	NA	NA	No	Yes
TB, 2,4,5-	000093-80-1	...	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	0.0700	500.0	500.0	500.0	500.0	...	...	0	0.0020	Yes	Yes
TCDD	001746-01-6	10000	1.0E+00	1.0E-04	2.0E-05	2.0E-09	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	...	...	6	0.0002	Yes	Yes
Tetrachlorobenzene, 1,2,4,5-	000095-94-3	10000	1.0E+00	1.0E-04	2.0E-03	2.0E-07	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	100	100	17	0.2000	Yes	Yes
Tetrachlorodibenzofuran, 2,3,7,8-	1746-01-6	...*	1.0E+00*	... *	... *	... *	0.4000*	0.0700*	0.5*	0.5*	0.5*	0.5*	...*	...*	NA*	NA *	No	Yes*
Tetrachloroethane, 1,1,1,2-	000630-20-6	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	0.4000	50.0	50.0	50.0	50.0	10	10	17	1.0000	Yes	No
Tetrachloroethane, 1,1,2,2-	000079-34-5	10	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	1.0000	5.0	5.0	5.0	5.0	100	100	11	1.0000	Yes	No
Tetrachloroethene	000127-18-4	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	1.0000	50.0	50.0	50.0	50.0	100	100	17	1.0000	Yes	No

* Indicates difference between previous version of chemical data (DEC91) and current version of chemical data.

HAZARD RANKING SYSTEM
Hazardous Substance Factor Values
(329 Substances)

Substance Name	CAS Number	Toxicity	Ground Water Mobility: Liquid Karst	Ground Water Mobility: Liquid Non-Karst	Ground Water Mobility: Non-Liquid Karst	Ground Water Mobility: Non-Liquid Non-Karst	Persistence River	Persistence Lake	Bioaccumulation: Food Chain Fresh	Bioaccumulation: Food Chain Salt	Bioaccumulation: Environmental Fresh	Bioaccumulation: Environmental Salt	Ecotoxicity Fresh	Ecotoxicity Salt	Air Gas Migration	Air Gas Mobility	Gas	Part
Trichlorophenol, 2,3,5-	000933-78-8	...	1.0E+00	1.0E-04	2.0E-01	2.0E-05	1.0000	1.0000	5000.0	5000.0	5000.0	5000.0	...	...	6	0.0200	Yes	Yes
Trichlorophenol, 2,3,6-	000933-75-5	...	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	500.0	500.0	500.0	500.0	...	...	6	0.0200	Yes	Yes
Trichlorophenol, 2,4,5-	000095-95-4	10	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	0.4000	500.0	500.0	5000.0	5000.0	1000	1000	11	0.2000	Yes	Yes
Trichlorophenol, 2,4,6-	000088-06-2	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0000	0.4000	500.0	500.0	50000.0*	50000.0*	1000	100	11	0.2000	Yes	Yes
Trichlorophenol, 3,4,5-	000609-19-6	...	1.0E+00	1.0E-02	2.0E-01	2.0E-03	1.0000	1.0000	500.0	500.0	500.0	500.0	1000*	1000*	11	0.0200	Yes	Yes
Trichlorophenoxyacetic acid, 2,4,5-	000093-76-5	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	0.0700	50.0	50.0	500.0	500.0	1000*	1000*	0	0.0020	Yes	Yes
Trichloropropane, 1,2,3-	000096-18-4	100	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	1.0000	5.0	5.0	5.0	5.0	10*	10*	11	1.0000	Yes	No
Triethanolamine	000102-71-6	1	1.0E+00	1.0E+00	...	...	0.4000	0.0700	0.5	0.5	0.5	0.5	1*	1*	0	0.0020	Yes	Yes
Trifluralin	001582-09-8	100	1.0E+00	1.0E-04	2.0E-01	2.0E-05	1.0000	1.0000	5000.0	5000.0	50000.0	50000.0	10000	1000	11	0.0200	Yes	Yes
Trinitrobenzene, 1,3,5-	000099-35-4	10000	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.0700	5.0	5.0	5.0	5.0	100	100	6	0.0200	Yes	Yes
Trinitrotoluene	000118-96-7	1000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	1.0000	1.0000	5.0	5.0	5.0	5.0	100*	100*	6	0.0200	Yes	Yes
Tris (2,3-dibromopropyl) phosphate	000126-72-7	1000	1.0E+00	1.0E-04	2.0E-01	2.0E-05	1.0000	1.0000	5000.0	5000.0	5.0	5.0	...	...	11	0.0200	Yes	Yes
Uranium 238 (radionuclion)	007440-61-1	...*	1.0E+00*	1.0E-02*	2.0E-05*	2.0E-07*	0.4000*	0.0700*	50000.0*	50000.0*	50000.0*	50000.0*	...*	...*	NA*	NA *	No	Yes*
Vanadium	007440-62-2	100*	1.0E+00*	1.0E-02*	... *	... *	1.0000*	1.0000*	0.5*	0.5*	0.5*	0.5*	...*	...*	NA*	NA *	No	Yes*
Vanadium pentoxide	001314-62-1	100	1.0E+00	...	...	...	1.0000	1.0000	0.5	0.5	0.5	0.5	100*	100*	NA	NA	No	Yes
Vinyl acetate	000108-05-4	10	1.0E+00	1.0E+00	1.0E+00	1.0E+00	0.4000	0.4000*	0.5	0.5	0.5	0.5	10	100	17	1.0000	Yes	No
Vinyl chloride	000075-01-4	10000	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.0007	0.0700	5.0	5.0	5.0	5.0	...	...	17	1.0000	Yes	No
Warfarin	000081-81-2	10000	1.0E+00	1.0E-02	2.0E-01	2.0E-03	0.4000	0.0700	50.0	50.0	50.0	50.0	10	10	NA	NA *	No *	Yes
Xylene, m-	000108-38-3	1*	1.0E+00	1.0E-02	1.0E+00	1.0E-02	0.4000	1.0000	500.0	500.0	500.0	500.0	100	10*	17	1.0000	Yes	No

* Indicates difference between previous version of chemical data (DEC91) and current version of chemical data.

4. Data-Quik Consultants, Inc., Site Investigation of A2Z Drycleaner's Site, 1989, 72 pp.

Pg. 1-2: The A2Z Drycleaners site occupies approximately 2 acres. The area surrounding the site is primarily agricultural. The site consists partially of a paved lot surrounded by a chain-link fence. There is a wastewater treatment system on the west side of the facility. The main building on-site is approximately 35,000 square feet and contains the laundry wastewater clarifiers, the vehicle maintenance area, two former dry cleaning areas, and other business operations. See Fig. 1-1 for a schematic of the facility.

Pg. 1-3: The site is located in a topographic depression. The nearest surface water body is the Podunk River, which is 5 miles south of the site.

Pg. 1-4: The population within 2 miles of the site is sparse. There are 3 families living on a ranch approximately 1/4 mile from the site.

Pg. 1-6: Prior to construction of the facility in 1969, the site was undeveloped. From 1969 to 1977 the current plant was operated as an industrial laundry facility for Lincoln Industrial Services. On-site laundry operations consisted of 60% water wash and 40% drycleaning. In 1977, the facility was purchased by A2Z Drycleaners and was operated as a central laundry facility for a number of various industries. On-site laundry operations consisted of 50% water wash and 50% dry cleaning during that this time. In 1983, A2Z Drycleaners discontinued its dry cleaning operations and the facility was closed.

Pg. 1-7: A2Z Drycleaners dry cleaned soiled work uniforms. Dry cleaning operations consisted of 50% of the total laundry volume at the site. The dry cleaning units were equipped with self-contained solvent storage compartments for spent and reclaimed solvent. Spent solvent recovery was accomplished through the use of vapor recovery, multiple stage condenser stills, and diatomaceous earth filters. Product PCE, contained in tanks, was piped directly into the dry cleaning machine.

Pg. 1-8: Facility records indicate that the drycleaning operation utilized approximately 2 gallons of water and detergent along with PCE solvent per wash to remove water soluble stains. PCE was used at a rate of approximately 60 gallons for 1,000 to 2,000 pounds of laundry.

Pg. 1-10: Wastewater containing spent PCE and lead from the drycleaning process was discharged into an on-site wastewater treatment system. The on-site treatment system was designed to reclaim solvents and remove particulates prior to the release of the wastewater into the public sewer system.

Pg. 1-15: There is a sump next to the wastewater treatment system that is designed to contain overflow from the system.

Pg. 1-16: The dimensions of the sump were measured as 20'x4'x4'.

Pg. 1-17: It is observed that the sump is made of concrete and is cracked and uncovered. No liner was observed during the SI.

Pg. 1-19: During the SI, stained soil was observed next to the sump. This area was also devoid of vegetation.

