Comments on the Remedial Investigation (RI) Report for the High Priority Sites (881 Hillside Area) - July 1, 1987

Chapter 1 - Introduction

1.1 Objectives and scope

The report discusses the results of the Remedial Investigation of the 881 Hillside High Priority Site and not of all the priority sites.

The report should conclude with a description of the plume of contamination including cross sections and plan maps sufficient to show the vertical and horizontal extent of the plume, its effects on the surface water and groundwater quality, and the ultimate effect of the plume on human health and the environment.

1.2 Site background information

A larger-scale map illustrating the buffer zone around the plant operations should be included for orientation and reference.

1.3 Nature and extent of problem

This section provides general background for the CEARP Phase II site specific monitoring plan and is not specific to the 881 Hillside. The reasons for prioritizing the 881 Hillside and the past disposal practices are presented. However, the nature and extent of the contamination problem at the 881 Hillside are not addressed.

1.4 Previous Investigations

Concise descriptions of the conclusions and/or results of the previous investigations should be provided. The order of the different pathways is not consistent with that of the chapters covering each of the different pathways.

1.4.1 Air Pathway

The section should briefly characterize the air pathway, its potential for contaminant migration, and include a concise history of past contamination.

1.4.2 Surface Water Pathway

A map, at an appropriate scale, illustrating the surface water flow patterns and sources of contamination at the 881 Hillside should be provided. Figure 2-3 shows the drainage patterns of the region but is not specific to the 881 Hillside.

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1.4.3 Groundwater Pathway

The text is not specific to the 881 Hillside. As in sections 1.4.1 and 1.4.2, a brief characterization of the pathway should be included.

1.5 Remedial Investigation Summary

The appropriate section, figure, or plate, for the nine items listed, should be referenced.

1.6 Overview of Report

This section provides a concise and informative description of the report outline and would be more effective if presented toward the beginning of Chapter 1 rather than at the end. It is somewhat repetitive of Section 1.1 and perhaps the two sections could be combined.

Chapter 2 - Regional Setting and Site Features

2.1 Demography

Reference to Figure 2-1 should be made in the first paragraph. Figure 2-1 does not show the county lines.

2.2 Land Use

This section should mention the railroad and roads around the plant and their frequency of use.

2.3 Natural Resources

Is this section pertinent to the evaluation of the 881 Hillside contamination? If the section does not relate, then it is not a necessary part of the report.

2.4 Climatology

The last sentence in the section needs clarification. A statement on the effects of the climatic conditions on potential contaminant migration should be included.

2.5 Physiography

For completeness, all the major stratigraphic units exposed in the area should be included in the general geologic description and not just the Dakota Sandstone and Fountain Formation.

2.6 Geology and soils

2.6.1 Geology

The section lacks a complete description of the local geology. This should be provided or reference should be made to previous studies. Maps illustrating the geologic features (structure and stratigraphy) described would be informative. The units overlying the Fountain Formation should be listed (in order of decreasing age) and not referred to as various units.

The stratigraphic description of the Upper Laramie Formation and Arapahoe Formation should be more detailed. The description should include: the grain sizes; the origin of the clay and sand layers; the location of the sand layers within the clay layers; the size, shape, and orientation of the sand layers; etc.

The discussion of the structure is too general. The fault patterns should be illustrated on a map to show their relationship to the facility. Cross section A-A' (Plate 4-3) shows a fracture zone in the Arapahoe Formation. Fracture zones are not described in the text. Their occurrence, extent, origin, and effect on the site hydrology must be described.

The geologic map (Plate 4-2) does not show the sandstone lenses in the Arapahoe Formation. Is the detail of mapping adequate to show sandstone lenses in the area? If so, include them on the map. Plate E-2 of the Part B permit application indicates that sandstone lenses are present in the 881 Hillside area.