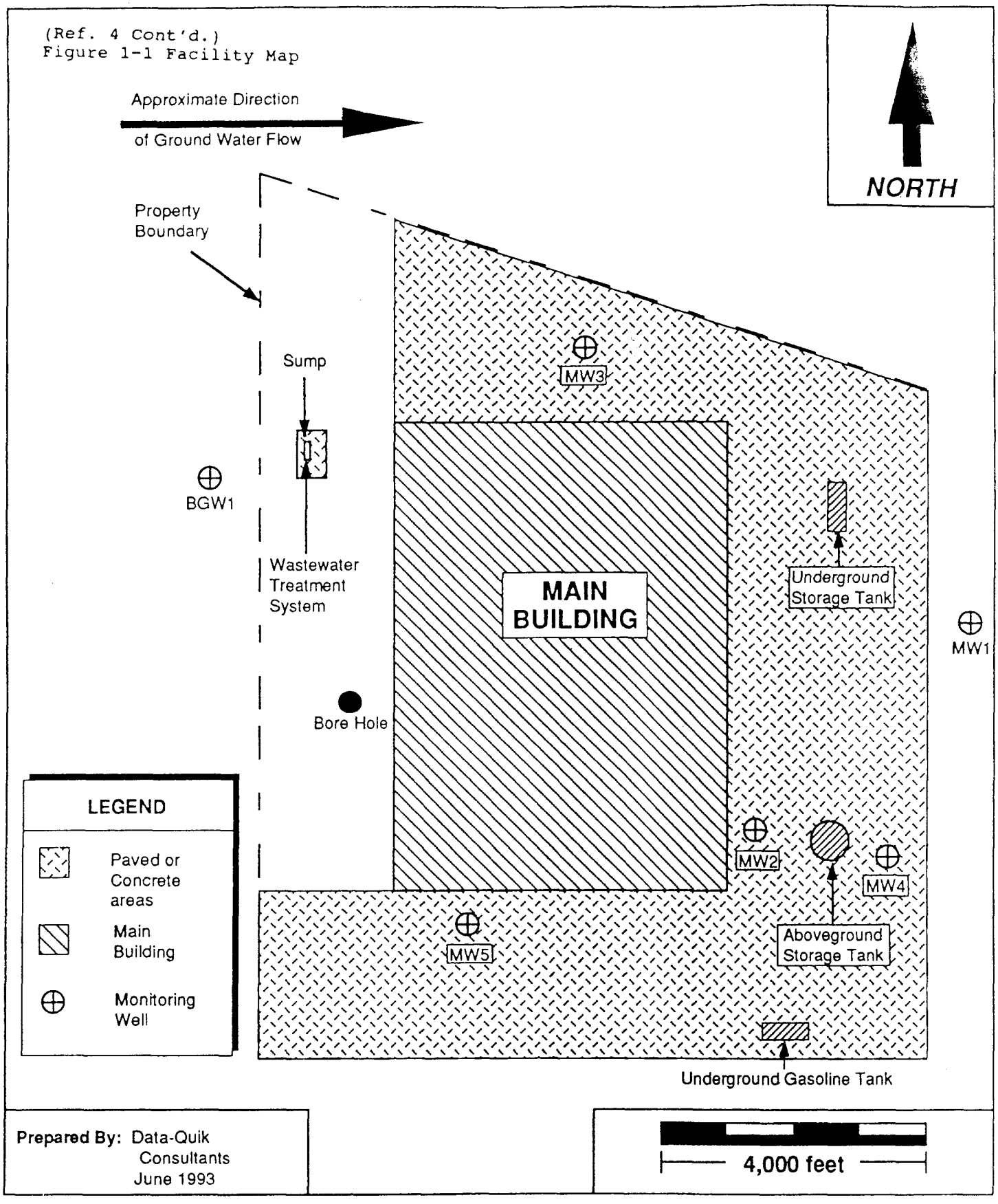


Figure 1-1
Facility Map
A2Z Drycleaners

(Ref. 4 Cont'd.)

Pg. 1-20: Five samples of the discolored soil next to the sump were taken. Analysis of these samples indicate high concentrations of lead and PCE. In addition, a background sample was taken for comparison. Appropriate QA/QC methods were implemented and none of the data were qualified. Complete analyses of these soil samples are included as Appendix A of this report. The CLP laboratory QA/QC report for these analyses are included as Appendix B. See Figure 1-2 for soil sample locations and Table 1-2 for a summary of the analytical results.

Table 1-2

	Soil Samples Analysis in mg/kg						
	S-1	S-2	S-3	S-4	S-5	S-6	SQL
PCE	500	40	<5	100	50	425	5
lead	3,900	2,000	59	15,200	1,300	6,200	50

Pg. 1-25: There is an above ground storage tank in the southwest side of the facility. According to facility records, it was purchased in 1979 and used to store product PCE.

Pg. 1-26: Because of its recent purchase, the tank was installed in compliance with the new state regulations.

Pg. 1-27: The tank is located under a weather-sheltered structure and surrounded by intact berms. The structure is situated on an elevated cement pad. At the SI, there were no signs of leakage or contaminated soil.

Pg. 1-28: According to the purchase order, the tank is constructed of double-walled steel and the capacity of the above ground tank is 30,000 gallons.

Pg. 1-29: Prior to closure of the facility in 1983, the above ground storage tank was clean-closed according to the state regulations. However, at the time of the SI, the tank remains on-site.

Pg. 1-30: There is an underground storage tank in the northeast corner of the facility that stored PCE until 1979 when it failed a pressure test conducted by the state. The tank remains on-site. During the SI, a sample of the residual sludge was collected from the bottom of the tank and PCE was detected at 5,200 ppm.

Pg. 1-32 A 5,000-gallon fuel tank is located in the southeast corner of the property. The tank was used to store unleaded gasoline for use in the laundry delivery trucks. At the time of the SI, this tank was still present at the site and found to be leaking fuel.

Pg. 2-3: According to facility records, throughout the operating life of the facility, sediment from the sump was dredged and removed on a monthly basis. Each month, 500 pounds of sediment were removed and drummed for off-site disposal at a nearby, unpermitted, landfill. Prior to off-site disposal, the drums were sampled and analyzed for content. During the SI, records of statistically representative analytical results were found in the facility records. These results are presented in Table 2-1.

Ref. 4 (Cont'd.)

Table 2-1

	Percent of constituent in waste (per 500 lbs of sediment)			
Constituent	March 1981	April 1981	May 1981	June 1981
PCE	2.5%	2.0%	2.5%	1.8%
lead	3.1%	3.1%	3.0%	2.5%

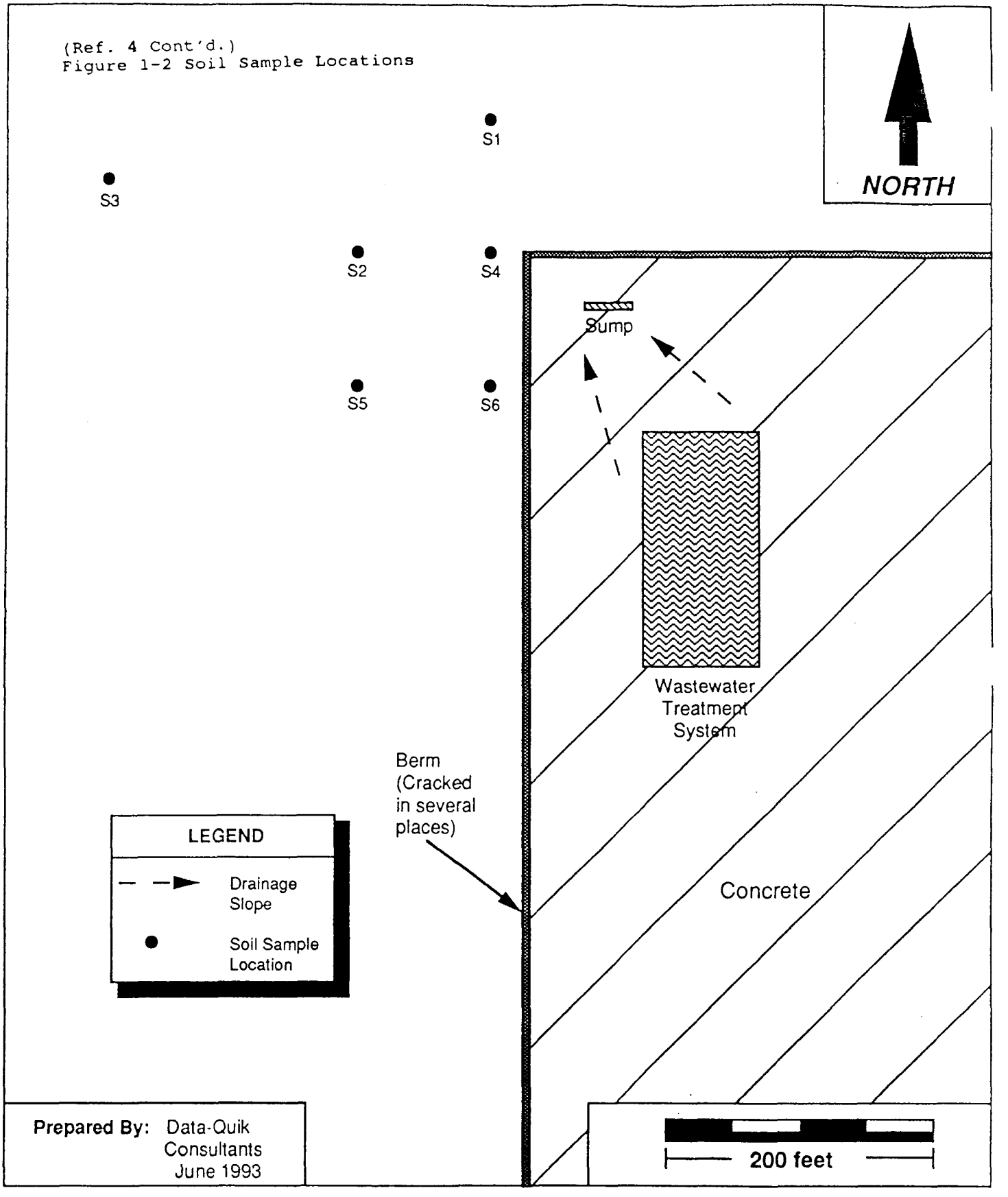


Figure 1-2
Soil Sample Locations
A2Z Drycleaners

(Ref. 4 Cont'd.)