2.6.2 Soils

A stratigraphic column of the surficial deposits would be helpful. The descriptions of the surficial deposits must be more detailed. If distinct layers are present then they should be described individually (i.e. the gravel layer at the base of the colluvium as mentioned in Chapter 3). In general, detailed mapping of the surficial deposits is necessary. The hummocky topography underlying the facility is indicative of localized landslides and slumping. These features must be distinguished on the geologic map and the effects of such features on the hydrology must be addressed. Reference is made in CEARP Phase I (p. III-5) to the occurrence of landslides and creep in the colluvium due to the contact angle between the Arapahoe Formation and colluvium and to lubrication along the contact by water infiltrating the colluvium.

2.7 Water Resources

The following items are mentioned in the text but not shown in Figure 2-3: Upper Church Lake, Standley Lake, Ralston Reservoir, and Kinnear Ditch and Reservoir. Mower Reservoir receives water from Women Creek (Fig. 2-3) but is not mentioned in the text. All local water bodies that may be affected by plant operations must be mentioned.

The use of off-site wells in the Laramie-Fox Hills, Arapahoe, and Rocky Flats aquifers should be addressed. Information should include any effect plant operations have on the groundwater quality. (See comments on Section 8.1.3).

Chapter 3 - Characterization of Waste Sources

More detail on the establishment of background must be provided. Background values (standards) for all parameters listed in Table 3-1 should be given in Table 3-2. A list of detection limits for these parameters and the geologic units sampled must also be provided.

Paragraph 3 indicates that at the time of writing, sample data was not complete. The conclusions made in the RI are then considered preliminary until all data is available and interpreted. Soil sample locations should be shown on a map.

Do the revised SWMU locations include both the source and plume of contamination? Explain reasons for the revision of the SWMU locations.

3.1 SWMU 102

It is possible that the proposed location of the site is not correct and that BH6-87 is too far from the source to conclude that SWMU 102 is not a source of contamination.

Southeast of BH6-87 in the drainage which cuts through SWMU 102, the TCE level was 1,541. Is this related to the SWMU 102 site?

3.2 SWMU 103

This section lacks a conclusion.

It is difficult to check the sample analyses given in the section with those listed in Appendix E-1. The appendix needs a table of contents so that the sample data can be easily referenced while reading the entire report. (See comments on Appendix E.)

3.3 SWMU 104

Sample results from BH7-87 indicate that a plume has migrated from SWMU 104. The vertical and horizontal extent of the plume must be determined.

3.4 SWMU 105

It is inconclusive, as pointed out, whether the source of contamination at BH4-87 was caused by migration of contaminants from SWMU 105 or from another source. The source, extent, and amount of contamination at BH4-87 must be investigated in more detail. The interrelationship of SWMU 105 with 107 should be referenced.

3.5 SWMU 106

The size and location of the pond at the discharge site of the SWMU should be provided and the surface water sample results, given in Chapter 5, should be referenced.

3.6 SWMU 107

The dimensions and location of the skimming pond should be given and the results of the surface water sample, given in Chapter 5, should be referenced.

A summary statement indicating the need for further investigation is lacking.

3.7 SWMU 119.1

The electromagnetic anomaly southwest of the SWMU and the conductivity anomaly on the southern portion of the SWMU should be located and explained.

TCE was found in six not five soil gas samples in and south of the SWMU. PCE and TCE values were elevated along the northern boundary and to the north of the SWMU. These elevated levels should be explained. Are they due to migration of contaminants from SWMU 130 or do they indicate that SWMU 119.1 extends farther north than shown? Results of sampling from BH15-87 should be incorporated into this section.

The conclusion that PCE, TCE, and TCA are only present in groundwater at this location is not substantiated by data collected from only two boreholes on the west end of the SWMU. The basis for this conclusion is not clear.

3.7.2 SWMU 119.2

Soil gas data indicate elevated levels of PCE at the north end of the SWMU 119.2 in addition to the elevated DCE and TCA readings reported (p. 3-11).

3.8 SWMU 130

Explanation of the electromagnetic anomalies should be given.

Elevated levels of PCE are present throughout the SWMU and one elevated sample of TCA is present at the southwest tip of the SWMU (plates 3-3 and 3-4, respectively). This is not consistent with the second paragraph on page 3-18 which states that only one sampling location had elevated VOCs.

The concentrations of bis(2-ethylhexyl)phthalate (800, 760, 1000 ppb) are similar to the concentrations in other SWMUs described and are therefore not several times less concentrated that other boreholes as

stated (p. 3-14). The elevated concentrations of VOCs must be addressed. Migration of this contamination may be the cause of contamination found downgradient in BH13-87.

3.9 SWMU 145

Soil gas results show elevated concentrations for PCE south and downgradient of the SWMU. This does not support the stated conclusion that results did not indicate elevated levels of VOCs and therefore the SWMU is not an environmental threat (p. 3-15). Is it possible that contamination migrated from the SWMU and mixed with contamination from SWMUs 106 and 107? Further investigations around the SWMU should be conducted to explain the elevated values.

3.10 SWMU 177

This SWMU is not indicated on the map. Because the site was not used for waste disposal does not preclude it from being a possible source of contamination. Has the possiblity been explored that the soil under the building was contaminated by an unknown event, especially if the drums were stored directly on soil in the past? SWMUs 103, 106, and 107 partly cover the SWMU. The remaining area should be investigated further.

3.11 Summary

SWMUs 102, 105, 145, and 177 are not considered as sources of surface water or groundwater contamination. However, information provided by the report indicates otherwise. Further investigation of these SWMUs must be completed before each of these can be discarded as an environmental problem.

The extent of the contamination from SWMUs 103, 106, 107, 119, 104, and 130 must be well defined through more detailed studies.

In addition to bis(2-ethylhexly)phthalate, PCE and TCE are contaminants of the 881 Hillside. From the data presented, it appears that radionuclides are also present.

Chapter 4 - Groundwater

4.1 Soils/Alluvial Materials

As noted in section 2.6.2, the different stratigraphic layers in the surficial deposits must be described. The hydrology of the different layers underlying the SWMUs must be investigated in greater detail.

The dates for the tests listed in Table 4-1 should be given.

4.2 Bedrock Materials

The elevations at which the sandstone lenses occur should be mentioned.

4.3 Groundwater Flow

Areas of recharge and discharge for each geologic unit referred to in 4.3.1 should be shown on the geologic map with specific reference to the SWMU locations.

The seasonal changes in flow velocities must be examined to determine possible effects on hydrology and contaminant migration.

4.4 Groundwater Contamination

Detailed geologic cross sections showing the stratigraphic units, structure, boreholes, wells, and extent of contamination underlying each SWMU are necessary.

The discussion on SWMUs 106 and 107 indicates that radionuclides are mobile in groundwater. Because this directly effects the extent of contamination further explanation is required.

The elevated strontium values given for SWMU 119.1 are not listed in Chapter 3. The section describing SWMU 119.2 refers to the southwest flow of groundwater. This is not illustrated on the potentiometric map (Plate 4-1).

4.5 Conclusion

Well 65-86 is not shown on the map and analytical data is not given for this well.

General comments

Information from the plates can be consolidated. Soil gas maps should show the SWMU boundaries. Levels of contaminant concentrations could be outlined to better characterize the plumes.

All cross sections must be constructed without vertical exaggeration. Several detailed cross sections are needed. The zones of contamination should be illustrated in plan and cross section to show the vertical and horizontal configuration of the plumes.

Table 4-2 should include background values for each of the contaminants listed and an explanation of the symbols (i.e. 130+/-17) used.

The hydraulic conductivity and interconnection under each SWMU must be described.

The potentiometric surface should be defined to Woman Creek. A potentiometric surface map should be constructed for each season to illustrate any variation in groundwater flow.

An explanation for ending the soil-gas survey at the interceptor ditch is necessary. It is indicated in CEARP Phase II, Plate II, that the survey extends farther south to Woman Creek.

The chemical and physical interaction of the contaminants and the matrix must be addressed.