Pg. 3-2: Chilly Drillers, Inc. were contracted to drill a 125-foot deep uncased borehole onsite in February 1989. The purpose of this boring was to determine the stratigraphy underlying the site. The location of this borehole is indicated on Figure 1-1. Significantly, no clay layers or other confining units were encountered within the entire depth of the boring. The materials encountered during drilling are listed below, by increasing depth:

Surface to 2' depth: Dark organic soil materials.

2' to 5' depth: Gray-green soil materials, grading to sandy silt with chert inclusions.

5' to 30' depth: Unconsolidated sandy silt with chert inclusions. Ground water was encountered at a depth of 20', and was continuous throughout remainder of boring.

30'to 100' depth: Oolithic gray limestone was encountered at 30' below ground surface, requiring use of 4X tungsten bit. This limestone extended to a depth of 100'.

100' to 125' depth: Clastic black to dark gray shale was encountered at a depth of 100', and continued to the termination of the boring at a depth of 125'.

Pg. 4-1: **Summary of Sample Results**

All samples were collected using Standard Sampling Protocol #482 (see Appendix C), on March 17, 1989. Complete sample analyses are included as Appendix A of this report. The laboratory QA/QC report for these analyses are included as Appendix B. The locations of the site sources and monitoring wells are depicted in Figure 1-1 of this report. The top of the screened interval in each monitoring well is 20' below ground surface.

The significant results of these analyses are summarized, as follows:

Background Samples:

BGW1 - All samples collected from the background monitoring well (BGW1) were "non-detect" for all analytes. This well was selected as representative of background conditions near the site. Ground water flow is to the East, locally, and BGW1 is westward of all site sources.

Release Samples:

MW1 - All samples taken from monitoring well #1 (MW1) exhibited measurable concentrations of vinyl chloride. The highest concentration of vinyl chloride was detected in sample number XT1000, at 0.0002 mg/L (the SQL for Vinyl Chloride in all samples analyzed was 1.0E -5 ppm). No other analytes were detected in any samples taken from MW1.

MW2 through MW5 - All samples collected from all of these wells were "non-detect" for all analytes.

5. Jones, David; former employee of A2Z Drycleaners. Telecon with Fred Fieldguy, Data-Quik Consultants Inc., July 3, 1992.

Mr. Jones stated that the wastewater treatment system backed up once a month and wastewater overflowed into the sump. He also stated that on occasion, the sump itself would overflow into the nearby field.

6. Smith, Robert; former employee of A2Z Drycleaners. Telecon with Fred Fieldguy, Data-Quik Consultants Inc., July 5, 1992.

Mr. Smith stated that from 1970 to 1979 there was a 10,000-gallon underground storage tank in the northeast corner of the facility that stored product PCE. The facility discontinued use of the underground storage tank in 1979 when it installed an above ground tank. The above ground tank and its associated berms were maintained and inspected regularly during its use.

7. Wermchopper, Sandy, Soil Survey of Podunk County, State Agricultural Extension Service, 1984, 322 pp.

Pg. 14: Soils underlying the site are classified as Balderdash silt-loam series, a member of the Spuria group. Spuria group soils are typic alfasols, developed in-situ from unconsolidated alluvial parent materials. The Balderdash series is characteristic of Spuric soils developed on level to gently sloping (less than 3%) terrain. In the Balderdash, the A_0 horizon extends to a depth of 8 to 12 inches, and is very dark gray to black in hue. The A_0 horizon overlies the A_1 horizon, which may extend to depths of 24 inches. The A_1 horizon changes hue gradually with depth, fading from nearly black to green-gray at its interface with the B horizon. The interface between the A_0 and A_1 horizon may be indistinct, and is usually absent if plowing or other surface disturbance has occurred. The B through E horizons are relatively undifferentiated, below the blanched spodic horizon, being a uniform gray-green throughout. Typically, Balderdash soils extend to a depth of 4 to 5 feet, before grading into the parent material.

8. Facht, Art E., and Rex, T., The Geology and Paleontology of Podunk County, the State Consortium of Learned Scholars and Animal Husbandry, 1894, 392 pp.

Pg. 42: The recent completion of the Cross-Border stone quarry has afforded an opportunity of great scientific importance in the study of Podunk County's geologic and paleontologic history. The Cross-Border quarry, located in Western Podunk County, is a marvel of modern engineering. Through the use of steam driven shovels and dynamite, the quarry has been completed at a depth of two hundred feet below the surface of the earth. Because all of the stratigraphic units transected by the excavation are water-bearing, it is not without the considerable efforts of man and beasts that the waters have been continuously pumped free of the excavation. As pumping operations will soon be discontinued, the authors have hastily chronicled the stratigraphy and paleontology of this excavation, in anticipation that its secrets will soon be surrendered to the depths.

The stratigraphic units exposed by this excavation are as follows:

From the surface of the earth to a depth of four feet, fine agricultural soils are in evidence. From five feet to a depth of thirty are found an unconsolidated alluvium, which is very transmissive of water below twenty feet.

Below the alluvium is found a limestone known as the Sauber formation, which extends to a depth of 100 feet. The Sauber is replete with oolites, which were at first thought to be the eggs of the dinosaurs whose remains riddle this formation. Alas, the oolites are nothing but calcareous agglomerations; but the Cretaceous-aged dinosauran fossils are as fine a collection as has been found in North America. Twelve species of dinosaurs have been identified from the fossil record of the Cross-Border excavation, as is further documented in Chapter Eighteen of the instant treatise. As the Sauber Limestone is an important source of steam-drilled well water in Podunk County, many a citizen may be surprised to learn that his daily water is extracted from amongst the earthly remains of these fallen giants.

The Sauber Limestone is underlain by the Leche de la Madre shale, so named by the Spanish Conquistadors who drank its waters as they emanated from springs that line the banks of the Podunk River, five miles distant to the South. The Leche de la Madre is highly fractured, and extends to a depth of some two hundred feet below the surface of the earth. The Leche de la Madre is underlain by the Machtsnichts basalt, an impermeable floor which retains all waters collected in the Cross Border quarry. As this basalt is extremely hard and has little economic value, quarrying operations have ceased at the depth at which it is encountered.

9. Clamper, Kelly, Podunk Well and Septic Service, Telecon with Fred Fieldguy, Data-Quik Consultants, Inc., June 31, 1992.

I called Mr. Clamper (Kelly) to inquire about aquifers underlying the site. Kelly was very familiar with the site area, and happy to answer questions. Kelly said that, in colonial times, wells were hand dug to a depth of about 25 feet. But, this proved unsatisfactory, since the alluvial overburden completely dries out every summer, when the water table drops to below 30 feet. Kelly knew of no wells currently in use that are screened in the alluvial overburden.

As soon as steam-powered drills were invented, people started drilling their wells into the Sauber Limestone (according to Kelly). Many private wells are still screened in the Sauber, today. These wells can yield up to 10 gpm; adequate for home or farm use. Most community or municipal wells, however, are screened deeper; into the highly-fractured Leche de la Madre shale. These wells can yield up to 25 gpm, if drilled into a fracture.

10. Gneisskopf, Cliff, The Geology of Podunk County, the State University, Department of Geology, 1982, 319 pp.

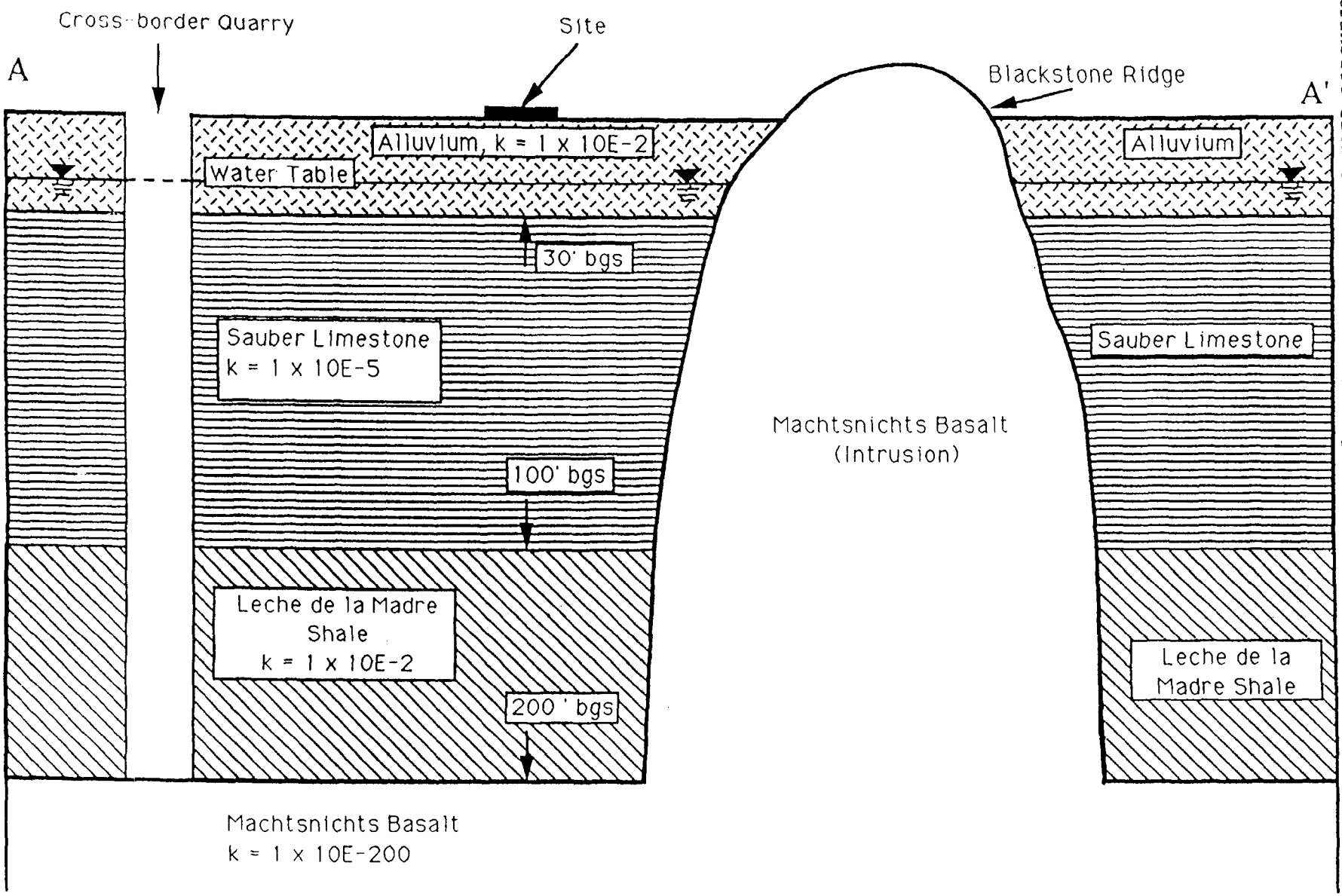
Pg. 287: The first true "bedrock" encountered in the region lies at an average depth of 30 feet. This is the surface of the Sauber formation, an oolithic limestone with a hydraulic conductivity (K value) of approximately 1 x 10E -5 cm/sec. The Sauber formation extends to an average depth of 100 feet below ground surface.

The Sauber limestone is overlain by an un-named unconsolidated alluvium, which was probably deposited as part of the outwash plain of the Great Podunk Glacier, during the last ice age. This alluvium has an average K value of 1 x 10E -2.

The Sauber limestone is underlain by the highly clastic Leche de la Madre shale. This shale occurs between 100 and 200 feet below ground surface throughout Podunk County, and is a primary drinking water aquifer. The average K value for the Leche de la Madre shale is 1 x 10E -2.

The Leche de la Madre shale rests atop the Machtsnichts basalt. The interface of these two units lies at a depth of approximately 200 feet below land surface throughout Podunk County, except along Blackstone Ridge, where the Machtsnichts formation extrudes above ground surface as an igneous intrusion. The Machtsnichts basalt is essentially impermeable, with a K value of approximately 1 x 10E -200. The Machtsnichts formation extends to a depth of approximately 2,000 feet below land surface throughout Podunk County.

Figure A, below, illustrates a geologic cross-section of Podunk County form 0 to 220 feet below ground surface.



vertical exaggeration = X 1,000

(Ref. 10, Cont'd.)
Figure A, below, illustrates a geologic cross-section of Podunk County from 0 to 220 feet below ground surface. This cross-section was taken along an east-west transect from the Cross-Border Quarry to East Mountain Village.

11. Rooter, Sue R., Supervisor, Podunk County Sewer and Water Authority, Interview with Fred Fieldguy, Data-Quik Consultants, Inc., June 17, 1992.

I visited Ms. Rooter (Sue) to inquire about target wells within four miles of the site. Sue said that it should be easy to document these wells, since that area is very sparsely populated (almost all of it belonging to the Agua Peligroso Ranch). After consulting her well permit files, Sue told me that she was aware of five wells within the TDL; three public wells, and two private wells. All of these wells are tested annually by the Podunk County Health Department, and no contamination has ever been detected in any of them. These 5 wells are listed below, and have been hand-drawn on the attached map (sketch):

1) The Podunk Municipal well is located about three and one-half miles southwest of the site, on Ranch Road. This well is screened between 150 and 200 feet below ground surface. This well is in almost continual operation, feeding the Podunk water tower. Water from the tower is gravity-fed to the town of Podunk, two miles west of the well. This well is the sole source of water for the Podunk municipal water system, which has about 13,000 connections.

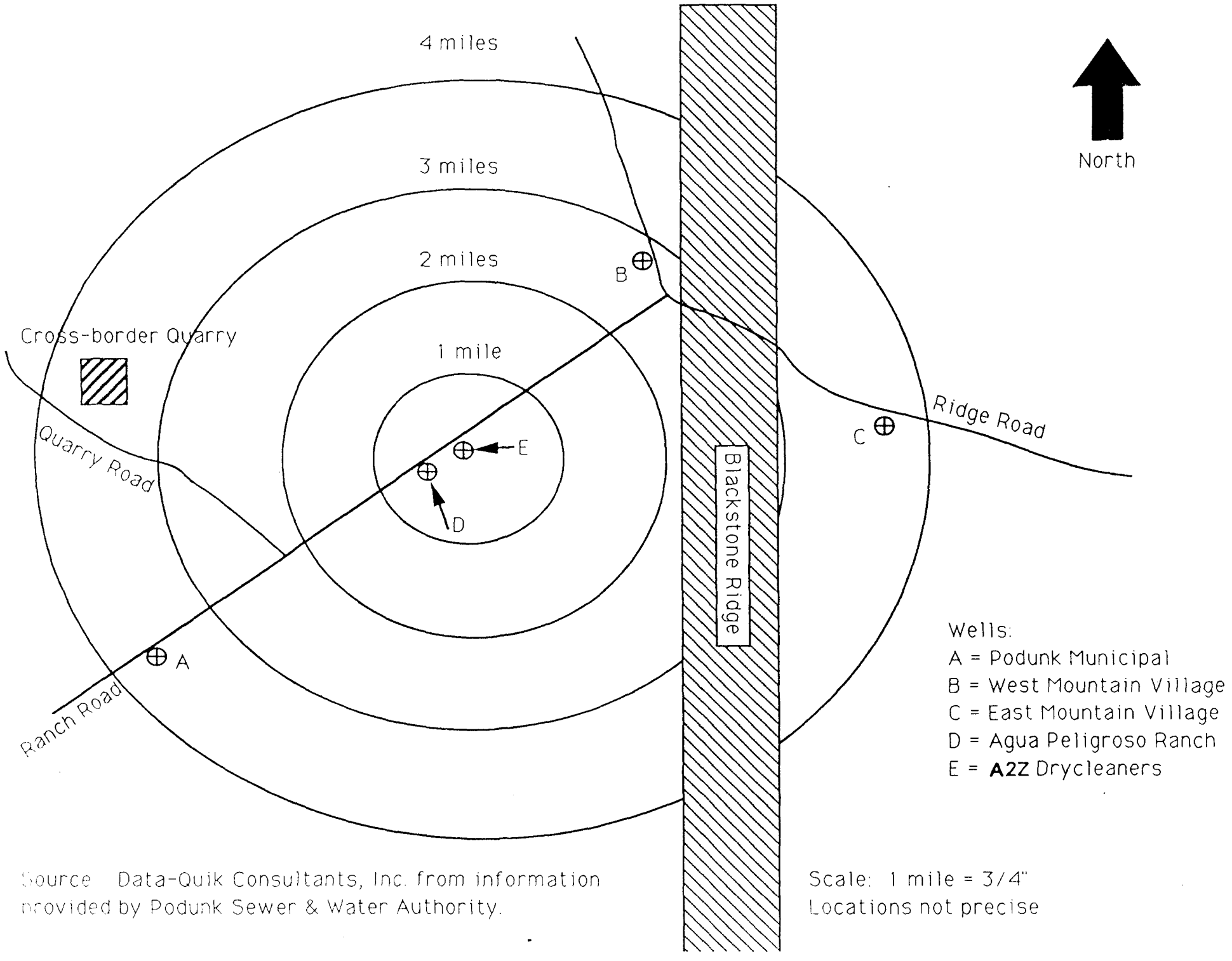
2) West Mountain Village, a subdivision on Ridge Road, has a community well that serves 35 single-family homes. This well is located about two and three quarters miles northeast of the site, and is screened between 55 and 75 feet below ground surface.

3) East Mountain Village, another subdivision on Ridge Road, has a community well that serves 25 single-family homes. This well is located almost four miles east of the site, and is screened between 55 and 75 feet below ground surface.

4) The Agua Peligroso Ranch is located about 1/4 mile west of the site. The Ranch's water comes from a single windmill-driven well that feeds an elevated storage tank. Water from the tank is then gravity-fed to the ranch houses and outbuildings. Three families (the property owners and two tenant families) use water from this well. This well is screened between 50 and 75 feet below ground surface.

5) A2Z Drycleaners has a single well onsite. This well was capped and locked by the County when A2Z went out of business, around 1983. This well is screened between 125 and 150 feet below ground surface. This well was used for drinking water, by A2Z's employees, and for some industrial (laundering) processes. No contamination was ever detected in this well.

Ref. 11 (Cont'd) Well Location Sketch



Source: Data-Quik Consultants, Inc. from information provided by Podunk Sewer & Water Authority.

Scale: 1 mile = 3/4"
Locations not precise

12. U.S. Dept. of Commerce, Bureau of the Census, 1990 Summary of Vital Statistics: Podunk County, 150 pp., p.29.

The average population per household in Podunk County is 3.2 persons.

Cross-Referenced WordPerfect Format

HRS DOCUMENTATION RECORD
GENERAL INSTRUCTIONS

The HRS documentation record provides a public record of the information the Agency relies upon to reach its listing decision for the site. Before beginning the documentation record for a site, you must first evaluate all site information to determine what HRS factors will be scored and how that information documents those factors. For example, evaluate analytical results from the site to decide what samples represent background levels and whether or not any samples meet the criteria for an observed release before preparing the Chemical Analysis part of the Observed Release section of the documentation record.