A sampling schedule must be submitted.

QA/QC is deficient. Possible methylene chloride contamination in the lab has caused uncertainty of some results. The radiochemistry data is conflicting for SWMU 119.2.

It is indicated that several of the SWMUs need further investigation before definitive conclusions can be made as to the nature and extent of the contamination. In light of this, the report is considered preliminary. The final RI should be a detailed report on the contamination at each SWMU.

Chapter 5 - Surface Water

A figure, drawn to scale, showing the location of all the features mentioned plus those of the ponds at SWMUs 106 and 107, would be helpful. The south interceptor ditch extends from the old landfill. Explain what affects the old landfill has on the water quality in the interceptor ditch.

The radionuclides and other parameters sampled and their maximum allowable values under the NPDES permit should be tabulated. Would this list be the same as Table 5-1?

5.1.1 Surface water flow

The reason for not measuring flow rates in May 1987 should be given. The variation in seasonal flow must be addressed.

5.1.2 Surface water chemistry

Values for total dissolved solids are not shown. Were samples analyzed for DCE?

South Interceptor Ditch

The source of the contamination detected in SW-37 (Bldg. 460?) and SW-36 (old landfill?) must be addressed. In general, the upstream samples show contamination. How does this affect the water quality downstream?

The impact of SW-44 on the interceptor ditch is that it effectively drains the upgradient contamination emanating from SWMUs 103, 106, 107, and possibly 177 and does contain elevated concentrations of radionuclides and 4 ppb PCE.

As noted in the description of SW-27, the concentrations of contaminants are for two different times of the year and the data may reflect temporal changes. If temporal changes will cause large variations in contaminant concentrations, then only the contaminant concentrations measured at the same time of year in up- and downstream stations should be compared. In addition, the effects of and potential for dilution and attenuation of concentrations should be addressed.

Even though the occurrence of the HSL compounds was isolated at SW-27, the significance of their occurrence must be addressed.

Woman Creek

The description of SW-33 indicates that there are no data on metals and major ions. Were the samples analyzed for these?

The increase in radionuclides at SW-32, downstream of SW-33 and SW-34 may be due to water flowing directly south from the 881 Hillside and discharging into Woman Creek. The uncertainty for the increase must be addressed.

The last paragraph stated that there is no indication of a contaminant release in samples from SW-29, SW-28, and Pond C-1. Show how the data support this.

5.2.1 Background Sediment Chemistry

The background concentrations of all parameters in sediments must be provided.

5.2.2 Downgradient Sediment Chemistry

The location of the East Trenches and 903 Pad Area should be shown for reference since they are mentioned as the likely sources for the increase in radionuclides in the downstream sediments.

5.3 Flood Potential

Figure 5-1 is basically illegible and too small a scale.

Chapter 6 - Air

The chapter describes the air monitoring program used at the facility. Specifically how the program applies to the 881 Hillside must be addressed. It is possible that contamination from wind dispersal of contaminated soil is widespread throughout the general area. Locations of contaminated soil which are subject to redistribution via the air pathway must be identified. Areas contaminated as a result of wind-blown contaminated soil must also be identified.

6.1.1 Ambient air sampling for radionuclides

The effectiveness of the existing monitoring stations for detecting airborne contaminants from the 881 Hillside must be presented to support the conclusions. The necessary documentation is absent. The geographic relationship between 881 Hillside, SWMUs, and relevant monitoring stations must be illustrated at an appropriate scale. The summary of the monitoring program findings over the last 10 years might provide the basis for evaluating contamination problems related to the 881 Hillside. A table showing the sample data, location and date, parameter standards, and other pertinent information is necessary. (This applies to the entire Chapter). The sample results could also be presented graphically.

Rationale for certain procedures should be provided. For example, on what is the "Plant Screening Guide" for analyzing filters of 0.01 picocuries per cubic meter of total long-lived alpha and plutonium activity based? Why are only long-lived alpha and plutonium activity tested?