Include documentation for all HRS factors that are evaluated. If you evaluate more than one aquifer for the ground water migration pathway, include a separate copy of the ground water portion of the documentation record for each aquifer. Similarly, if you evaluate more than one watershed for the surface water migration pathway, include a separate copy of the surface water portion of the documentation record for each watershed.

Delete the pages documenting any HRS factors that are not evaluated. For example, the HRS requires that you evaluate potential to release for a watershed only if an observed release cannot be established for that watershed. If an observed release is established for the watershed, delete the pages documenting the potential to release for that watershed. Similarly, delete the pages for any migration pathway that is not evaluated.

Remember that all assertions of fact in the documentation record must be referenced. References to analytical results should include the sample number or other identifier. If calculations were performed to estimate a value, include the calculations as an attachment or a reference. The HRS value that is assigned to each factor must be supported by the references provided.

The printed version of the documentation record has companion instructions to help you understand the requirements of the documentation record. If you are unsure about how the instructions apply to a particular situation, consult the HRS itself. The HRS is the definitive source on scoring a site. If you cannot resolve the difficulty at the regional level, document the problem and refer it to EPA Headquarters for resolution.

A companion WordPerfect® version of the documentation record has the instructions embedded as comments. As you enter information into the documentation record, you will see the instructions, but the printed copies for the public docket will not include the instructions. If you need extra space to document an assigned value, WordPerfect will automatically provide extra pages; please do not change or add any hard page breaks to the documentation record. A separate section entitled "Instructions for Documentation Record Typists" provides more detailed instructions for using the WordPerfect version.

In many places in the documentation record, you will be asked to copy data or assigned values at the bottom of the page. This will assist EPA in entering the information into a database. If you are using the WordPerfect version, please do not alter these data entry areas of the documentation record except to enter the information requested.

You will also be asked to enter factor values into the HRS scoresheets, Tables 3-1, 4-1, 5-1, 6-1, 6-2, and 6-8. Complete those tables as directed in the HRS, and place the completed scoresheet table(s) at the end of the appropriate pathway in the documentation record. You may use EPA's HRS Scoring Spreadsheet in Lotus 123® to produce these tables.

HRS DOCUMENTATION RECORD–REVIEW COVER SHEET

Name of Site:

Contact Persons

Site Investigation:

(Name) (Telephone)

Documentation Record:

(Name) (Telephone)

Pathways, Components, or Threats Not Evaluated

List below any pathway, component, or threat that was not evaluated, along with a brief rationale. Delete the corresponding pages from the documentation record below.

Avoid stating that there was "no risk" for a particular pathway. Instead, give a nonjudgmental explanation of why that pathway would not have generated a significant HRS score.

Refer to the following sections of the HRS Guidance Manual, Interim Final, November 1992 (HRSGM):

- *Sec. 2.2, Scoring All Pathways and Threats, p. 11.*
- *Sec. 3.1, General Approach to HRS Scoring, Step 3: Identify and Characterize Significant Pathways, p. 23.*
- *Sec. 3.4, HRS Scoring Strategy, p. 31.*

HRS DOCUMENTATION RECORD

Name of Site:
EPA Region: Date Prepared:
Street Address of Site:
County and State:

Attach an 8"x 11" map showing the general location of the site within the state and including large cities and nearby county boundaries.

Refer to the Regional Quality Control Guidance for NPL Candidate Sites, December 1991 (RQCG), Appendix D, Map Specifications for the HRS Documentation Record.

Describe the general location of the site in the state, e.g, Central Illinois, Northeast New Jersey, and give the name of the USGS topographic map(s) on which the site is located.

General Location in the State:
Topographic Map:

Provide universal coordinates of the site in degrees, minutes, and seconds.

Refer to the Guidance for Performing Preliminary Assessments Under CERCLA, September 1991, Appendix E, Standard Operating Procedure to Determine Site Latitude and Longitude Coordinates.

Latitude: Longitude:

Copy the applicable pathway scores and the site score below.

Scores

Air Pathway
Ground Water Pathway
Soil Exposure Pathway
Surface Water Pathway

HRS SITE SCORE

WORKSHEET FOR COMPUTING HRS SITE SCORE

Enter the pathway, component and threat scores from the HRS Tables as indicated. If you do not evaluate a pathway or component, write "Not Evaluated" in the appropriate blank in this worksheet.

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	____	____
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	____	
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	____	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	____	____
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	____	____
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	____	____
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		____
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root	____	

REFERENCES

Assign each reference a number and refer in the documentation record to a reference number and page.

Reference Number	Description of the Reference

Give a reference for each assertion in the documentation record when the assertion is made. For any reference with 5 or more pages, identify not only the reference number but the page number (e.g., ref. 23:18-20). For non-paginated references, e.g., data reports, supply page numbers manually. Where analytical results are discussed, include the sample number or identifier. If calculations were performed to estimate a value, include the calculations as an attachment or a reference.

Refer to:

- *RQCG Sec. 2.4.4, List of Reference Materials, p. 18, and remainder of Sec. 2.4, p. 15.*
- *HRSGM Sec. 3.2, The HRS Scoring Package, References, pp. 28-29.*

SOURCE DESCRIPTION

2.2 Source Characterization

Make a separate copy of sections 2.2 through 2.4.2.1.5 of the documentation record for each source at the site (See section 1.0 for definitions). The information collected below will be used in evaluating Waste Characteristics and Likelihood of Release under each migration pathway; however, no factor values will be assigned in this section. Information used in evaluating the Soil Exposure pathway will be documented separately.

Refer to:
- *HRSGM Sec. 2.1, Source and Site Definitions, p. 9.*
- *HRSGM Chapter 4, Sources, p. 41.*

Since response actions are considered by the HRS, with exceptions for sources where there is evidence that contaminants have migrated from the site, or where there is reasonable concern about the potential for migration from the site, distinguish between current conditions and conditions prior to any response actions, as appropriate.

Refer to HRSGM Sec. 2.3, Evaluation of Sites With Waste Removals, p. 11.

If there are hazardous substances and hazardous wastestreams at the site that cannot be allocated to any specific source, fill out the "unallocated source" description separately for use in the hazardous waste quantity factor. Also assign the hazardous substances to sources as appropriate.

Refer to HRSGM Sec. 4.1, Characterization of Sources and Areas of Observed Contamination, Tips and Reminders, p. 48.

Number of the source:

Use this number to identify this source throughout the documentation record. Enter this number in the headers for sections 2.4.1 through 2.4.2.1.5 of the documentation record.

Name and description of the source:

Location of the source, with reference to a map of the site:

Refer to RQCG, Appendix D, Map Specifications for the HRS Documentation Record, Source Characterization, p. D-4.

Containment

Fully describe the methods currently in use to provide containment of the hazardous substance source. In addition, if response actions have been carried out, give a complete description of conditions for the source prior to any response actions. For sources where there has been evidence of contaminant migration in the past, provide information on the state of containment associated with that migration.

Refer to:

- *HRSGM Sec. 4.1, Characterization of Sources and Areas of Observed Contamination, Item (4), Evaluate the Containment for Each Source, pp. 45-46.*
- *The appropriate HRSGM Highlight, Data Needs for Evaluating Containment, listed below for each pathway.*
- *The appropriate HRS containment factor value table, listed below for each pathway. Describe source containment using the exact terminology found in these tables.*

Gas release to air

- *HRSGM Highlight 10-4, p. 407.*
- *HRS Table 6-3, p. 51652 .*

Particulate release to air

- *HRSGM Highlight 10-4, p. 407.*
- *HRS Table 6-9, p. 51653.*

Release to ground water

- *HRSGM Highlight 7-22, p. 149.*
- *HRS Table 3-2, p. 51596.*

Release via overland migration and/or flood

- *HRSGM Highlight 8-26, p. 247.*
- *HRS Table 4-2, pp. 51609 - 51610.*

2.4.1 Hazardous Substances

List the hazardous substances attributable to this source, and cite the evidence, including specific sample numbers or deposition records, that document the presence of the substance in the source. In addition, if a source description has been prepared for an unallocated source, include here each specific substance at the site that cannot be allocated to a specific source, providing there is no definitive information that the hazardous substance could not be present in this source.

Refer to HRSGM Sec. 2.4, CERCLA Pollutants or Contaminants, p. 18.

Hazardous substance	Evidence	Reference

2.4.2. Hazardous Waste Quantity

In the sequence presented below, evaluate quantities of hazardous substances and hazardous wastestreams for the source. (Hazardous waste quantity for the Soil Exposure pathway will be evaluated separately in Section 5.0)

Show all calculations and describe all methods used to calculate hazardous waste quantity factor values. Attach long calculations or complex methods as a reference to the documentation record. Include any maps or photos on which measurements and calculations are based.

Refer to HRSGM Chapter 6, Hazardous Waste Quantity, p. 82.

2.4.2.1.1. Hazardous Constituent Quantity

Calculate and enter below the mass (S) in pounds of each CERCLA hazardous substance in the source (with the exceptions noted for RCRA wastes in Section 2.4.2.1.1.). Include references showing the basis for calculating the quantity for each substance. Sum the quantities.

Refer to HRSGM Sec. 6.2, Tier A - Hazardous Constituent Quantity, p. 91.

Hazardous Substance	Constituent Quantity (pounds) (Mass - S)	Reference

sum: (pounds)

Based on the above sum for constituent quantity, assign a value for hazardous constituent quantity using Tier A of Table 2-5. Do not round to the nearest integer. Enter the value below.