Analyses of the five samplers located near the solar evaporation ponds and 903 Pad areas (p. 6-2) are compared to the DCG for inhalation of Class W and Class Y plutonium. In order to make the comparison, the plutonium concentrations in the samplers and the DCG value must be provided. Again, it is important to explain the connection between these samplers and the 881 Hillside.

No supporting information is given backing the statement that most plutonium released will be Class Y lung clearance category, with a consequent lesser dose. Without providing the analytical data, the reader cannot determine that the mean annual plutonium levels since 1977 were less than the DCG. Were the levels higher than the DCG prior to 1977? Although the results of the RAAMP samples are in the monthly reports, the data pertinent to the discussion is needed to provide a basis for analysis.

Terminology must be defined. What indicates an anomaly or a trend? Is there an established baseline to which anomalies, values, or trends can be compared?

6.1.2 Routine Nonradioactive Ambient Air Monitoring

The location of the sample stations for which non-rad consituents are monitored should be given. The presence of VOCs in groundwater and surface water at the 881 Hillside, suggests that VOCs should also be monitored.

Can contaminants from the 881 Hillside be detected at the existing sample locations or are additional samplers, appropriately located along the 881 Hillside, necessary?

6.1.3 Special Dust Resuspension Studies

The background values of plutonium referred to in the text must be given.

This section pertains to a study concerning the 903 Pad Area. How does the research relate to the 881 Hillside? It is important to address resuspension of the soils, etc., present on the 881 Hillside (are they the same as at the 903 Pad Area?) Is the 881 Hillside effected by contamination from the 903 Pad Area? This may be important in determining the methods of remediation at each site and the order of remediation for all the sites.

It is noted that plutonium dispersal was possible via dust resuspension from 30-35 mph winds and that dust resuspension significantly increased from high velocity winds (p. 6-7). The interpretation of the data leading to the conclusion that the potential for contaminant exposure by dust is low, does not account for the high winds which are common in this area (p. 2-6). The study should also address the transportability of volatiles and other contaminants.

The term "fallout levels" must be defined.

6.2 Remedial Investigation Air Sampling Results

6.2.1 Radiometric Survey

The term "background level" must be defined. Analytical results of the survey should be presented and include the alpha, beta, and gamma activites, sample locations, and expected source. Indicate on a map at the appropriate scale, the area of the radiometric survey and the four areas with gamma radiation above background.

Address whether or not the radionuclide contamination is site specific or dispersed across the 881 Hillside. Based on the information provided, it is not conclusive that radioactive contamination of air and airborne particles is not an environmental problem.

Dispersion meterology and air flow patterns at Rocky Flats are discussed in the Environmental Impact Study (1980, Appendix B) and CEARP Phase I (p. III-2). Data that supports the conclusions presented for the 881 Hillside contained in those reports should be included in the RI.

6.2.2 Volatile Organic Compound Survey

Bis(2-ethylhexyl)phthalate was sited as the primary soil contaminant on the 881 Hillside (p. 3-16). This is not consistent with that stated in the first paragrpah that PCE & TCE were the most commonly found contaminants and had the highest concentrations. (See comments on Section 3.11.) Toxicity of contaminants must be taken into account along with the concentrations.

A map, at an appropriate scale, showing the area surveyed, sample points, and SWMU outlines, is necessary to gain an understanding of the sources, nature, and extent of contamination.

Detection limit concentrations and standards are not provided in Table 6-1 and are necessary to evaluate the data.

The conclusion that soil gas contamination is not migrating is not supported. The conclusion is based on analysis of samples from Woman Creek. It is possible that the plume of contamination does not extend to Woman Creek. The migration distance must be defined in order to characterize the nature and extent of contamination.

Minimal must be defined. What are the effects of the volatile organics released to ambient air on human health and the environment?