Hazardous Constituent Quantity Value (S):

Are the data complete for hazardous constituent quantity for this source? If so, assign hazardous wastestream quantity, volume, and area values of 0 for this source and proceed to Section 2.4.2.1.5. If not, proceed to hazardous wastestream quantity below.

2.4.2.1.2. Hazardous Wastestream Quantity

Evaluate and enter below the mass in pounds of each hazardous wastestream in the source plus the mass of any additional CERCLA pollutants and contaminants (as defined in CERCLA Section 101(33) in the source. For a wastestream that consists solely of a hazardous waste listed pursuant to Section 3001 or RCRA as amended, include the mass of this entire hazardous waste. For a wastestream that consists solely of a RCRA hazardous waste that exhibits the characteristics identified under Section 3001 of RCRA as amended, include the mass of this entire hazardous waste. Cite all references which describe and document the quantity of each wastestream.

Refer to HRSGM Sec. 6.3, Tier B - Hazardous Wastestream Quantity, p. 99.

Hazardous Wastestream	Quantity (pounds)	Reference
	sum:	(pounds)

Based on this sum, assign a value for hazardous wastestream quantity from Tier B of Table 2-5. Do not round to the nearest integer. Enter the value below.

Hazardous Wastestream Quantity Value (W):

Are the data complete for hazardous wastestream quantity for this source? If so, assign volume and area a value of zero and proceed to Section 2.4.2.1.5. If not, proceed to Volume, except: if this is the unallocated source, assign volume and area a value of zero and then proceed to Section 2.4.2.1.5.

2.4.2.1.3. Volume

Estimate the volume of the source, and based on this volume, (V) assign the source a value for volume using the Tier C equation in Table 2-5. Do not round to the nearest integer.

Refer to HRSGM Sec. 6.4, Tier C - Volume, p. 105.

Dimension of source (yd^3 or gallons):

References(s):

Volume Assigned Value:

If the source volume cannot be determined, proceed to Area. If it can be determined, assign area a value of zero.

2.4.2.1.4. Area

Estimate the area of the source and based on this area, (A) assign the source a value for area using the equation in Tier D of Table 2-5. Do not round to the nearest integer.

Refer to:
- *HRSGM Sec. 6.5, Tier D - Area, p. 109.*
- *HRSGM Highlight 9-2, Delineating Areas of Observed Contamination for Sources Other Than Contaminated Soil, p. 346.*

Area of source (ft^2):

Reference(s):

Area Assigned Value:

2.4.2.1.5. Source Hazardous Waste Quantity Value

Select the highest of the values assigned to the source for hazardous constituent quantity, hazardous wastestream quantity, volume, and area. Enter this value as the source hazardous waste quantity value below. (Do not round to the nearest integer).

Refer to HRSGM Sec. 6.6, Hazardous Waste Quantity Calculation, p. 111.

Source Hazardous Waste Quantity Value:

SITE SUMMARY OF SOURCE DESCRIPTIONS

List each source described under each source characterization in Section 2.2 and give the Source Hazardous Waste Quantity value. Indicate whether the source is available to each pathway.

Source No.	Source Hazardous Waste Quantity Value	Ground Water	Containment: Surface Water	Containment: Gas	Containment: Air Particulate

Refer to HRSGM:
- *Ch. 4, Sources, p. 41.*
- *Ch. 6, Hazardous Waste Quantity, p. 83.*

3.0 GROUND WATER MIGRATION PATHWAY

Evaluate each aquifer using a separate copy of the portion of the documentation record for ground water, Section 3.0.1 through Section 3.3.4. Calculate a separate ground water migration pathway score for each aquifer, using the factor category values for that aquifer for likelihood of release, waste characteristics, and targets. Include both the targets using water from that aquifer and the targets using water for all overlying aquifers through which the hazardous substances would migrate to reach the aquifer being evaluated. Assign the highest ground water migration pathway score that results for any aquifer as the ground water migration pathway score for the site.

3.0.1 GENERAL CONSIDERATIONS

Characterize the aquifer being evaluated and all overlying aquifers and strata within the target distance limit (usually 4 miles). Include the name, description, and references for each aquifer or stratum, including information on composition, thickness, depth, and dip. Note particularly any evidence of karst. If overlying aquifers are present, describe all strata down through the aquifer being evaluated. Continue adding aquifers and strata until all aquifers and their overlying strata have been described.

Refer to HRSGM Sections:
- *7.1, Determining Aquifer Boundaries and Number of Aquifers, p. 115.*
- *7.2, Treatment of Karst, p. 137.*
- *7.9, Scoring Sites With Multiple Aquifers, p. 197.*

Pay close attention to the definitions of "Aquifer", "Aquifer Boundary", and "Top of the Aquifer", pp. 116-117. The phrase; "significantly lower hydraulic conductivity", as found in the "Aquifer Boundary" definition, is further refined on pp. 120-124 of the HRSGM, and in the Background section of the HRS, p. 51553. Check available references for information on hydraulic conductivity.

For each aquifer, document all aquifer interconnections within 2 miles of the sources at the site. If observed ground water contamination attributable to the site extends beyond 2 miles, any locations within this area of documented contamination also may be considered in documenting aquifer interconnections.

Refer to HRSGM Sec. 7.1 Determining Aquifer Boundaries and Number of Aquifers, Identifying Aquifer Interconnections, p. 127.

In the description, document discontinuities for each aquifer within 4 miles of the sources at the site.

Refer to HRSGM Sec. 7.1 Determining Aquifer Boundaries and Number of Aquifers, Identifying Aquifer Discontinuities, p. 125.

Aquifer/Stratum 1 (shallowest)

Aquifer/Stratum Name:

Description:

References:

Aquifer/Stratum n (deepest)

Aquifer/Stratum Name:

Description:

References:

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Refer to HRSGM Chapter 5, Observed Release, p. 55. In evaluating an observed release, be certain to document that hazardous substances have been released to an "aquifer", as defined on page 116 of the HRSGM.

An observed release can be established by either direct observation or chemical analysis. If an observed release is established by direct observation only, fill out the documentation for direct observation and delete the chemical analysis documentation. Similarly, if an observed release is established only by chemical analysis, delete the direct observation documentation and fill out the chemical analysis documentation. If the observed release can be established in both ways, include all documentation.

Refer to HRSGM Sec. 5.1 Establishing an Observed Release and Observed Contamination, p. 55.

Document all samples and observations that meet the criteria for an observed release. Note that this documentation also supports the determination of targets subject to Level I and Level II concentrations in Section 3.3 below.

Refer to HRSGM Sec. 7.4, Actual Contamination, p. 153.

If no observed release can be established for the aquifer being evaluated, enter a value of 0 on line 1 in Table 3-1 and go on to Section 3.1.2, Potential to Release, for that aquifer.

Aquifer Being Evaluated:

<u>Direct Observation</u>:

Direct observation establishes that a material containing one or more hazardous substances has been deposited into or has been observed entering the aquifer.

- Basis for Direct Observation:

Describe the evidence for establishing the direct observation, including the aquifer that the hazardous substance entered.

- Hazardous Substances in the Release

Provide analyses of the hazardous substances contained in the material or other documentation of the content of the material. If analyses are provided, include the time and location (provide a map as a reference) and the basis for selection for each sample. Specify the hazardous substances, their concentrations, and the associated sample quantitation limits. Identify (e.g., with asterisks) any data that was qualified by the analyst and explain below the qualifications and the rationale for using the qualified data.

Refer to HRSGM Sec. 5.3, Transformation Products, p. 79.

Chemical Analysis:

When a chemical analysis established an observed release according to the criteria in Table 2-3, documentation should include two parts: analytical significance versus background and the rationale for the attribution of some portion of the release to the site.

- Background Concentration

If the background concentrations are obtained from samples, identify the location (provide a map as a reference) and the date of each background sample.

Sample ID	Depth	Date	Reference

Note that the "Depth" heading, above, refers to the depth of the sample, rather than the depth of the monitoring well. In a well, the depth of the sample is equal to the top of that well's screened interval.

Explain the rationale for choosing the background samples, and establish that the background samples are comparable to the contaminated samples described below. For each background sample, list the hazardous substances found, their concentrations, and the associated sample quantitation limits. Specify the unit of measure for all concentrations. Identify (e.g., with asterisks) any data used that was qualified by the analyst and explain below the qualifications and the rationale for using the qualified data.

Sample ID	Hazardous Substance	Concentration	Sample Quantitation Limit	Reference

HRS Table 2-3, p. 51589, describes alternative detection limits that may substitute for the sample quantitation limit. Edit the "Sample Quantitation Limit" heading, above, to reflect the detection limit actually reported with the data.

If the background concentrations are not obtained from samples, provide background concentrations for each hazardous substance establishing an observed release. Explain the rationale for choosing each background concentration listed.

Refer to: HRSGM Sec. 5.2, Selecting Appropriate Background Samples, p. 67.

- Contaminated Samples

Identify the location (provide a map as a reference) and date of each sample that established as observed release according to the criteria in Table 2-3.

Sample ID	Depth	Date	Reference

Explain the rationale for choosing the contaminated samples.

Refer to HRSGM Highlight 5.3, Examples for Deciding Whether Significance above Background is Established, p. 61.

For each contaminated sample, list the hazardous substances that establish an observed release, their concentrations, and the associated sample quantitation limits. Specify the unit of measure for all concentrations. Identify (e.g., with asterisks) any data used that was qualified by the analyst and explain below the qualifications and the rationale for using the qualified data.