Chapter 7 - Biota

7.1 Flora

One purpose of the vegetation sampling is to help determine the nature and extent of contamination. Therefore, it is important to show the locations of the sampled areas and SWMU's and to provide the analytical results and background values. Information relevant to determining the nature and extent of the contamination along the 881 Hillside should be outlined. Graphical illustration such as a contour map of radionuclide concentrations, may be helpful in evaluating the data.

The second paragraph on page 7-3 states that hazardous constituents have not been found in soils at the 881 Hillside. This is contrary to the soil gas studies presented in Chapter 3. In addition, the last paragraph indicates that areas of erosion and slumping are present. These areas and their effect on site-specific hydrology and hence contaminant migration, were not delineated in the geologic and hydrologic sections. Consistency must be maintained throughout the RI. (See comments on Section 2.6.2.)

The section does not address or provide information that would help characterize the nature and extent of the contaminant plumes on the 881 Hillside.

7.2 Wildlife

As is noted in Section 7.1, hazardous contsituents are present in shallow soils. The opposite is stated in this section (p. 7-5).

The section should also use the results of past investigations to help determine the extent of contamination along the 881 Hillside.

The radionuclide data for the report is preliminary. Therefore, the statement that plutonium has not been found (p. 7-6) is not supported.

7.3 Aquatic Life

The first paragraph states that Woman Creek received cooling tower blowdown and water treatment plant filter backwash discharge. This is not directly stated in Chapter 5. The possible contribution of these past discharges to the on-and off-site contamination must be addressed.

Chapter 8 - Public Health and Environmental Concerns

The Feasibility Study for the 881 Hillside will address, in more detail, the concerns presented in this chapter. The following review provides some initial comments.

Consistency in information is lacking. The second paragraph states that radiochemical data was unavailable at the time of the writing. However, radionuclide concentrations are given at the end of the paragraph. The concentrations of all the contaminants given in the paragraph should be referenced to the appropriate table.

8.1 Potential Receptors

8.1.1 Direct Source Contact Potential Receptors

In general, it is not sufficient to argue that exposure to contaminants is not possible because the area is in a restricted zone. This also pertains to section 8.2.1.

8.1.2 Potential Receptors of Contaminated Air

The first sentence is unclear. The necessary documentation that supports plume dilution is not given or referenced. The data source from which the wind rose was determined should be referenced.

8.1.3 Potential Receptors of Contaminated Groundwater

The frequency of domestic well use and amount of water withdrawn where pertinent to contaminant migration from the 881 Hillside should be given. This section discusses location of wells but does not address the potential of contaminants occurring in the wells.

8.1.4 Potential Receptors of Contaminated Surface Water

This section should include a discussion on Mower Reservoir as it also accepts flow from Woman Creek (Fig. 2-3).

8.2 Public Health Impacts

The comments presented for Chapter 6 should be taken into account in this section. This section does not address what the exposure potential is or what the potential health effects are to receptors of low levels of ambient radioactivity on resuspended dust particles.

8.2.3 Exposure to Contaminated Groundwater

The exposure potential and associated health concerns related to groundwater contamination are not fully addressed. The text states that contaminated groundwater surfaces and discharges into Woman Creek but that surface waters are "clean" downstream of the 881 Hillside. A detailed analysis tracking the path and contaminant concentrations in the contaminated water and the associated health and environment effects of the contamination must be provided. The term "clean" must be defined.

8.2.4 Exposure to contaminated Surface Water

The comments concerning surface water presented in Section 8.2.3 must be addressed.

The nine samples mentioned should be referenced back to Chapter 5 or listed. The SWMU associated with the contamination at SW-45 must be given. The flow time, flow rate, and contaminant concentrations of the footing-drain discharge may change seasonally.

Seasonal variation and possible effects on remediation must be considered for complete evaluation of the SWMU. August 1986 and May 1987 sample data for SW-32 indicate seasonal effects.

From the discussion, it appears that the old landfill is a potential contaminant source at the 881 Hillside and should be taken into account under the current investigation. Reference to future remediation of the old landfill should be made.