Sample ID	Hazardous Substance	Concentration	Sample Quantitation Limit	Reference

- Level I Samples

Document below each contaminated sample that meets or exceeds a relevant health-based benchmark (Table 3-10). Repeat the information for each sample that meets a Level I criterion. If no sample meets or exceeds these criteria, delete the entire Level I sample part of the documentation. Enter below the concentration of each hazardous substance in the sample that meets the criteria for an observed release. Document that the sample meets the requirements for Level I by comparing the sample concentration to a health-based benchmark (Table 3-10). If no hazardous substance individually meets or exceeds its benchmark concentration, calculate the indices I and J as specified in Section 2.5.2 of the HRS. List the hazardous substances considered in the table below and provide a reference showing the calculation.

Refer to HRSGM Sec. 7.4, Actual Contamination, p. 153.

Sample ID:
Reference for Benchmarks:

Hazardous Substance	Hazardous Substance	Benchmark Concentration	Benchmark

Attribution:

Enter here the rationale for attributing the release, at least in part, to a source at the site. Discuss relevant alternative sources.

Refer to HRSGM Sec. 5.3, Transformation Products, p. 79.

Hazardous Substances Released

List the hazardous substances that meet the criteria for an observed release below. If an observed release has been established for the aquifer being evaluated, enter a value of 550 below and on line 1 in Table 3-1.

==========

Ground Water Observed Release Factor Value:

3.1.2 POTENTIAL TO RELEASE

Evaluate the potential to release for each aquifer for which an observed release has not been established. If an observed release to an aquifer has been established, do not assess the potential to release for that aquifer. Rather, delete the documentation for containment, net precipitation, depth to aquifer, and travel time for that aquifer and assign the value of 0 to the potential to release on Table 3-1. Proceed to Section 3.2, Waste Characteristics.

Refer to HRSGM Sections:
- *7.1, Determining Aquifer Boundaries and Number of Aquifers, p. 115.*
- *7.2, Treatment of Karst, p. 137.*
- *7.9, Scoring Sites With Multiple Aquifers, p. 197.*

Pay close attention to the definitions of "Aquifer", "Aquifer Boundary", and "Top of the Aquifer", pp. 116-117. The phrase; "significantly lower hydraulic conductivity", as found in the "Aquifer Boundary" definition, is further refined on pp. 120-124 of the HRSGM, and in the Background section of the HRS, p. 51553. Check available references for information on hydraulic conductivity.

3.1.2.1 Containment

For each source at the site, assign a source type and a containment value from Table 3-2 based on the containment of the source against release. Provide the descriptors for containment from Table 3-2 that apply and the rationale for choosing those descriptors.

Refer to HRSGM:
- *Chapter 4, Sources, p. 41.*
- *Highlight 4-1, Commonly Confused Source Types, p. 44.*
- *Highlight 7-22, Data Needs for Evaluating Containment, p. 149.*

Source	Descriptor	Value

Select the highest source containment factor value assigned to those sources with a source hazardous waste quantity value of 0.5 or more (Section 2.4.2.1.5). Note that this minimum size requirement does not apply to any other factors in this pathway. If no source at the site meets this minimum size requirement for containment, then ignore the minimum size requirement in selecting the highest value. Enter this highest value below and on line 2a of Table 3-1.

==========

Containment Factor Value:

3.1.2.2 Net Precipitation

Determine the net precipitation factor value from Figure 3-2. If the site is located such that an appropriate factor value cannot be read from Figure 3-2, calculate net precipitation from the procedure included in section 3.1.2.2 of the HRS. Show the calculations below. Based on the annual net precipitation, assign a net precipitation factor value from Table 3-4. Enter, on the line below and on line 2b of Table 3-1, the factor value assigned from Figure 3-2 or Table 3-4.

Precipitation (in inches):
Reference:
Factor Value:

3.1.2.3 Depth to Aquifer

Evaluate the depth to the aquifer by determining the depth from the lowest known point of hazardous substances at the site to the top of the aquifer being evaluated, considering all layers in that interval. Begin the table with the lowest known point of hazardous substances. Assign an intervening karst layer a thickness of 0 feet. Determine the depth to the aquifer only at locations within 2 miles of the sources at the site, except when observed ground water contamination attributable to these sources extends beyond 2 miles from them; then use any location within the limits of this observed contamination for those aquifers that do not have an observed release. If the necessary depth information is available at two or more locations, show the calculations for each location in the table below.

Location	Stratum	Depth (in feet)	Cumulative Depth	Reference

Make certain that all depth measurements are in units of feet, and are taken from the same reference point, (e.g. "above mean sea level", or "below ground surface", or "below top of well casing") before using these numbers in calculations. The best approach is to convert all measurements to feet above mean sea level.

Refer to HRSGM:
- *Sec. 7.2, Determining Aquifer Boundaries and Numbers of Aquifers, p. 115.*
- *Sec. 7.2, Treatment of Karst, p. 137.*
- *Highlight 7-17, Scoring Considerations for Karst Aquifers: Depth to Aquifer Factor, p. 142.*
- *Sec. 7.9, Scoring Sites With Multiple Aquifers, p. 197.*

Use the location having the smallest depth to assign the factor value. Enter this value below and on line 2c of Table 3-1.

==========

Net Precipitation Factor Value:
Depth to Aquifer Factor Value:

3.1.2.4 Travel Time

Assess travel time for those geologic materials that lie between the lowest known point of hazardous substances at the site and the top of the aquifer being evaluated. Determine travel time only at locations within 2 miles of the sources at the site, except when observed ground water contamination attributable to these sources extends beyond 2 miles from them. Then use any location within the limits of this observed contamination when evaluating travel time for those aquifers that do not have an observed release. If the necessary subsurface geologic information is available at multiple locations, evaluate the travel time factor at each location. Use the location that gives the highest factor value to assign the factor value for the aquifer being evaluated.

If the depth to the aquifer is 10 feet or less, or if all the intervening materials are karst, document the situation and assign a value of 35. No further documentation is required. Enter this value below and on line 2d of Table 3-1.

Assign to any karst layer a thickness of 0 feet. Drop from further consideration the first 10 feet of intervening material and also any intervening layer less than 3 feet thick. If the depth is greater than 10 feet, or if all the intervening materials are not karst, document the following for each of the intervening layers: identification and composition of the layer, the thickness of the layer, and the hydraulic conductivity. Select the intervening layer(s) with the lowest hydraulic conductivity. Assign the HRS value for travel time from Table 3-7.

Give preference to representative, measured hydraulic conductivities whenever available, using the values in Table 3-6 as defaults.

Refer to HRSGM:
- *Sec. 7.2, Determining Aquifer Boundaries and Numbers of Aquifers, p. 115.*
- *Sec. 7.2, Treatment of Karst, p. 137.*
- *Highlight 7-17, Scoring Considerations for Karst Aquifers: Depth to Aquifer Factor, p. 142.*
- *Sec. 7.9, Scoring Sites With Multiple Aquifers, p. 197.*

Layer	Composition	Thickness (feet)	Conductivity (cm/sec)	Reference

Lowest Hydraulic Conductivity:

Enter the value determined below and on line 2d of Table 3-1.

==========

Travel Time Factor Value:

3.2 WASTE CHARACTERISTICS

Determine the waste characteristics factor category for each aquifer being evaluated.

3.2.1 Toxicity/Mobility

For the aquifer being evaluated, list each hazardous substance for which an observed release to ground water has been documented (Section 3.1.1) and hazardous substances associated with all sources with a ground water containment value greater than 0 (as determined in Section 2.4.1 and listed in the Site Summary of Source Descriptions of this record).

Assign each substance a toxicity factor value (Section 2.4.1.1), a mobility factor value (Section 3.2.1.2), and a combined toxicity/mobility factor value (Table 3-9) from the EPA Chemical Database.

Give the reference which provides the rationale for assigning each of these values. If a substance cannot be found in the data base, assign the value according to the instructions in the HRS and provide a reference that shows how the value was assigned.

If all substances available to the ground water pathway receive toxicity values of 0 because of insufficient data, assign a default toxicity value of 100 to each hazardous substance.

For any hazardous substance that meets the criteria for an observed release to one or more aquifers underlying the sources at the site, regardless of the aquifer being evaluated, assign a mobility factor value of 1.

For any hazardous substance that does not meet the criteria for an observed release to at least one of the aquifers, assign that hazardous substance a mobility factor value from the EPA Chemical Database. If a substance cannot be found in the database, assign a value from Table 3-8 for the aquifer being evaluated, based on its solubility and distribution coefficient (K_d). Provide references for the chemical properties and show how the value was assigned.

If the hazardous substance cannot be assigned a mobility factor value because data on its solubility or distribution coefficient are not available, use other hazardous substances for which information is available in evaluating the pathway.

If none of the hazardous substances eligible to be evaluated can be assigned a mobility factor value, use a default value of 0.002 as the mobility factor value for all these hazardous substances.

Refer to HRSGM Sec. 7.2, Treatment of Karst, p. 137.

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Toxicity/ Mobility	Ref.

Select the hazardous substance with the highest toxicity/mobility factor value for the aquifer being evaluated. Enter the value for that substance below and on line 4 of Table 3-1.

==========

Toxicity/Mobility Factor Value:

3.2.2 Hazardous Waste Quantity

List the sources that have a ground water containment factor value greater than 0 and the source hazardous waste quantity value assigned to each source in the source description (Section 2.4.2.1 of this documentation record and summarized in the Site Summary of Source Descriptions). Note for each source whether the hazardous constituent quantity data are complete or not.

Refer to HRSGM:
- *Ch. 4, Sources, p. 41.*
- *Ch. 6, Hazardous Waste Quantity, p. 83.*

Sum the source hazardous waste quantity values for each source and round this sum to the nearest integer, except if the sum is greater than 0 and less than 1. In this case, round it to 1.