8.3 Environmental Impacts

Radionuclide data from nine soil samples (p. 3-1) were not available at the time of the writing. Therefore, the conclusions made concerning contaminated soils are not substantiated. Even though biodegradation and volatilization of bis(2-ethylhexyl)phthalate has occurred, analytical results show that the compound is still present.

It is not sufficient to state that the intended land use precludes any potential environmental impacts caused by contamination on the facility.

9.0 - References

The complete reference for Leroy and Weimer, 1977 is not given.

Appendix A - Report of Geophysical Investigations
881 Hillside Area

Based on the bedrock and shallow well pair 59-86 and 69-86, it was determined that the water level in the sandstone is 18 feet lower than that in the surficial material. This is not consistent with figure 4-1 (p. 4-8).

3.2 Electromagnetic Conductivity and 3.3 Resistivity

It would be helpful in interpreting the significance of the survey results if the SWMU locations, and geology were superimposed onto the horizontal and vertical dipole plots provided.

Section 5 Survey Results

It is confusing to have Appendices A, B, and C in Appendix A.

5.1 Electromagnetic Conductivity

Define anomaly.

5.2 Resistivity

The information obtained from the survey should be incorporated with data obtained from the other surveys and subsurface drilling to characterize, in detail, the hydrology and effect on contaminant migration from each SWMU.

5.3 Magnetometry

The anomalous areas discussed in the text should be labeled on the plot of magnetometer data. It appears that more than two anomalous areas are present.

Detailed information must be provided regarding the four locations where magnetic and conductivity anomalies overlap possibly indicating "large concentrations of metallic objects which have been deposited on the site" (p. A-23).

Section 6 Conclusions

The cause of anomalous values obtained near SWMUs 106, 107 and 130 must be investigated to fully assess the nature and extent of contamination along the 881 Hillside.

Appendix B - Soil Gas Survey

1.0 Introduction

The objective of the 881 Hillside report, as stated in this section, was in part to determine the presence and concentrations of carbon tetrachloride. Soil gas analyses of carbon tetrachloride are not provided. If carbon tetrachloride is expected as a contaminant at the 881 Hillside, then analyses should be done. A justification for not performing the analyses is needed otherwise.

2.4 Plume Map

Data can be contoured to better illustrate the extent of the plumes.

Appendix C - Description of Drilling Activities

2.1 Borehole Locations

BH4-87 is the closest borehole to SWMU 105.

The concentrations of TCA and DCE at soil gas point 92 were also high. No boreholes are south (downgradient) of SWMU 119.2 where TCE and PCE were detected in soil gas sampling.

2.2 Monitor Well Location

Is the swale where wells 1-82, 2-82, and 6-87 are located, a local discharge area? What effect does this have on contaminant migration? Recharge and discharge areas need to be shown.

3.1 Volatile Organic Field Screeing Procedures

A reason for the change in sampling procedure at BH12-87 and BH14-87 should be given.

Appendix D - Hydrogeologic data

Some of the well summary data sheets, log-boring data sheets, and aquifer-test data sheets are hand-written copies and are illegible.

Appendix E - Analytical Chemistry Results

A table of contents and introduction are necessary to explain the organization of the data. Detection limits must be provided (or referenced) for data comparison.

Some of the data sheets are not legible.

Data sheets contain results of the different media (soil and water) sampled. The background concentrations of the potential contaminants in all of the media (surface water, groundwater, and each geologic unit) should be established so that elevated concentrations can be distinguished. Organization and graphical display of the data can show where significant trends and elevated concentrations exist which help determine the nature and extent of contamination.

Appendix F - Quality Assurance

1.3 Laboratory quality assurance

QA/QC procedures are not explained in Appendix E or F. The problems encountered in analytical procedures and the effect on the results must be addressed to determine the validity of the data. An explanation should be provided for changes in the laboratory performing the analyses and what effect this may have on precision and accuracy.

1.5 Soil Gas QA

Table F-2 requires an explanation and map showing the sample locations. Also, it is not clear if duplicates were taken for all VOCs or only for PCE and TCE.