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is source hazardous constituent quantity data complete? (yes/no)

Sum of Values:

Based on this sum, select a hazardous waste quantity value from Table 2-6. If all sources are evaluated for the ground water pathway based on complete hazardous constituent quantity data, assign the value from Table 2-6 as the hazardous waste quantity factor value. If the hazardous constituent quantity data are not complete for one of more sources evaluated, assign the greater of the value from Table 2-6 or a value of 10, <u>except</u>: if the value from Table 2-6 is 0, then assign a value of 0 as the hazardous waste quantity factor value. Enter this value below and on line 5 of Table 3-1.

3.2.3 Waste Characteristics Factor Category Value

Multiply the toxicity/mobility and hazardous waste quantity factor values, subject to a maximum product of 1×10^8. Based on this product, assign a value from Table 2-7 to the waste characteristics factor category for this aquifer. Enter this value below and on line 6 of Table 3-1.

Toxicity/Mobility Factor Value X Hazardous Waste Quantity Factor Value:

==========

Hazardous Waste Quantity Factor Value:
Waste Characteristics Factor Category Value:

3.3 TARGETS

Determine the targets factor category value for each aquifer being evaluated. Evaluate the nearest well, population, resources, and Wellhead Protection Area based on targets within the target distance limits in Section 3.0.1.1 and the aquifer boundaries in Section 3.0.1.2

List all drinking water wells that lie within the target distance limit (and are not separated from the site by a discontinuity) and draw water from the aquifer being evaluated or an overlying aquifer. List also those drinking water wells that lie outside the 4-mile target distance limit but are subject to an observed release. Include standby wells only if they are used for drinking water supply at least once every year. If the list is extensive, private wells drawing from the same aquifer may be reported as the number of wells within each county and each distance category (categories are given in Table 3-11).

If one or more samples meet the criteria for an observed release for a drinking water well within the target distance limit, determine if that well is subject to Level I or Level II concentrations as specified in Sections 2.5.1 and 2.5.2. Targets in overlying aquifers can be subject to Level I or Level II concentrations even if there is no observed release to the aquifer being evaluated. For any well at which an observed release is documented, reference should be made to documentation of the release at that well in Section 3.1.1, Observed Release and a statement should be made as to whether the contamination is Level I or Level II.

For any well subject to potential contamination, include the distance to the well from the nearest source with a ground water containment value greater than 0. Note the special instructions for karst aquifers and report the distance from a source to the karst aquifer.

Be sure to document that target wells actually draw from (are screened in) an aquifer of concern.

Refer to:
- *HRSGM Sec. 7.1, Determining Aquifer Boundaries and Number of Aquifers, p. 115.*
- *HRSGM Sec. 7.2, Treatment of Karst, p. 137.*
- *HRSGM Sec. 7.9, Scoring Sites With Multiple Aquifers, p. 197.*
- *RQCG Appendix D, Map Specification for the HRS Documentation Record, Ground Water Pathway, p. D-5.*

Well	Distance From Source	Aquifer	Level I Contam. (Y/N)	Level II Contam. (Y/N)	Potential Contam. (Y/N)	Ref.

3.3.1 Nearest Well

In evaluating the nearest well factor, include both the drinking water wells drawing from the aquifer being evaluated and those drawing from overlying aquifers as specified in Section 3.0. Include standby wells only if they are used for drinking water supply at least once every year.

Assign a value for the nearest well factor as follows:

If one or more drinking water wells is subject to Level I concentrations, assign a value of 50.

If not, but if one or more drinking water wells is subject to Level II concentrations, assign a value of 45.

Score a Level I or Level II well as the nearest well, even if other wells (not subject to actual contamination) are closer to sources on site.

If not, determine the shortest distance to any of the drinking water wells, as measured from any source at the site with a ground water containment factor value greater than 0. Select a value from Table 3-11 based on this distance. Assign it as the value for the nearest well factor, unless one of the target aquifers is a karst aquifer and a higher value can be assigned. In this case, follow the instructions in Section 3.3.1 for karst aquifers.

Be sure to document that the nearest target well actually draws from (is screened in) an aquifer of concern.

Refer to HRSGM:
- *Sec. 7.1, Determining Aquifer Boundaries and Number of Aquifers, p. 115.*
- *Sec. 7.2, Treatment of Karst, p. 137.*
- *Sec. 7.5, Population and Nearest Well Factors, 163.*
- *Sec. 7.7, Standby Wells, p. 187.*
- *Sec. 7.9, Scoring Sites With Multiple Aquifers, p. 197.*

Well:
Level of Contamination (I, II, or potential):
If potential contamination, distance from source in miles:

Enter the value assigned to the nearest well factor below and on line 7 of Table 3-1.

==========

Nearest Well Factor Value:

3.3.2 Population

In evaluating the population factor, include those persons served by drinking water wells within the target distance limit specified in Section 3.0.1.1. For the aquifer being evaluated, count those persons served by wells in that aquifer and those persons served by wells in overlying aquifers as specified in Section 3.0. Include residents, students, and workers who regularly use the water. Exclude transient populations. When a standby well is maintained on a regular basis so that water can be withdrawn, treat it as an active well and include the population it serves. Note that this criterion is different from that stated for the nearest well.

In estimating residential population, when the estimate is based on the number of residences, multiply each residence by the average number of persons per residence for the county in which the residence is located. If house counts are used, include a map showing the basis of the house count.

In determining the population served by a well, if the water from the well is blended with other water, apportion the total population regularly served by the blended system to the well based on the well's relative contribution to the total blended system, in accordance with the instructions in Section 3.3.2.

Refer to HRSGM:
- *Sec. 7.5, Population and Nearest Well Factors, 163.*
- *Sec. 7.6, Blended Water Supplies, p. 177.*
- *Sec. 7.7, Standby Wells, p. 187*
- *Sec. 7.9, Scoring Sites With Multiple Aquifers, p. 197*

3.3.2.1 Level of Contamination

Evaluate the population served by water from a point of withdrawal based on the level of contamination for that point of withdrawal. Use the applicable factor: Level I concentrations, Level II concentrations, or potential contamination.

Refer to HRSGM:
- *Sec. 7.2, Treatment of Karst, p. 137.*
- *Sec. 7.4, Actual Contamination, p. 153.*

3.3.2.2 Level I Concentrations

List the wells subject to Level I contamination, sum the number of people served by these wells, and enter this sum below as the Population Served by Level I Wells. Multiply this sum by 10 and assign this product as the value for this factor. Enter the assigned Level I Concentrations factor value below and on line 8a of Table 3-1.

Level I Well	Population	Reference

Population Served by
Level I Wells:

Level I Concentrations Factor Value:

3.3.2.3 Level II Concentrations

List the wells subject to Level II contamination and sum the number of people served by these wells. Enter this value below and on line 8b of Table 3-1. Do not include wells already counted under Level I.

Level II Well	Population	Reference

==========

Level II Concentrations Factor Value:

3.3.2.4 Potential Contamination

For each distance category in Table 3-11, first determine the number of people served by drinking water from points of withdrawal subject to potential contamination. Do not include those people already counted under the Level I and Level II concentration factors. Based on the number of people within a distance category, assign a distance-weighted population value for that distance category, using Tables 3-12 and 3-13, in accordance with the instructions in Section 3.3.2.4.

Distance Category	Population	Reference	Distance-Weighted Population Value

Sum the distance-weighted population values across the distance categories and divide the sum by 10. If the result is greater than 1, round to the nearest integer. If the result is less than 1, do not round. Enter this value below and on line 8c of Table 3-1.

Refer to HRSGM:
- *Sec. 7.2, Treatment of Karst, p. 137.*
- *Sec. 7.9, Scoring Sites With Multiple Aquifers, p. 153.*

Sum of Distance-Weighted Population Values:

==========

Potential Contamination Factor Value:

3.3.3 RESOURCES

Assess all wells that lie within the 4-mile target distance limit (and are not separated from the site by a discontinuity) and draw water from the aquifer being evaluated or from an overlying aquifer. Include also wells outside the target distance limit that have an observed release from a source at the site.

Document if water drawn from any of these wells is used for the purposes listed in Section 3.3.3 of the HRS. Alternatively, document that, although there are no drinking water wells in the aquifer being evaluated or the overlying aquifers, the water in any of these aquifers is usable for drinking water purposes.

Refer to HRSGM Sec. 7.8, Resources and Wellhead Protection Area, p. 193.

If any of the above uses are documented, enter a value of 5 below and on line 9 of Table 3-1. Otherwise, enter a value of 0.

Well	Aquifer	Resource Use	Reference

==========

Resources Factor Value:

3.3.4 WELLHEAD PROTECTION AREA

Evaluate the Wellhead Protection Areas factor based on areas designated according to Section 1428 of the Safe Drinking Water Act, as amended. Consider only those areas applicable to the aquifer being evaluated or overlying aquifers. Assign a value of 20 if either of the following criteria applies for the aquifer being evaluated or overlying aquifers:

A source with a ground water containment value greater than 0 lies, either partially or fully, within or above a designated Wellhead Protection Area.

Observed ground water contamination attributable to the sources at the site lies, either partially or fully, within the designated Wellhead Protection Area.

Refer to HRSGM Sec. 7.8, Resources and Wellhead Protection Area, p. 193.

If neither criterion applies, assign a value of 5 if, within the target distance limit, there is a designated Wellhead Protection Area applicable to the aquifer of concern or an overlying aquifer. Assign a value of 0 if none of the above applies.

Area	Use	Reference	Value

Enter on the line below and on line 10 of Table 3-1 the highest value that applies.

==========

Wellhead Protection Area Factor Value: