cc: Joe Zannotti,
Dick Brazell
Art Fossit
+ return

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September 25, 1989

Gary A. Litwin
Chief, Eastern Section
Bureau of Environmental
Exposure Investigation
II University Place
Albany, NY 12203-3313

Dear Mr. Litwin:

Enclosed are two copies of the revised Draft Risk Assessment report for the Clark Property site in Syracuse, New York. The assessment utilizes standard risk assessment methodologies and employs the New York State Air Guide I for ambient air criteria and exposure calculations.

I look forward to receiving your comments on this draft risk assessment. I apologize for the delay in revising this document.

If you have any questions or comments, please feel free to contact Janine Dinan at the number provided.

Sincerely,

David A. Belluck

David A. Belluck, Ph.D.
Manager
Toxicology and Risk Assessment

J. Madrian

DRAFT

BASELINE RISK ASSESSMENT FOR THE CLARK PROPERTY SYRACUSE, NEW YORK

Prepared for:

SHANLEY, SWEENEY & REILLY
Albany, New York

Prepared by:

DUNN GEOSCIENCE CORPORATION
12 Metro Park Road
Albany, New York 12022

Date:

September 1989

EXECUTIVE SUMMARY

The Baseline Risk Assessment report evaluated the potential risk to public health and welfare associated with the release or potential release of chemicals of the Clark Property in Syracuse, New York. The methodology of this evaluation is based upon the USEPA Superfund Public Health Evaluation Manual and was prepared to identify and quantitate potential exposures under a no-action alternative for the site.

Potential exposure concentrations were calculated for selected indicator chemicals which represented the most toxic, mobile and persistent chemicals present at the site. In the absence of media-specific ARAR's, these calculated exposure values were compared with existing health-based criteria in order to characterize risk. Of the thirteen indicator chemicals, four were found to greatly exceed health-based criteria, or represent greater than a 10^{-4} cancer risk.

ACRONYM LIST

ADI	Acceptable Daily Intake
ARAR	Appropriate or Relevant and Applicable Requirement
q1*	Cancer Potency Factor
DCE	Dichloroethene
DW	Ditch Water
DGC	Dunn Geoscience Corporation
GW	Groundwater
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MEK	Methyl Ethyl Ketone (a.k.a. 2-Butanone)
NYS	New York State
PCB	Polychlorinated Biphenyl
RfD	Reference Dose
SS&R	Shanley, Sweeney & Reilly, P.C.
SPHEM	Superfund Public Health Evaluation Manual
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Chemical

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1.0 INTRODUCTION

Dunn Geoscience Corporation (DUNN), in response to a request from the law firm of Shanley, Sweeney and Reilly, P.C. (SS&R), has conducted subsurface investigations to characterize soil, groundwater and surface water conditions at the Clark Property in Syracuse, New York (Figure 1.0) This document evaluates the potential risk to public health and welfare associated with the release or potential release of hazardous substances from the Clark Property site. It is based on currently available data generated during a hydrogeologic investigation of the property conducted by Dunn Geoscience Corporation (September 1988). In the event that any additional media-specific analytical data are obtained within a reasonable time frame, this document may be revised to incorporate this data, if warranted.

A risk assessment is a multistage process which evaluates the potential adverse health effects of exposure to chemicals in the environment. The methodology of this assessment is based on the Superfund Public Health Evaluation Manual (EPA, 1986b) which recommends the use of health based criteria to define acceptable exposure levels when media-specific standards are not available.

The following are the major steps in the public health evaluation process:

Exposure Assessment:

- Select indicator chemicals
- Define potential routes of exposure
- Quantitate potential exposure concentrations

Risk Assessment:

- Compare calculated exposure concentrations to Applicable or Relevant and Appropriate Requirements (ARARs)
- Compare calculated exposure concentrations to health based criteria
- Assess toxicity and characterize risk

2.0 SITE LOCATION AND ENVIRONMENTAL SETTING

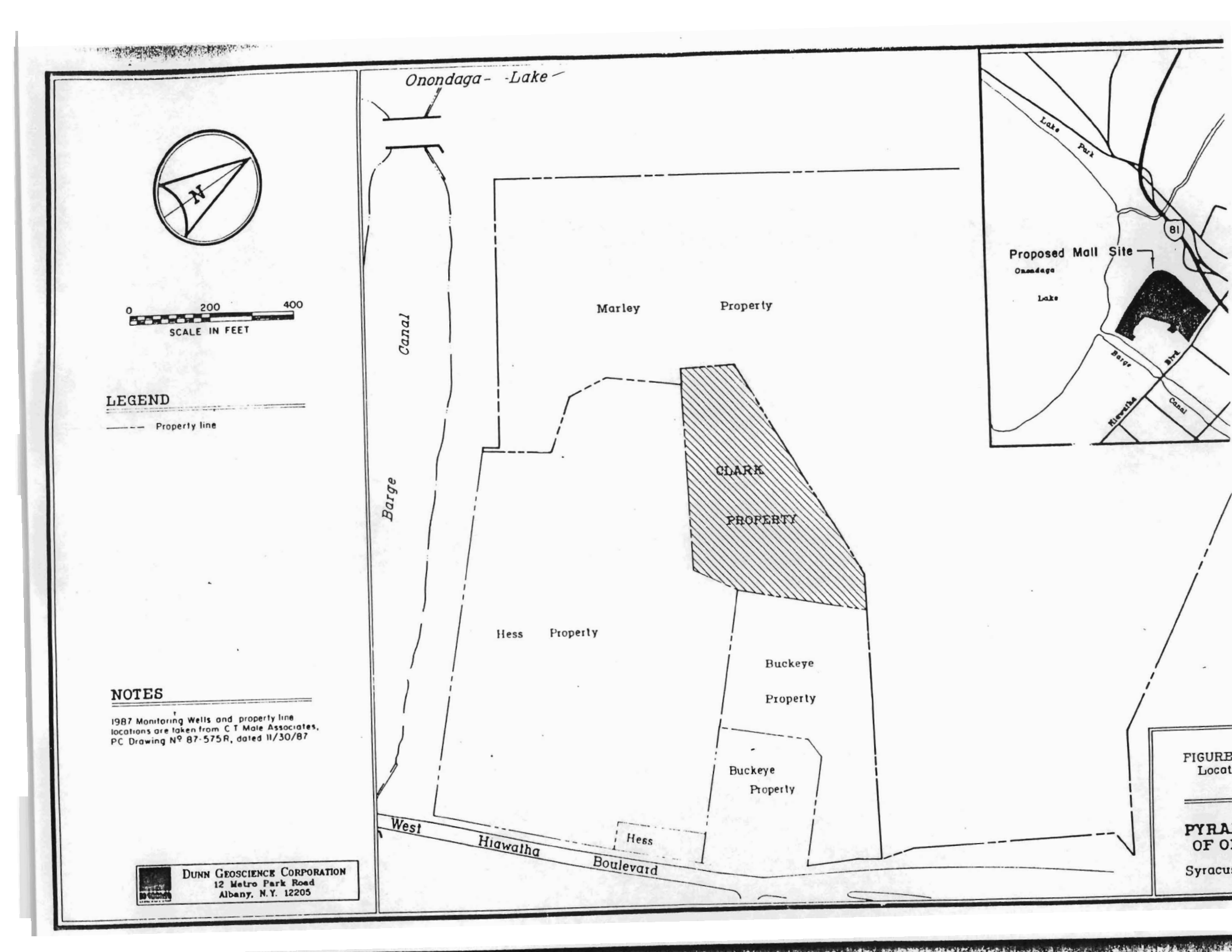
The Clark Property site is adjacent to the proposed location of the Carousel Center Mall in the City of Syracuse, New York at the southeastern end of Onondaga Lake (Figure 1.0). A portion of the Clark Property (Figure 2.0) is listed in the New York State registry of Inactive Hazardous Waste Sites as a Class II site. Generally, the site is bordered by Interstate 81 to the northeast, Hiawatha Boulevard to the southeast, the New York State Barge Canal to the southwest, and Onondaga Lake to the northwest.

The Clark Property covers approximately 3.5 acres and is relatively flat with elevations ranging from approximately 366 feet above mean sea level at the southwestern edge of the property to 375 feet above sea level in the northern part of the property. The topography slopes gently toward a drainage ditch along the southwestern property line adjacent to the Hess property. Regrading of some of the unlisted portion of the site has occurred in conjunction with mall construction activities.

3.0 EXPOSURE ASSESSMENT

3.1 Selection of Indicator Chemicals

Sampling results often identify a large number of chemicals present at a site. Conducting a public health evaluation that addresses all the substances detected would be both difficult and impractical. Instead, the indicator chemical selection process is designed to identify 10-15 of the "highest risk" chemicals at a site so that the public health evaluation focuses on the chemicals of greatest concern. The chemicals chosen should represent the most toxic, mobile and persistent chemicals at a site as well as those present in the highest concentrations.


Onondaga - Lake
Marley Property
Barge Canal
CLARK PROPERTY
Hess Property
Buckeye Property
Buckeye Property
Hess
West Hiawatha Boulevard
N
0 200 400
SCALE IN FEET
LEGEND
Property line
NOTES
1987 Monitoring Wells and property line locations are taken from C T Male Associates, PC Drawing Nº 87-575R, dated 11/30/87
DUNN GEOSCIENCE CORPORATION
12 Metro Park Road
Albany, N.Y. 12205
Proposed Mall Site
Onondaga Lake
Lake Part
81
Barge
Canal
Hiawatha
Blvd
FIGURE
Locat
PYRA
OF O
Syracus

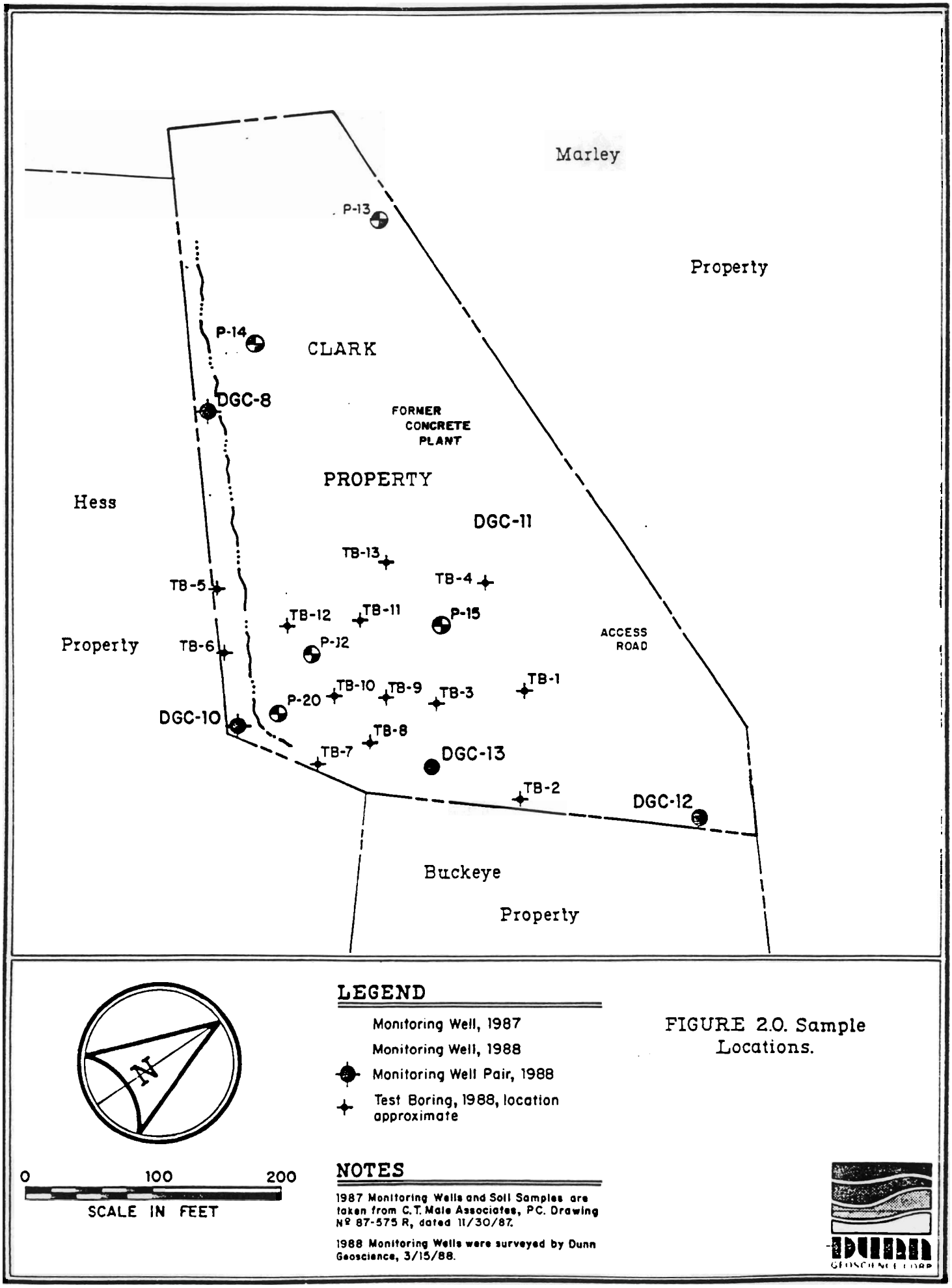


FIGURE 2.0. Sample Locations.

Volatile, semi-volatile and PCB (Polychlorinated Biphenyl) analyses were performed on samples collected from the Clark Property. Results of the semi-volatile analyses revealed very low (i.e., less than 100 ppb) concentrations of naphthalene, phenol, 4-methylphenol, benzoic acid, 2-methylphenol and 1,2-dichlorobenzene in groundwater (Appendix B). The levels reported were considered negligible relative to concentrations of Volatile Organic Chemicals (VOCs) detected in on-site soils, surface water and groundwater.

VOC analyses were performed on surface water samples collected from the Barge Canal. The upstream sample contained tetrachloroethene at 2 ppb. No other volatile organics were detected in either the upstream or downstream samples.

Results of the petroleum hydrocarbon analyses also revealed relatively insignificant concentrations to be present in groundwater, surface (ditch) water and ditch sediment (Appendices B and C).

No PCB's or organochlorine pesticides were detected in surface soil or groundwater samples obtained from the Clark Property.

Of the compounds detected, the following were selected as indicator chemicals ("chemicals of concern") for the Clark Property based on concentration, frequency of detection, as well as, chemical mobility and toxicity:

Acetone	Methylene Chloride
Benzene	Toluene
2-Butanone (MEK)	1,1,1-Trichloroethane
1,1-Dichloroethane	Trichloroethene
1,1-Dichloroethene	Vinyl Chloride
trans-1,2-Dichloroethene	Xylenes
Ethylbenzene	

Of the selected indicator chemicals, the following are known or suspected carcinogens:

Chemical Name	USEPA Weight of Evidence Classification*	USEPA Carcinogenicity Determination*
Benzene	A	Known Human Carcinogen
1,1-Dichloroethane	B2	Probable Human Carcinogen
1,1-Dichloroethene	C	Possible Human Carcinogen
Methylene Chloride	B2	Probable Human Carcinogen
Trichloroethene	B2	Probable Human Carcinogen
Vinyl Chloride	A	Known Human Carcinogen

* (See Appendix H)

3.2 Define potential routes of exposure

Routes of exposure are the probable scenarios by which people may come in contact with contaminated media both onsite and offsite. An exposure pathway consists of four elements: (1) a source and mechanism of chemical release to the environment, (2) an environmental transport medium (e.g., air, groundwater) (3) a point of potential human contact with the contaminated medium ("exposure point") and (4) a human exposure route (e.g. drinking water ingestion) at the contact point. At the Clark Property site, the selected chemicals of concern were detected in groundwater, subsurface soil, onsite surface water (drainage ditch) and ditch sediments. In addition, inhalation of volatile chemicals presents a potential exposure pathway.

3.2.1 Potential Onsite Exposure Routes

In terms of onsite exposures, the concerns are (1) direct contact with chemicals detected in onsite soils and (2) inhalation of volatile chemicals detected in the onsite surface water and soils.

The property is part of a former salt marsh and the groundwater in the area is not useable as a source of potable water. The onsite surface water is located in a ditch along the Hess/Clark property boundary and is comprised primarily of onsite surface water runoff and local groundwater discharge and has no known use. Therefore, direct contact with contaminants in either the groundwater, surface water or sediments is considered unlikely.

Direct contact with contaminants in the subsurface soils is also considered unlikely as site access is restricted and controlled. However, based on the assumption that this site may undergo commercial development in the future, direct contact with onsite subsurface soils during construction activities should be considered as a potential onsite exposure pathway.

Inhalation of ambient air is also considered to be a potential onsite exposure pathway due to the volatile nature of the chemicals of concern in onsite soils and surface (ditch) water.

3.2.2 Potential Offsite Exposure Routes

In evaluating the potential for offsite exposure to chemicals of concern on the Clark Property, the focus is to define potentially completed pathways for the migration of onsite contaminants to offsite receptors. The site is located in an industrial area where access is restricted by six-foot, chain link fencing and guarded around the clock. There is no residential housing in the area nor are there any public recreational facilities. Therefore, the public is unlikely to have direct contact with onsite soils. Onsite groundwater has the potential to discharge to the NYS Barge Canal and Onondaga Lake, but neither are potable water supplies. In addition to onsite groundwater, surface water in the onsite drainage ditch discharges to the Barge Canal. Although presently there is no known exposure route for offsite surface water, future use of the Barge Canal and Onondaga Lake may involve recreational activities. In that case, recreational use of potentially impacted surface water would represent a completed pathway for exposure.

To date, sampling results have not indicated the presence of any indicator chemicals in the Barge Canal. Therefore, this potential pathway of exposure is considered incomplete at this time and will not be addressed.

In terms of potential offsite exposure to contaminants in the ambient air, there does not appear to be any offsite receptors immediately downwind of the site. In this case, the New York State Department of Environmental

Conservation suggests that the evaluation focus on the potential concentration of indicators in ambient air at the site boundary (NYSDEC, 1986).

3.2.3 Exposure Routes of Concern

The following scenarios have been identified as potential completed routes of exposure for chemicals of concern at the Clark Property site:

Onsite

- Inhalation of volatile chemicals from undisturbed soils
- Inhalation of volatile chemicals from surface (ditch) water
- Dermal contact and incidental ingestion of indicator chemicals resulting from direct contact with soils

Offsite

- Inhalation of volatile chemicals in ambient air at the property boundary

3.3 Quantitate Potential Exposure Concentrations

Potential exposure concentrations are calculated by incorporating information on the physical/chemical properties of the indicator chemicals and field monitoring data into an appropriate mathematical model. Sample calculations and methodologies are presented in Appendices D, E, F and G.

3.3.1 Data Used to Estimate Exposure Concentrations

Table 1 presents the "worst case" and "average case" soil, surface water and groundwater data used to calculate both onsite and offsite exposure levels for each of the indicator chemicals.

TABLE 1

CONCENTRATION OF INDICATORS

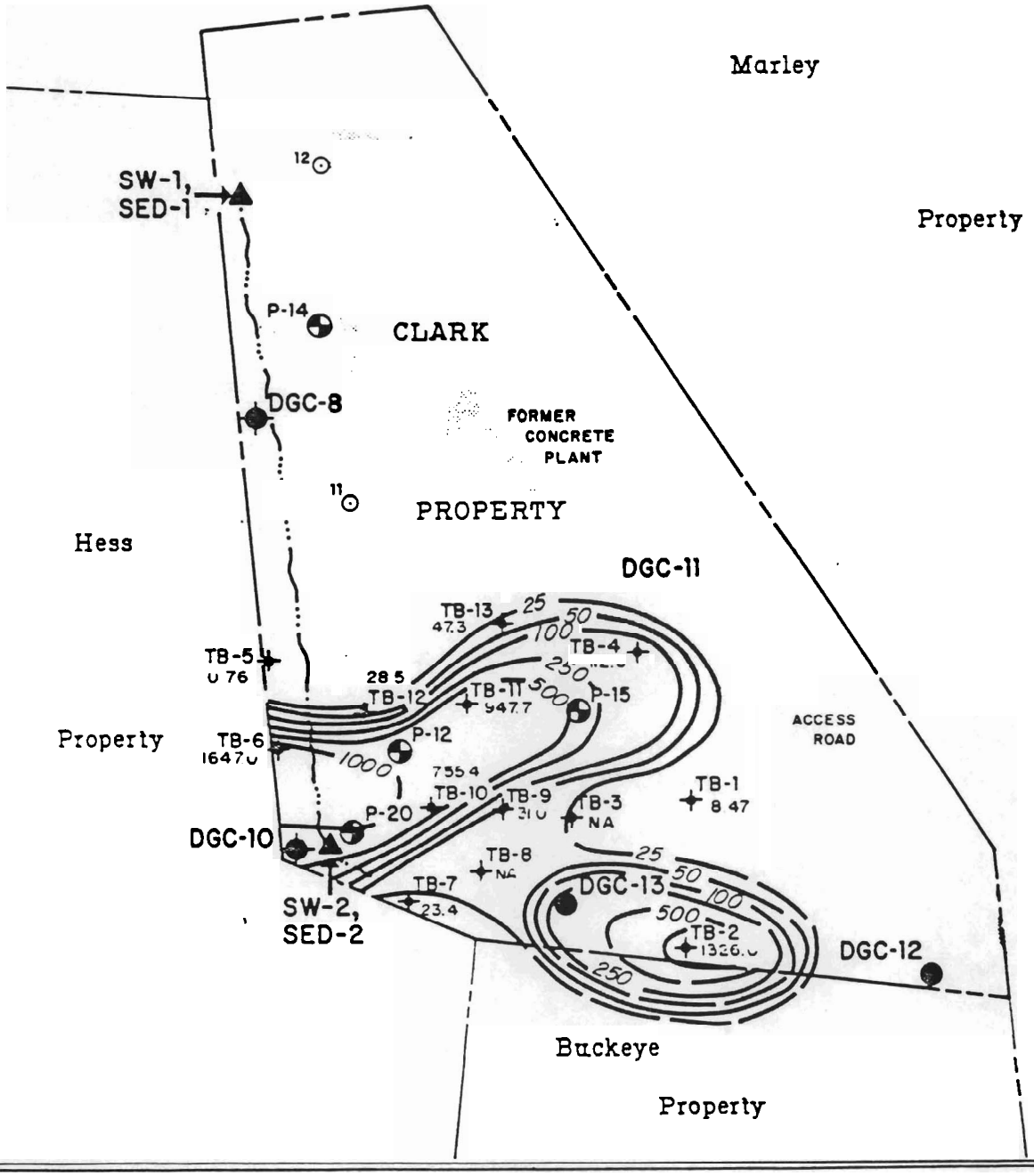
INDICATOR CHEMICALS	ONSITE SOIL AND SURFACE WATER CONCENTRATION USED TO ESTIMATE INHALATION EXPOSURES				ONSITE SOIL CONCENTRATION USED TO ESTIMATE DERMAL EXPOSURES	
	worst case soil Plume a ug/kg	worst case soil Plume b ug/kg	avg* case soil ug/kg	worst case sw ug/l	worst case soil ug/kg	avg* case soil ug/kg
ACETONE	1.50E+05	1.60E+03	1.33E+03	5.80E+03	1.50E+05	1.33E+03
BENZENE	--	9.40E+01	6.61E+01	--	9.40E+01	6.61E+01
2 BUTANONE (MEK)	--	--	--	--	--	--
1,1 DICHLOROETHANE	1.80E+04	8.60E+03	8.55E+02	1.10E+03	1.80E+04	8.55E+02
1,1 DICHLOROETHENE	2.40E+03	1.20E+03	1.83E+02	1.80E+02	3.70E+03	1.83E+02
t-1,2 DICHLOROETHENE	6.80E+04	5.40E+04	4.80E+03	1.40E+04	6.80E+04	4.80E+03
ETHYLBENZENE	4.40E+03	2.70E+03	2.50E+02	--	4.40E+03	2.50E+02
METHYLENE CHLORIDE	1.50E+04	1.10E+05	1.71E+03	--	1.10E+05	1.71E+03
TOLUENE	4.60E+05	4.90E+05	3.55E+04	5.70E+03	4.90E+05	3.55E+04
1,1,1 TRICHLOROETHANE	1.60E+05	1.60E+05	2.20E+03	5.00E+03	1.60E+05	2.20E+03
TRICHLOROETHENE	9.70E+05	5.80E+05	1.32E+04	5.70E+03	9.70E+05	1.32E+04
VINYL CHLORIDE	2.90E+04	8.00E+03	8.64E+02	2.30E+03	2.90E+04	8.64E+02
XYLENES (total)	3.40E+04	5.20E+04	2.46E+03	1.70E+02	5.20E+04	2.46E+03

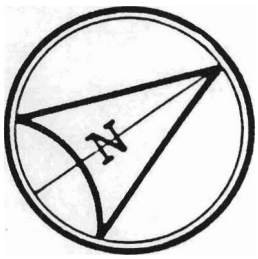
* Average values based on geometric means

To quantitate potential intake of volatile contaminants in soil via inhalation, both worst case and average case estimates were calculated using areas of contamination defined by total VOC levels obtained during subsurface soil sampling at the site (DUNN Sept. 1988). Two distinct soil contaminant plumes (Plume a and Plume b) were identified and are shown in Figure 3. Worst case estimates incorporated the highest contaminant concentrations from both contaminant plumes. The worst case area of Plume a was defined as the area outlined by the 500 ppm contaminant concentration isochron which includes TB-6, TB-10 and TB-11. The worst case area of Plume b was defined as the area outlined by the 1000 ppm isochron around TB-2. Contaminant concentrations were estimated by using analytical laboratory data from the soil borings within each defined area. Average case estimates represent the geometric mean of contaminant concentrations from the total area of contamination which covers approximately 38,000 ft^2. This area is defined by the outermost isochron and incorporates concentrations from both contaminant plumes. Due to the large area of contamination used to estimate the average case exposure, little difference exists between average case and worst case exposure values for inhalation of volatilized soil contaminants.

Analytical results from the soil borings were also used to calculate worst case and average case exposures resulting from dermal contact with onsite soils during excavation/construction activities. The worst case concentration represents the highest level of each indicator chemical detected onsite; whereas, the average case is the geometric mean of onsite soil concentrations for each indicator chemical.

The surface (ditch) water results were used to calculate the potential volatilization of indicator chemicals from water in the onsite drainage ditch. Due to the limited number of samples collected, only worst case estimates are presented.





0 100 200

SCALE IN FEET

LEGEND

- Monitoring Well, 1987
- Monitoring Well, 1988
- Monitoring Well Pair, 1988
- 25 Isochron (ppm)
- Test Boring (approx. loc.), 6/22/88

NOTES

1987 Monitoring Wells and Soil Samples are taken from C.T. Male Associates, P.C. Drawing Nº 87-575 R, dated 11/30/87.

1988 Monitoring Wells were surveyed by Dunn Geoscience, 3/15/88.

FIGURE 3.0. Contours of Maximum Total Volatile Organic Chemicals in TB-Series Borings.

3.3.2 Calculating Potential Onsite Inhalation Exposures

The emission rate and subsequent air concentration for each indicator chemical detected in onsite soil and ditch water were calculated using the equations presented in Appendix D. The equations are based on (i.e., combinations of) those presented in the Superfund Exposure Assessment Manual (EPA, 1986a) for estimated volatile releases from landfills and impacted surface water.

The basis for the soil equations is Fick's First Law of steady state diffusion (EPA, 1986a). Fick's Law assumes that diffusion into the atmosphere occurs at a planar surface where concentrations remain constant. The equations do not take into account the effects of biodegradation, dilution and transport in water or adsorption to soils. The model emphasizes diffusion of the contaminant vapor through the soil cover as the controlling factor for emissions. The equations also assume that there is zero concentration of the volatilizing chemical at the soil surface, facilitating the movement of chemicals from an area of higher concentration to an area of lesser concentration. The presence of water in the soil cover will decrease the flux rate of volatiles by decreasing the porosity of the soil. However, EPA suggests that the total soil porosity for dry soils be used in order to represent the worst case (EPA, 1986a).

The equations used to calculate emissions from the onsite ditch water are based on a model where the dominant process is molecular diffusion, which is dependent on phase exchange coefficients rather than vaporization from the solution. It is assumed that the water body and the chemicals dissolved are well mixed with a thin surface layer across which a concentration gradient exists. It also assumes that the air above the water is well mixed and that a thin layer above the water surface contains a second concentration gradient. The concentrations across the layers are assumed to be unequal such that the volatilization rate of the indicator chemicals into the air is greater than the condensation rate back to the water (EPA, 1986a).

Table 2 presents the calculated emission rate and air concentration for each indicator chemical. Air concentrations were derived by dividing the emission

TABLE 2

POTENTIAL ONSITE AIR CONCENTRATION

INDICATOR CHEMICALS	VOLATILE EMISSION RATES (g/sec)				POTENTIAL CONCENTRATION OF VOLATILES IN AIR* (g/cu.m)		
	worst case soil Plume a	worst case soil Plume b	avg** soil	worst case sw (ditch)	worst case soil (a+b)	avg** soil	worst case sw (ditch)
ACETONE	1.66E-05	2.14E 08	1.49E-06	4.10E 04	1.66E-06	1.49E-07	4.10E-05
BENZENE	--	4.02E-10	2.37E 08	--	4.02E-11	2.37E-09	--
2-BUTANONE (MEK)	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.00E-06	1.15E-07	9.62E 07	8.78E-03	2.12E-07	9.62E-08	8.78E-04
1,1-DICHLOROETHENE	6.30E-07	3.81E-08	4.87E-07	4.72E-03	6.68E-08	4.87E-08	4.72E-04
t-1,2-DICHLOROETHENE	7.14E-06	6.85E-07	5.11E-06	3.35E-01	7.83E-07	5.12E-07	3.35E-02
ETHYLBENZENE	1.49E-08	1.11E-09	8.60E-09	--	1.60E-09	8.60E-10	--
METHYLENE CHLORIDE	2.77E 06	2.45E-06	3.20E 06	--	5.22E-07	3.21E 07	--
TOLUENE	4.99E-06	6.43E 07	3.91E-06	6.33E-02	5.63E-07	3.91E 07	6.33E-03
1,1,1 TRICHLOROETHANE	1.16E 05	1.41E-06	1.62E-06	8.78E 02	1.30E-06	1.63E-07	8.78E 03
TRICHLOROETHENE	4.25E 05	5.83E 07	5.87E-06	6.33E-02	4.31E-06	5.87E-07	6.33E-03
VINYL CHLORIDE	3.54E-05	1.18E 06	1.07E-05	7.02E-02	3.66E-06	1.07E-06	7.02E-03
XYLENES (total)	1.06E-07	1.96E-08	7.80E 08	1.82E-03	1.26E-08	7.80E 09	1.82E 04

* Air concentration calculated with 5 m/sec wind speed

** Average values based on geometric means

rates by the following factors: wind speed, height of the atmospheric mixing zone and the distance from the source to the receptor. The air concentration is then multiplied by the standard air intake volume for an adult during a typical 8 hour workday ($10m^3$/day). The result, presented in Table 3, is the potential onsite inhalation exposure that might occur during a workday.

3.3.3 Calculating Potential Onsite Exposures from Direct Contact with Soil

The Exposure Factors Handbook (EPA, 1988) estimates chemical intake factors for exposures via direct contact with contaminated soils. For adults engaged in outdoor work (e.g., yardwork, gardening) the combined intake from dermal absorption and ingestion is estimated to be 537 mg/day. The factor is based on the assumption that 57 mg of the chemical would be absorbed through intact skin and 480 mg would be ingested from oral contact with contaminated hands while eating, smoking, etc. For the purpose of this evaluation the intake factor will represent potential exposure during onsite construction/excavation activities.

The potential exposures resulting from direct contact with onsite soil are calculated by multiplying the soil intake factor (537 mg) by the concentration of the indicator chemicals detected in onsite soil samples. The results, presented in Table 3, assume 100% absorption of the chemical from the soil contacted.

3.3.4 Calculating Potential Offsite Exposures

As previously stated, the potential exists for the migration of volatile indicator chemicals from onsite soil and surface (ditch) water to offsite receptors. The nearest offsite receptor has not been identified. In such cases, the NYS Department of Environmental Conservation suggests that the property boundary should be evaluated as the nearest offsite receptor (NYSDEC, 1986). For this evaluation, the corner where the Buckeye and Hess properties meet is the point of access for the Clark Property and will be considered the property boundary. The distance from the source to the boundary is approximately 800 ft. Using methodology set forth in NYS Air Guide I (NYSDEC,

TABLE 3

POTENTIAL ONSITE EXPOSURES

INDICATOR CHEMICALS	INHALATION EXPOSURE* DURING 8 HOUR WORKDAY (mg/day)			DIRECT CONTACT EXPOSURE DURING 8 HOUR WORKDAY (mg/day)	
	worst case intake soil	avg** intake soil	worst case intake (sw/ditch)	worst case intake soil	avg** intake soil
ACETONE	1.66E-02	1.49E 03	4.10E-01	8.06E-02	7.14E-04
BENZENE	4.02E-07	2.37E-05	--	5.05E-05	3.55E 05
2 BUTANONE (MEK)	-	-	-	--	-
1,1 DICHLOROETHANE	2.12E 03	9.62E-04	8.78E+00	9.67E-03	4.59E-04
1,1 DICHLOROETHENE	6.68E 04	4.87E-04	4.72E+00	1.99E 03	9.83E-05
t-1,2-DICHLOROETHENE	7.83E-03	5.12E-03	3.35E+02	3.65E-02	2.58E-03
ETHYLBENZENE	1.60E-05	8.60E 06	--	2.36E-03	1.34E-04
METHYLENE CHLORIDE	5.22E 03	3.21E 03	--	5.91E-02	9.18E-04
TOLUENE	5.63E-03	3.91E-03	6.33E+01	2.63E-01	1.91E-02
1,1,1 TRICHLOROETHANE	1.30E-02	1.63E-03	8.78E+01	8.59E-02	1.18E-03
TRICHLOROETHENE	4.31E 02	5.87E-03	6.33E+01	5.21E-01	7.09E 03
VINYL CHLORIDE	3.66E-02	1.07E-02	7.02E+01	1.56E-02	4.64E-04
XYLENES (total)	1.26E 04	7.80E-05	1.82E+00	2.79E-02	1.32E-03

* Inhalation rate estimated at 10 cu.m per 8 hours

** Average values based on geometric means

1986), calculated air concentrations onsite will be divided by a factor of 35 (see Appendix F) to estimate the ambient air concentrations at the property boundary.

Table 4 presents the calculated onsite air concentrations and the estimated air concentrations at the property boundary.

4.0 RISK ASSESSMENT

4.1 Compare Exposure Concentrations to Applicable or Relevant and Appropriate Requirements (ARARs).

ARARs are media specific, enforceable standards promulgated by the federal or state government that can be applied directly to site conditions. Both federal and state ARARs for the indicator chemicals in each media are listed in Table 5.

In terms of federal regulations, the only promulgated standards are Maximum Contaminant Levels (MCLs) for public drinking water supplies. There are no federal ARARs for the selected indicator chemicals in soils or ambient air. Since the ground and surface waters on the site are not sources of potable water, drinking water MCLs do not apply.

The State of New York has promulgated drinking water standards and ambient water quality criteria for specific classes of water bodies. The ground and surface waters on the site are not sources of potable water nor have they been classified; therefore, the New York State Water Quality standards do not apply. The state has not promulgated standards for organic contaminants in soil or ambient air. However, guidance values have been set for certain organics in ambient air and are listed under Air Guide I (NYSDEC, 1986). Although, the guidance values in Air Guide I are not enforceable standards, they are widely used as a screening tool for determining whether or not a permit should be issued and to assess ambient air quality in general. Therefore, we compared the calculated onsite air concentrations to the Acceptable Ambient Levels (AALs) set forth in Air Guide I. The results of the

TABLE 4

POTENTIAL OFFSITE AIR CONCENTRATION

INDICATOR CHEMICALS	POTENTIAL CONCENTRATION OF VOLATILES IN AIR* ONSITE (g/cu.m)			POTENTIAL CONCENTRATION OF VOLATILES IN AIR* OFFSITE*** (g/cu.m)		
	worst case soil (a+b)	avg** soil	worst case sw (ditch)	based on worst case soil (a+b)	based on avg** soil	based on worst case sw (ditch)
ACETONE	1.66E-06	1.49E-07	4.10E-05	4.74E-08	4.26E-09	1.17E-06
BENZENE	4.02E-11	2.37E-09	--	1.15E-12	6.77E-11	--
2-BUTANONE (MEK)	--	--	--	--	--	--
1,1-DICHLOROETHANE	2.12E-07	9.62E-08	8.78E-04	6.06E-09	2.75E-09	2.51E-05
1,1-DICHLOROETHENE	6.68E-08	4.87E-08	4.72E-04	1.91E-09	1.39E-09	1.35E-05
t-1,2-DICHLOROETHENE	7.83E-07	5.12E-07	3.35E-02	2.24E-08	1.46E-08	9.57E-04
ETHYLBENZENE	1.60E-09	8.60E-10	--	4.57E-11	2.46E-11	--
METHYLENE CHLORIDE	5.22E-07	3.21E-07	--	1.49E-08	9.17E-09	--
TOLUENE	5.63E-07	3.91E-07	6.33E-03	1.61E-08	1.12E-08	1.81E-04
1,1,1-TRICHLOROETHANE	1.30E-06	1.63E-07	8.78E-03	3.71E-08	4.66E-09	2.51E-04
TRICHLOROETHENE	4.31E-06	5.87E-07	6.33E-03	1.23E-07	1.68E-08	1.81E-04
VINYL CHLORIDE	3.66E-06	1.07E-06	7.02E-03	1.05E-07	3.06E-08	2.01E-04
XYLENES (total)	1.26E-08	7.80E-09	1.82E-04	3.60E-10	2.23E-10	5.20E-06

* Air concentration calculated with 5 m/sec wind speed

** Average values based on geometric means

*** Offsite concentrations estimated at the property boundary

TABLE 5

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

INDICATOR CHEMICALS	FEDERAL ARARs			STATE ARARs				
				WATER (ug/L)			AIR +++ (ug/m3)	SOIL
	WATER MCL/MCLG	AIR/SOIL	RFD/ADI/q1* (mg/kg/day)	MCL +	surface water ++	ground water ++		
ACETONE	--	--	1.00E 01 RFD	50	--	--	35,600	-
BENZENE	0.005 ppm	--	2.90E-02 Oral Slope Factor/ Inhalation Slope Factor	5	1.0	ND (potable) 6 (non potable)	100	
2 BUTANONE (MEK)	--		5.00E 02 RFD	50	--	--	1,967	
1,1 DICHLOROETHANE	--	--	9.10E-02 Oral Slope Factor ++++ 1.34E+00 Inhalation ADI +++++	5	50	50	--	-
1,1 DICHLOROETHENE	0.007 ppm	--	6.00E-01 Oral Slope Factor 1.20E+00 Inhalation Slope Factor	5	0.07	0.07	--	
t 1,2 DICHLOROETHENE	0.1 ppm (proposed)	-	2.00E-02 RFD	5	50	50	--	-
ETHYLBENZENE	0.7 ppm (proposed)	-	1.00E 01 RFD	5	50	50	1,450	-
METHYLENE CHLORIDE	--	--	7.50E-03 Oral Slope Factor 1.40E-02 Inhalation Slope Factor	5	50	50	1,167	--
TOLUENE	2 ppm (proposed)	-	3.00E-01 RFD	5	50	50	7,500	
1,1,1 TRICHLOROETHANE	0.2 ppm	-	9.00E-02 RFD	5	50	50	38,000	-
TRICHLOROETHENE	0.005 ppm (proposed)		1.10E-02 Oral Slope Factor 1.30E-02 Inhalation Slope Factor	5	3	10 (potable) 11 (non potable	900	
VINYL CHLORIDE	0.002 ppm	-	1.90(mg/kg/day)-1 ++++ 2.95(mg/kg/day)-1 ++++	2	0.3	5	0.4	-
XYLENES (total)	10 ppm (proposed)		2.00E+00 RFD	5	50	50	1450	-

+ New York State Sanitary Code, Chpt.1,Subpart 5-1,1988
++ New York State Ambient Water Quality Standards and Guidance, 1987
+++ New York State Air Guide I,1986

comparison indicated that the estimated onsite air concentrations for the following compounds exceeded their respective AALs:

- Trichloroethene volatilized from onsite surface (ditch) water
- Vinyl chloride volatilized from onsite soils and surface (ditch) water

Compliance with AALs must be determined for air levels detected at the "nearest downwind receptor." To date, the "nearest downwind receptor" to the Clark Property has not been established. Thus, for the purpose of this evaluation, the distance from the source to the area where access to the site is restricted will be considered the nearest receptor. In this case, the distance is approximately 800 ft. southwest of the Clark Property at the corners where the Buckeye and Hess properties meet. Using the methodology set forth in Air Guide I, the calculated onsite air concentrations are divided by a factor of 35 to obtain estimated levels at the nearest receptor. The results of this comparison indicated that the estimated air level of vinyl chloride, volatilized from onsite surface (ditch) water, would exceed the AAL at the nearest receptor (i.e., property boundary).

4.2 Health Based Criteria Used for Comparison to Calculated Exposure Concentrations

In the absence of media specific ARARs for each of the indicator chemicals, EPA advises that exposure concentrations be compared to health based criteria (EPA, 1986b). These criteria, listed in Table 5, include reference doses (RfDs) for non-carcinogenic compounds and cancer potency factors (q_1^*) for known or suspected carcinogens (IRIS).

RfDs are an estimate of the daily intake level for humans that is likely to be without appreciable risk of deleterious effects over a lifetime of exposure. These values can be compared to the exposure levels calculated for each indicator chemical.

Cancer potency factors ($q1^*$) can be used to quantitate the level of risk posed by exposure to potentially carcinogenic compounds. For Superfund sites, the

remedial alternatives are designed to reduce the exposure to carcinogenic chemicals to levels that correspond to a range of risk between 10^{-7} and 10^{-4} (EPA, 1986b). For the purpose of this evaluation, the risk level that should not be exceeded is set at 10^{-4} (i.e., a risk of 1 excess case of cancer per 10,000 exposed population). The q1* for each carcinogenic indicator was used to estimate an intake level corresponding to a 10^{-4} risk (see Appendix G Equation A.2).

4.3 Assess Toxicity and Characterize Risk

Table 6 lists the estimated intake levels for onsite exposures to the indicator chemicals and their respective EPA health based criteria. For non-carcinogenic indicators, the calculated exposure levels can be compared to the RfDs. For carcinogenic indicators, the calculated exposure levels are compared to intake levels corresponding to a 10^{-4} cancer risk.

The following is a discussion of those compounds for which the calculated exposure levels exceed health based criteria. Also included is a brief explanation of the magnitude by which the health based criteria are exceeded for both noncarcinogens and carcinogens, in the worst case (unless otherwise noted).

- o Direct contact with onsite soils

  Carcinogens

  - The exposure estimate for vinyl chloride exceeds health criteria by one order of magnitude but is still within a 10^{-4} risk level (See Appendix G Section I-C).

- o Inhalation exposure from volatiles in onsite soils

  Carcinogens

  - The exposure estimate for vinyl chloride exceeds health criteria by one order of magnitude in both the worst case and average

TABLE 6

COMPARISON OF ESTIMATED EXPOSURES TO
HEALTH BASED CRITERIA

INDICATOR CHEMICALS	DIRECT CONTACT EXPOSURE DURING 8 HOUR WORKDAY (mg/day)		INHALATION EXPOSURE FROM ONSITE SOIL AND SURFACE WATER DURING 8 HOUR WORKDAY (mg/day)			HEALTH BASED CRITERIA (mg/day)
	worst case intake	avg* intake	worst case soils	avg* soils	worst case (sw/ditch)	USEPA
ACETONE	8.06E-02	7.14E-04	1.66E-02	1.49E-03	4.10E-01	7.00E+00 RFD oral inhalation
BENZENE	5.05E-05	3.55E-05	4.02E-07	2.37E-05	--	2.41E-01 1.0E-04 Risk(Oral) 1.0E-04 Risk(Inhalation)
2 BUTANONE (MEK)	--	--	-	--	--	3.50E+00 RFD oral
1,1-DICHLOROETHANE	9.67E-03	4.59E-04	2.12E-03	9.62E-04	8.78E+00	7.69E-02 1.0E-04 Risk(Oral) ** 9.36E+01 Inhalation ADI ***
1,1-DICHLOROETHENE	1.99E-03	9.83E-05	6.68E-04	4.87E-04	4.72E+00	1.17E-02 1.0E-04 Risk(Oral) 5.83E-03 1.0E-04 Risk(Inhalation)
t 1,2 DICHLOROETHENE	3.65E-02	2.58E-03	7.83E-03	5.12E-03	3.35E+02	1.40E+00 RFD oral inhalation
ETHYLBENZENE	2.36E-03	1.34E-04	1.60E-05	8.60E-06	--	7.00E+00 RFD oral 1.09E+01 inhalation
METHYLENE CHLORIDE	5.91E-02	9.18E-04	5.22E-03	3.21E-03	--	9.33E-01 1.0E-04 Risk(Oral) 5.00E-01 1.0E-04 Risk(Inhalation)
TOLUENE	2.63E-01	1.91E-02	5.63E-03	3.91E-03	6.33E+01	2.10E+01 RFD oral 4.20E+01 inhalation
1,1,1 TRICHLOROETHANE	8.59E-02	1.18E-03	1.30E-02	1.63E-03	8.78E+01	6.30E+00 RFD oral 2.09E+01 inhalation
TRICHLOROETHENE	5.21E-01	7.09E-03	4.31E-02	5.87E-03	6.33E+01	6.36E-01 1.0E-04 Risk(Oral) 5.38E-01 1.0E-04 Risk(Inhalation)
VINYL CHLORIDE	1.56E-02	4.64E-04	3.66E-02	1.07E-02	7.02E+01	3.68E-03 1.0E-04 Risk(Oral) ** 2.37E-03 1.0E-04 Risk(Inhalation)
XYLENES (total)	2.79E-02	1.32E-03	1.26E-04	7.80E-05	1.82E+00	1.40E+02 RFD oral 2.18E+02 inhalation

* Average values based on geometric means
** Health Effects and Environmental Profiles, EPA,1985
*** Syracuse Research Corp.,1986

case. The worst case exposure represents a 10^{-3} risk level; whereas, the average case exposure is still within a 10^{-4} risk level.

o Inhalation exposure from volatiles in onsite surface (ditch) water

Noncarcinogens

- The exposure estimate for trans-1,2-dichloroethene exceeds the health criteria by two orders of magnitude.

- The exposure estimate for toluene exceeds the health criteria by less than one order of magnitude.

- The exposure estimate for 1,1,1-trichloroethane exceeds the health criteria by less than one order of magnitude.

Carcinogens

- The exposure estimate for 1,1-dichloroethene exceeds the health criteria by three orders of magnitude and represents a 10^{-2} risk level.

- The exposure estimate for trichloroethene exceeds the health criteria by two orders of magnitude and represents a 10^{-2} risk level.

- The exposure estimate for vinyl chloride exceeds the health criteria by four orders of magnitude and represents a 10^{0} risk level.

5.0 UNCERTAINTIES

Completion of a public health evaluation involves the use of numerous assumptions and many uncertainties are inherent to the process. In most cases,

site history, site characterization, chemical monitoring data and future use information may be lacking to some degree. Toxicity information is based on animal studies and extrapolation of effects to humans is a major source of uncertainty. Likewise, the calculations used in exposure modeling rely on simplifying assumptions, many of which are considered "highly" conservative. It is thought that these conservative assumptions will generally overestimate the potential risks posed by exposure to a particular substance. Consequently, the results of the baseline evaluation should not be taken as a characterization of absolute risk. However when the methodologies and assumptions are applied evenly throughout the process, the evaluation will highlight the areas of concern at a site so that they may be the focus of further evaluation (EPA, 1986b).

For the Clark Property assessment, the estimated dermal and inhalation exposures are conservative in that they do not take into account the attenuating effects of biochemical degradation or actual atmospheric mixing on contaminant concentrations. Nor do they take into account the mitigating effects of personal protective equipment for potential onsite exposures. Furthermore, it is conservative to compare these estimates to health criteria established for chronic/lifetime exposures. One should keep in mind, however, that the methodology used in this assessment does not address the potential additive, synergistic or antagonistic effects of exposure to a mixture of chemicals. The approach necessary to make a definitive assessment of these potential interactive effects is not currently available and is beyond the scope of this investigation.

6.0 SUMMARY

This evaluation was prepared by using currently available site monitoring data and currently accepted EPA methods and assumptions to predict the risk posed by potential exposure to indicator chemicals from the Clark Property site. The results should not be taken as a characterization of absolute risk but should be used to identify the areas of concern at the site so that they may be evaluated further.

For exposures to noncarcinogenic compounds, an element of risk is suggested when an estimated exposure level exceeds health based criteria. However, in light of the conservative assumptions used in calculating onsite and offsite exposure levels, differences of one order of magnitude or less would not appear to be significant. Where exposures to noncarcinogens are estimated at levels greater than one order of magnitude above health criteria or exposure to carcinogens are estimated at greater than a 10^{-4} risk level, remedial efforts should focus on the sources of these potential exposures.

Results of the evaluation indicate that onsite exposure to the following chemicals was found to exceed health criteria by greater than one order of magnitude for noncarcinogens or present a risk level greater than 10^{-4} for carcinogens:

Noncarcinogens

- trans-1,2-Dichloroethene via inhalation

Carcinogens

- 1,1-Dichloroethene via inhalation
- Trichloroethene via inhalation
- Vinyl chloride via inhalation

mhh

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APPENDIX A

SOIL DATA

Table 3.11
Volatile Organic Subsurface Soil Analytical Data
Clark Property

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 8240/624

Compound	TB-1 S-3 (0-2)		TB-2 S-3 (6-8)		TB-2 S-4 (8-10)		TB-2 S-5 (10-12)		TB-2 S-6 (12-14)	
	RL	VAL	RL	VAL	RL	VAL	RL	VAL	RL	VAL
Chloromethane	750	ND	36000	ND	4700	ND	180	ND	3400	ND
Bromomethane	750	ND	36000	ND	4700	ND	180	ND	3400	ND
Vinyl Chloride	750	ND	36000	ND	4700	8000	180	1000	3400	ND
Chloroethane	750	ND	36000	ND	4700	ND	180	ND	3400	ND
Methylene Chloride	750	ND	36000	ND	4700	11000	180	590	3400	6700
Acetone	3800	ND	180000	ND	24000	ND	920	1600	17000	ND
Carbon Disulfide	300	ND	14000	ND	1900	ND	74	ND	1400	ND
1,1-Dichloroethylene	300	ND	14000	ND	1900	ND	74	1200	1400	ND
1,1-Dichloroethane	300	970	14000	ND	1900	8600	74	7600	1400	ND
1,2-Trans-Dichloroethylene	300	1700	14000	44000	1900	54000	74	39000	1400	ND
Chloroform	300	ND	14000	ND	1900	ND	74	ND	1400	ND
1,2-Dichloroethane	300	ND	14000	ND	1900	ND	74	ND	1400	ND
2-Butanone	1500	ND	72000	ND	9400	ND	370	ND	7000	ND
1,1,1-Trichloroethane	300	ND	14000	160000	1900	30000	74	20000	1400	ND
Carbon Tetrachloride	300	ND	14000	ND	1900	ND	74	ND	1400	ND
Vinyl Acetate	1500	ND	72000	ND	9450	ND	370	ND	7000	ND
Bromodichloromethane	300	ND	14000	ND	1900	ND	74	ND	1400	ND
1,2-Dichloropropane	300	ND	14000	ND	1900	ND	74	ND	1400	ND
1,3-Trans-Dichloropropene	300	ND	14000	ND	1900	ND	74	ND	1400	ND
Trichloroethylene	300	400	14000	580000	1900	110000	74	110000	1400	1900
Dibromochloromethane	300	ND	14000	ND	1900	ND	74	ND	1400	ND
1,1,2 Trichloroethane	300	ND	14000	ND	1900	ND	74	ND	1400	ND
Benzene	300	ND	14000	ND	1900	ND	74	94	1400	ND
1,3-Cis-Dichloropropene	300	ND	14000	ND	1900	ND	74	ND	1400	ND
2-Chloroethyl vinyl ether	1500	ND	72000	ND	9400	ND	370	ND	7000	ND
Bromoform	300	ND	14000	ND	1900	ND	74	ND	1400	ND
4-Methyl-2-Pentanone	1500	ND	72000	ND	9400	ND	370	2000	7000	ND
2-Hexanone	1500	ND	72000	ND	9400	ND	370	ND	7000	ND
1,1,2,2-Tetrachloroethane	300	ND	14000	ND	1900	ND	74	ND	1400	ND
Tetrachloroethylene	300	ND	14000	ND	1900	ND	74	160	1400	ND
Toluene	300	5100	14000	490000	1900	140000	74	97000	1400	19000
Chlorobenzene	300	ND	14000	ND	1900	ND	74	ND	1400	ND
Ethyl Benzene	300	ND	14000	ND	1900	2200	74	2700	1400	ND
Styrene	300	ND	14000	ND	1900	ND	74	ND	1400	ND
Total Xylenes	300	300	14000	52000	1900	13000	74	9800	1400	ND

NOTES :

All parameters are measured in ug/kg (dry wt) except where noted

ND = Not Detected
RL = Recording Limit

Table 3.11 (continued)
Volatile Organic Subsurface Soil Analytical Data
Clark Property

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 8240/624

Compound	TB-4 S-4 (6-8)		TB-4 S-7 (12-14)		TB-4 S-8 (14-16)		TB-5 S-2 (2-4)		TB-6 S-7 (12-14)	
	RL	VAL	RL	VAL	RL	VAL	RL	VAL	RL	VAL
Chloromethane	1500	ND	600	ND	3400	ND	150	ND	650	ND
Bromomethane	1500	ND	600	ND	3400	ND	150	ND	650	ND
Vinyl Chloride	1500	3000	600	1700	3400	ND	150	ND	650	1100
Chloroethane	1500	ND	600	ND	3400	ND	150	ND	650	ND
Methylene Chloride	1500	ND	600	1300	3400	9300	150	3800	650	1200
Acetone	7500	ND	3000	ND	17000	ND	750	ND	3300	ND
Carbon Disulfide	600	ND	240	ND	1400	ND	60	ND	260	ND
1,1-Dichloroethylene	600	ND	240	ND	1400	ND	60	ND	260	ND
1,1-Dichloroethane	600	1900	240	3500	1400	6100	60	ND	260	1400
1,2-Trans-Dichloroethylene	600	11000	240	14000	1400	ND	60	120	260	17000
Chloroform	600	ND	240	ND	1400	ND	60	ND	260	ND
1,2-Dichloroethane	600	ND	240	ND	1400	ND	68	ND	260	ND
2-Butanone	3000	ND	1200	ND	7000	ND	300	ND	1300	ND
1,1,1-Trichloroethane	600	8000	240	760	1400	11000	60	60	260	1900
Carbon Tetrachloride	600	ND	240	ND	1400	ND	60	ND	260	ND
Vinyl Acetate	3000	ND	1200	ND	7000	ND	300	ND	1300	ND
Bromodichloromethane	600	ND	240	ND	1400	ND	60	ND	260	ND
1,2-Dichloropropane	600	ND	240	ND	1400	ND	60	ND	260	ND
1,3-Trans-Dichloropropene	600	ND	240	ND	1400	ND	60	ND	260	ND
Trichloroethylene	600	19000	240	20000	1400	47000	60	250	260	1100
Dibromochloromethane	600	ND	240	ND	1400	ND	60	ND	260	ND
1,1,2 Trichloroethane	600	ND	240	ND	1400	ND	60	ND	260	ND
Benzene	600	ND	240	ND	1400	ND	60	ND	260	ND
1,3-Cis-Dichloropropene	600	ND	240	ND	1400	ND	60	ND	260	ND
2-Chloroethyl vinyl ether	3000	ND	1200	ND	7000	ND	300	ND	1300	ND
Bromoform	600	ND	240	ND	1400	ND	60	ND	260	ND
4-Methyl-2-Pentanone	3000	ND	1200	ND	7000	ND	300	ND	1300	ND
2-Hexanone	3000	ND	1200	ND	7000	ND	300	ND	1300	ND
1,1,2,2-Tetrachloroethane	600	ND	240	ND	1400	ND	60	ND	260	ND
Tetrachloroethylene	600	ND	240	ND	1400	ND	60	ND	260	ND
Toluene	600	21000	240	16000	1400	47000	60	210	260	17000
Chlorobenzene	600	ND	240	ND	1400	ND	60	ND	260	ND
Ethyl Benzene	600	ND	240	ND	1400	ND	60	ND	260	ND
Styrene	600	ND	240	ND	1400	ND	60	ND	260	ND
Total Xylenes	600	3500	240	850	1400	1700	60	120	260	700

NOTES :

All parameters are measured in ug/kg (dry wt) except where noted

ND = Not Detected
RL = Recording Limit

Table 3.11 (continued)
Volatile Organic Subsurface Soil Analytical Data
Clark Property

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 8240/624

Compound	TB-6 S-8 (14-16)		TB-6 S-9 (16-18)		TB-7 S-5 (8-10)		TB-9 S-6 (10-12)		TB-9 S-7 (12-14)	
	RL	VAL	RL	VAL	RL	VAL	RL	VAL	RL	VAL
Chloromethane	3100	ND	6500	ND	750	ND	700	ND	150	ND
Bromomethane	3100	ND	6500	ND	750	ND	700	ND	150	ND
Vinyl Chloride	3100	1300	6500	ND	750	ND	700	ND	150	170
Chloroethane	3100	ND	6500	ND	750	ND	700	ND	150	ND
Methylene Chloride	3100	6800	6500	15000	750	ND	700	2000	150	640
Acetone	16000	ND	32000	ND	3800	ND	3500	ND	750	ND
Carbon Disulfide	1200	ND	2600	ND	300	ND	280	ND	60	ND
1,1-Dichloroethylene	1200	1300	2600	ND	300	ND	280	ND	60	ND
1,1-Dichloroethane	1200	3700	2600	11000	300	1300	280	1800	60	3700
1,2-Trans-Dichloroethylene	1200	21000	2600	7600	300	2600	280	ND	60	850
Chloroform	1200	ND	2600	ND	300	ND	280	ND	60	ND
1,2-Dichloroethane	1200	ND	2600	ND	300	ND	280	ND	60	ND
2-Butanone	6200	ND	13000	ND	1500	ND	1400	ND	300	ND
1,1,1-Trichloroethane	1200	56000	2600	160000	300	ND	280	ND	60	ND
Carbon Tetrachloride	1200	ND	2600	ND	300	ND	280	ND	60	ND
Vinyl Acetate	6200	ND	13000	ND	1500	ND	1400	ND	300	ND
Bromodichloromethane	1200	ND	2600	ND	300	ND	280	ND	60	ND
1,2-Dichloropropane	1200	ND	2600	ND	300	ND	280	ND	60	ND
1,3-Trans-Dichloropropene	1200	ND	2600	ND	300	ND	280	ND	60	ND
Trichloroethylene	1200	120000	2600	970000	300	12000	280	ND	60	290
Dibromochloromethane	1200	ND	2600	ND	300	ND	280	ND	60	ND
1,1,2 Trichloroethane	1200	ND	2600	ND	300	ND	280	ND	60	ND
Benzene	1200	ND	2600	ND	300	ND	280	ND	60	ND
1,3-Cis-Dichloropropene	1200	ND	2600	ND	300	ND	280	ND	60	ND
2-Chloroethyl vinyl ether	6200	ND	13000	ND	1500	ND	1400	ND	300	ND
Bromoform	1200	ND	2600	ND	300	ND	280	ND	60	ND
4-Methyl-2-Pentanone	6200	ND	13000	ND	1500	ND	1400	ND	300	ND
2-Hexanone	6200	ND	13000	ND	1500	ND	1400	ND	300	ND
1,1,2,2-Tetrachloroethane	1200	ND	2600	ND	300	ND	280	ND	60	ND
Tetrachloroethylene	1200	ND	2600	ND	300	ND	280	ND	60	ND
Toluene	1200	110000	2600	460000	300	7500	280	2900	60	24000
Chlorobenzene	1200	ND	2600	ND	300	ND	280	ND	60	ND
Ethyl Benzene	1200	2400	2600	4400	300	ND	280	ND	60	690
Styrene	1200	ND	2600	ND	300	ND	280	ND	60	ND
Total Xylenes	1200	16000	2600	34000	300	ND	280	540	60	1300

NOTES :

All parameters are measured in ug/kg (dry wt) except where noted

ND = Not Detected
RL = Recording Limit

Volatile Organic Subsurface Soil Analytical Data
Clark Property

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 8240/624

Compound	TB-10 S-3 (4-6)		TB-10 S-5 (8-10)		TB-10 S-6 (10-12)		TB-10 S-7 (12-14)		TB-11 S-2 (2-4)	
	RL	VAL	RL	VAL	RL	VAL	RL	VAL	RL	VAL
Chloromethane	650	ND	7500	ND	1700	ND	6500	ND	150	ND
Bromomethane	650	ND	7500	ND	1700	ND	6500	ND	150	ND
Vinyl Chloride	650	ND	7500	19000	1700	25000	6500	29000	150	ND
Chloroethane	650	ND	7500	ND	1700	ND	6500	ND	150	ND
Methylene Chloride	650	850	7500	30000	1700	4000	6500	7600	150	480
Acetone	3300	ND	38000	40000	8500	150000	33000	94000	750	ND
Carbon Disulfide	260	ND	3000	ND	680	ND	2600	ND	60	ND
1,1-Dichloroethylene	260	ND	3000	ND	680	ND	2600	ND	60	ND
1,1-Dichloroethane	260	ND	3000	12000	680	7200	2600	8200	60	ND
1,2-Trans-Dichloroethylene	260	9400	3000	37000	680	22000	2600	30000	60	98
Chloroform	260	ND	3000	ND	680	ND	2600	ND	60	ND
1,2-Dichloroethane	260	ND	3000	ND	680	ND	2600	ND	60	ND
2-Butanone	1300	ND	15000	ND	3400	ND	13000	ND	300	ND
1,1,1-Trichloroethane	260	11000	3000	100000	680	1700	2600	11000	60	ND
Carbon Tetrachloride	260	ND	3000	ND	680	ND	2600	ND	60	ND
Vinyl Acetate	1300	ND	15000	ND	3400	ND	13000	ND	300	ND
Bromodichloromethane	260	ND	3000	ND	680	ND	2600	ND	60	ND
1,2-Dichloropropane	260	ND	3000	ND	680	ND	2600	ND	60	ND
1,3-Trans-Dichloropropene	260	ND	3000	ND	680	ND	2600	ND	60	ND
Trichloroethylene	260	38000	3000	350000	680	2700	2600	15000	60	5100
Dibromochloromethane	260	ND	3000	ND	680	ND	2600	ND	60	ND
1,1,2 Trichloroethane	260	ND	3000	ND	680	ND	2600	ND	60	ND
Benzene	260	ND	3000	ND	680	ND	2600	ND	60	ND
1,3-Cis-Dichloropropene	260	ND	3000	ND	680	ND	2600	ND	60	ND
2-Chloroethyl vinyl ether	1300	ND	15000	ND	3400	ND	13000	ND	300	ND
Bromoform	260	ND	3000	ND	680	ND	2600	ND	60	ND
4-Methyl-2-Pentanone	1300	ND	15000	ND	3400	4700	13000	ND	300	ND
2-Hexanone	1300	ND	15000	ND	3400	ND	13000	ND	300	ND
1,1,2,2-Tetrachloroethane	260	ND	3000	ND	680	ND	2600	ND	60	ND
Tetrachloroethylene	260	ND	3000	ND	680	ND	2600	ND	60	ND
Toluene	260	16000	3000	170000	680	57000	2600	55000	60	2900
Chlorobenzene	260	ND	3000	ND	680	ND	2600	ND	60	ND
Ethyl Benzene	260	ND	3000	ND	680	ND	2600	ND	60	78
Styrene	260	ND	3000	ND	680	ND	2600	ND	60	ND
Total Xylenes	260	980	3000	8400	680	2800	2600	ND	60	420

NOTES :

All parameters are measured in ug/kg (dry wt) except where noted

ND = Not Detected
RL = Recording Limit

Clark Property

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 8240/624

Compound	TB-11 S-3 (4-6)		TB-11 S-4 (6-8)		TB-11 S-5 (8-10)		TB-11 S-6 (10-12)		TB-12 S-3 (4-6)	
	RL	VAL	RL	VAL	RL	VAL	RL	VAL	RL	VAL
Chloromethane	330	ND	1600	ND	1500	ND	2000	ND	700	ND
Bromomethane	330	ND	1600	ND	1500	ND	2000	ND	700	ND
Vinyl Chloride	330	ND	1600	ND	1500	ND	2000	8000	700	ND
Chloroethane	330	ND	1600	ND	1500	ND	2000	ND	700	ND
Methylene Chloride	330	ND	1600	ND	1500	ND	2000	11000	700	880
Acetone	1700	ND	7800	ND	7500	ND	9800	ND	3500	ND
Carbon Disulfide	130	ND	620	ND	600	ND	780	ND	280	ND
1,1-Dichloroethylene	130	ND	620	ND	600	ND	780	2400	280	440
1,1-Dichloroethane	130	ND	620	ND	600	ND	780	18000	280	15000
1,2-Trans-Dichloroethylene	130	3900	620	7200	600	4000	780	68000	280	ND
Chloroform	130	ND	620	ND	600	ND	780	ND	280	ND
1,2-Dichloroethane	130	ND	620	ND	600	ND	780	ND	280	ND
2-Butanone	660	ND	3100	ND	30000	ND	3900	ND	1400	ND
1,1,1-Trichloroethane	130	2100	620	8400	600	5800	780	33000	280	ND
Carbon Tetrachloride	130	ND	620	ND	600	ND	780	ND	280	ND
Vinyl Acetate	660	ND	3100	ND	30000	ND	3900	ND	1400	ND
Bromodichloromethane	130	ND	620	ND	600	ND	780	ND	280	ND
1,2-Dichloropropane	130	ND	620	ND	600	ND	780	ND	280	ND
1,3-Trans-Dichloropropene	130	ND	620	ND	600	ND	780	ND	280	ND
Trichloroethylene	130	7300	620	40000	600	32000	780	600000	280	2000
Dibromochloromethane	130	ND	620	ND	600	ND	780	ND	280	ND
1,1,2 Trichloroethane	130	ND	620	ND	600	ND	780	ND	280	ND
Benzene	130	ND	620	ND	600	ND	780	ND	280	ND
1,3-Cis-Dichloropropene	130	ND	620	ND	600	ND	780	ND	280	ND
2-Chloroethyl vinyl ether	660	ND	3100	ND	30000	ND	3900	ND	1400	ND
Bromoform	130	ND	620	ND	600	ND	780	ND	280	ND
4-Methyl-2-Pentanone	660	ND	3100	ND	30000	ND	3900	ND	1400	ND
2-Hexanone	660	ND	3100	ND	30000	ND	3900	ND	1400	ND
1,1,2,2-Tetrachloroethane	130	ND	620	ND	600	ND	780	ND	280	ND
Tetrachloroethylene	130	ND	620	ND	600	ND	780	ND	280	ND
Toluene	130	21000	620	47000	600	24000	780	200000	280	9900
Chlorobenzene	130	ND	620	ND	600	ND	780	ND	280	ND
Ethyl Benzene	130	760	620	1400	600	700	780	2300	280	ND
Styrene	130	ND	620	ND	600	ND	780	ND	280	ND
Total Xylenes	130	5200	620	9400	600	4900	780	16000	280	1200

NOTES :

All parameters are measured in ug/kg (dry wt) except where noted

ND = Not Detected
RL = Recording Limit

Table 3.11 (continued)
Volatile Organic Subsurface Soil Analytical Data
Clark Property

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 8240/624

Compound	TB-13 S-3A (6-7) RL	TB-13 S-3A (6-7) VAL	TB-13 S-3B (7-8) RL	TB-13 S-3B (7-8) VAL
Chloromethane	3300	ND	220	ND
Bromomethane	3300	ND	220	ND
Vinyl Chloride	3300	7100	220	760
Chloroethane	3300	ND	220	ND
Methylene Chloride	3300	5400	220	350
Acetone	17000	ND	1100	ND
Carbon Disulfide	1300	ND	88	ND
1,1-Dichloroethylene	1300	ND	88	140
1,1-Dichloroethane	1300	1700	88	ND
1,2-Trans-Dichloroethylene	1300	12000	88	810
Chloroform	1300	ND	88	ND
1,2-Dichloroethane	1300	ND	88	ND
2-Butanone	66000	ND	4400	ND
1,1,1-Trichloroethane	1300	ND	88	ND
Carbon Tetrachloride	1300	ND	88	ND
Vinyl Acetate	66000	ND	4400	ND
Bromodichloromethane	1300	ND	88	ND
1,2-Dichloropropane	1300	ND	88	ND
1,3-Trans-Dichloropropene	1300	ND	88	ND
Trichloroethylene	1300	2100	88	210
Dibromochloromethane	1300	ND	88	ND
1,1,2 Trichloroethane	1300	ND	88	ND
Benzene	1300	ND	88	ND
1,3-Cis-Dichloropropene	1300	ND	88	ND
2-Chloroethyl vinyl ether	66000	ND	4400	ND
Bromoform	1300	ND	88	ND
4-Methyl-2-Pentanone	66000	ND	4400	ND
2-Hexanone	66000	ND	4400	ND
1,1,2,2-Tetrachloroethane	1300	ND	88	ND
Tetrachloroethylene	1300	ND	88	ND
Toluene	1300	20000	88	2200
Chlorobenzene	1300	ND	88	ND
Ethyl Benzene	1300	ND	88	110
Styrene	1300	ND	88	ND
Total Xylenes	1300	4400	88	520

NOTES :

All parameters are measured in ug/kg (dry wt) except where noted

ND = Not Detected
RL = Recording Limit

APPENDIX B

GROUNDWATER DATA

Table 3.8
Volatile Organic Groundwater Analytical Data
Clark Property
March 22 - 23, 1988

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 624

Compound	RL	P-12	RL	P-14	RL	P-20
Chloromethane	5000	ND	5	ND	13000	ND
Bromomethane	5000	ND	5	ND	13000	ND
Vinyl Chloride	5000	35000	5	27	13000	ND
Chloroethane	5000	ND	5	ND	13000	ND
Methylene Chloride	20000	ND	10	ND	25000	ND
Acetone	25000	ND	25	ND	130000	ND
Carbon Disulfide	2000	ND	2	ND	5000	ND
1,1-Dichloroethylene	2000	ND	2	2.1	5000	ND
1,1-Dichloroethane	2000	31000	2	50	5000	12000
1,2-Trans-Dichloroethylene	2000	85000	2	ND	5000	240000
Chloroform	2000	ND	2	ND	5000	ND
1,2-Dichloroethane	2000	ND	2	ND	5000	ND
2-Butanone	10000	ND	10	ND	25000	ND
1,1,1-Trichloroethane	2000	38000	2	ND	5000	180000
Carbon Tetrachloride	2000	ND	2	ND	5000	ND
Vinyl Acetate	10000	ND	10	ND	25000	ND
Bromodichloromethane	2000	ND	2	ND	5000	ND
1,2-Dichloropropane	2000	ND	2	ND	5000	ND
1,3-Trans-Dichloropropene	2000	ND	2	ND	5000	ND
Trichloroethylene	2000	170000	2	84	5000	330000
Dibromochloromethane	2000	ND	2	ND	5000	ND
1,1,2 Trichloroethane	2000	ND	2	ND	5000	ND
Benzene	2000	ND	2	4.4	5000	ND
1,3-Cis-Dichloropropene	2000	ND	2	ND	5000	ND
2-Chloroethyl vinyl ether	10000	ND	10	ND	25000	ND
Bromoform	2000	ND	2	ND	5000	ND
4-Methyl-2-Pentanone	10000	ND	10	ND	25000	ND
2-Hexanone	10000	ND	10	ND	25000	ND
1,1,2,2-Tetrachloroethane	2000	ND	2	ND	5000	ND
Tetrachloroethylene	2000	ND	2	ND	5000	ND
Toluene	2000	110000	2	120	5000	130000
Chlorobenzene	2000	ND	2	ND	5000	ND
Ethyl Benzene	2000	ND	2	11	5000	ND
Styrene	2000	ND	2	ND	5000	ND
Total Xylenes	2000	ND	2	46	5000	ND

All values expressed in ug/l (ppb).

ND = Not Detected
RL = Reporting Limit

Table 3.8 (continued)
Volatile Organic Groundwater Analytical Data
Clark Property
March 22 - 23, 1988

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 624

Compound	RL	DGC-8S	RL	DGC-8D	RL	DGC-10S
Chloromethane	5	ND	5	ND	500	ND
Bromomethane	5	ND	5	ND	500	ND
Vinyl Chloride	5	ND	5	ND	500	890
Chloroethane	5	ND	5	ND	500	ND
Methylene Chloride	5	ND	5	ND	1000	ND
Acetone	25	ND	25	ND	2500	21000
Carbon Disulfide	2	ND	2	ND	200	ND
1,1-Dichloroethylene	2	ND	2	ND	200	350
1,1-Dichloroethane	2	9.1	2	3.9	200	3100
1,2-Trans-Dichloroethylene	2	12	2	5.6	200	13000
Chloroform	2	ND	2	ND	200	ND
1,2-Dichloroethane	2	ND	2	ND	200	ND
2-Butanone	10	ND	10	ND	1000	3100
1,1,1-Trichloroethane	2	ND	2	ND	200	3700
Carbon Tetrachloride	2	ND	2	ND	200	ND
Vinyl Acetate	10	ND	10	ND	1000	ND
Bromodichloromethane	2	ND	2	ND	200	ND
1,2-Dichloropropane	2	ND	2	ND	200	ND
1,3-Trans-Dichloropropene	2	ND	2	ND	200	ND
Trichloroethylene	2	4.2	2	3.2	200	48000
Dibromochloromethane	2	ND	2	ND	200	ND
1,1,2 Trichloroethane	2	ND	2	ND	200	ND
Benzene	2	2.1	2	ND	200	ND
1,3-Cis-Dichloropropene	2	ND	2	ND	200	ND
2-Chloroethyl vinyl ether	10	ND	10	ND	1000	ND
Bromoform	2	ND	2	ND	200	ND
4-Methyl-2-Pentanone	10	ND	10	ND	1000	ND
2-Hexanone	10	ND	10	ND	1000	ND
1,1,2,2-Tetrachloroethane	2	ND	2	ND	200	ND
Tetrachloroethylene	2	ND	2	ND	200	ND
Toluene	2	13	2	2.5	200	41000
Chlorobenzene	2	ND	2	ND	200	ND
Ethyl Benzene	2	ND	2	ND	200	ND
Styrene	2	ND	2	ND	200	ND
Total Xylenes	2	ND	2	ND	200	2400

All values expressed in ug/l (ppb).

ND = Not Detected
RL = Reporting Limit

Table 3.8 (continued)
Volatile Organic Groundwater Analytical Data
Clark Property
March 22 - 23, 1988

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 624

Compound	RL	DGC-10D	RL	DGC-11	RL	DGC-12
Chloromethane	500	ND	5	ND	5	ND
Bromomethane	500	ND	5	ND	5	ND
Vinyl Chloride	500	720	5	ND	5	ND
Chloroethane	500	ND	5	ND	5	ND
Methylene Chloride	500	ND	5	ND	5	ND
Acetone	2500	55000	25	ND	25	ND
Carbon Disulfide	200	ND	2	ND	2	ND
1,1-Dichloroethylene	200	1500	2	ND	2	ND
1,1-Dichloroethane	200	5300	2	ND	2	ND
1,2-Trans-Dichloroethylene	200	10000	2	ND	2	ND
Chloroform	200	ND	2	ND	2	ND
1,2-Dichloroethane	200	ND	2	ND	2	ND
2-Butanone	1000	3800	10	ND	10	ND
1,1,1-Trichloroethane	200	18000	2	ND	2	ND
Carbon Tetrachloride	200	ND	2	ND	2	ND
Vinyl Acetate	1000	ND	10	ND	10	ND
Bromodichloromethane	200	ND	2	ND	2	ND
1,2-Dichloropropane	200	ND	2	ND	2	ND
1,3-Trans-Dichloropropene	200	ND	2	ND	2	ND
Trichloroethylene	200	160000	2	ND	2	ND
Dibromochloromethane	200	ND	2	ND	2	ND
1,1,2 Trichloroethane	200	ND	2	ND	2	ND
Benzene	200	ND	2	ND	2	ND
1,3-Cis-Dichloropropene	200	ND	2	ND	2	ND
2-Chloroethyl vinyl ether	1000	ND	10	ND	10	ND
Bromoform	200	ND	2	ND	2	ND
4-Methyl-2-Pentanone	1000	ND	10	ND	10	ND
2-Hexanone	1000	ND	10	ND	10	ND
1,1,2,2-Tetrachloroethane	200	ND	2	ND	2	ND
Tetrachloroethylene	200	ND	2	ND	2	ND
Toluene	200	73000	2	ND	2	ND
Chlorobenzene	200	ND	2	ND	2	ND
Ethyl Benzene	200	220	2	ND	2	ND
Styrene	200	ND	2	ND	2	ND
Total Xylenes	200	2100	2	ND	2	ND

All values expressed in ug/l (ppb).

ND = Not Detected
RL = Reporting Limit

Table 3.8 (continued)
Volatile Organic Groundwater Analytical Data
Clark Property
March 22 - 23, 1988

Hazardous Substance List (HSL) - Volatile Organics
EPA Method 624

Compound	RL	DGC-13	RL	I-3 (DGC-10D)
Chloromethane	5000	ND	5000	ND
Bromomethane	5000	ND	5000	ND
Vinyl Chloride	5000	55000	5000	ND
Chloroethane	5000	ND	5000	ND
Methylene Chloride	20000	ND	5000	ND
Acetone	25000	ND	25000	53000
Carbon Disulfide	2000	ND	2000	ND
1,1-Dichloroethylene	2000	ND	2000	ND
1,1-Dichloroethane	2000	31000	2000	6700
1,2-Trans-Dichloroethylene	2000	77000	2000	12000
Chloroform	2000	ND	2000	ND
1,2-Dichloroethane	2000	ND	2000	ND
2-Butanone	10000	ND	10000	ND
1,1,1-Trichloroethane	2000	ND	2000	22000
Carbon Tetrachloride	2000	ND	2000	ND
Vinyl Acetate	10000	ND	10000	ND
Bromodichloromethane	2000	ND	2000	ND
1,2-Dichloropropane	2000	ND	2000	ND
1,3-Trans-Dichloropropene	2000	ND	2000	ND
Trichloroethylene	2000	23000	2000	150000
Dibromochloromethane	2000	ND	2000	ND
1;1,2 Trichloroethane	2000	ND	2000	ND
Benzene	2000	ND	2000	ND
1,3-Cis-Dichloropropene	2000	ND	2000	ND
2-Chloroethyl vinyl ether	10000	ND	10000	ND
Bromoform	2000	ND	2000	ND
4-Methyl-2-Pentanone	10000	ND	10000	ND
2-Hexanone	10000	ND	10000	ND
1,1,2,2-Tetrachloroethane	2000	ND	2000	ND
Tetrachloroethylene	2000	ND	2000	ND
Toluene	2000	79000	2000	73000
Chlorobenzene	2000	ND	2000	ND
Ethyl Benzene	2000	ND	2000	ND
Styrene	2000	ND	2000	ND
Total Xylenes	2000	2800	2000	ND

All values expressed in ug/l (ppb).

I = Blind Duplicate
ND = Not Detected
RL = Reporting Limit

Table 3.9
Semi-Volatile Organic Groundwater Analytical Data
Clark Property
March 22 - 23, 1988

Hazardous Substance List (HSL) - Semivolatile Organics and Base Neutrals
EPA Method 625

Compound	RL	DGC-10S	RL	DGC-10D	RL	DGC-10D*
Phenol	10	27	10	52	10	63
bis(2-Chloroethyl)ether	10	ND	10	ND	10	ND
2-Chlorophenol	10	ND	10	ND	10	ND
1,3-Dichlorobenzene	10	ND	10	ND	10	ND
1,4-Dichlorobenzene	10	ND	10	ND	10	ND
Benzyl Alcohol	10	Tr	10	Tr	10	Tr
1,2-Dichlorobenzene	10	17	10	Tr	10	Tr
2-Methylphenol	10	11	10	Tr	10	Tr
bis(2-Chloroisopropyl)ether	10	ND	10	ND	10	ND
4-Methylphenol	10	35	10	33	10	38
N-Nitrosodi-n-propylamine	10	ND	10	ND	10	ND
Hexachloroethane	10	ND	10	ND	10	ND
Nitrobenzene	10	ND	10	ND	10	ND
Isophorone	10	ND	10	ND	10	ND
2-Nitrophenol	10	ND	10	ND	10	ND
2,4-Dimethylphenol	10	ND	10	ND	10	ND
Benzoic Acid	50	ND	50	ND	50	23
bis(2-Chloroethoxy)methane	10	ND	10	ND	10	ND
2,4-Dichlorophenol	10	ND	10	ND	10	ND
1,2,4-Trichlorobenzene	10	ND	10	ND	10	ND
Naphthalene	10	47	10	24	10	23
4-Chloroaniline	10	ND	10	ND	10	ND
Hexachlorobutadiene	10	ND	10	ND	10	ND
4-Chloro-3-methylphenol	10	ND	10	ND	10	ND
2-Methylnapthalene	10	Tr	10	Tr	10	Tr
Hexachlorocyclopentadiene	10	ND	10	ND	10	ND
2,4,6-Trichlorophenol	10	ND	10	ND	10	ND
2,4,5-Trichlorophenol	50	ND	50	ND	50	ND
2-Chloronaphthalene	10	ND	10	ND	10	ND
2-Nitroaniline	50	ND	50	ND	50	ND

All values expressed in ug/l (ppb).

ND = Not Detected
RL = Reporting Limit
Tr = Trace Detected
* = Filtered Sample

Semi-Volatile Organic Groundwater Analytical Data
Clark Property
March 22 - 23, 1988

Hazardous Substance List (HSL) - Semivolatile Organics and Base Neutrals
EPA Method 625

Compound	RL	DGC-10S	RL	DGC-10D	RL	DGC-10Ds
Dimethyl phthalate	10	ND	10	ND	10	ND
Acenaphthylene	10	ND	10	ND	10	ND
3-Nitroaniline	50	ND	50	ND	50	ND
Acenaphthene	10	ND	10	ND	10	ND
2,4-Dinitrophenol	50	ND	50	ND	50	ND
4-Nitrophenol	50	ND	50	ND	50	ND
Dibenzofuran	10	ND	10	ND	10	ND
2,4-Dinitrotoluene	10	ND	10	ND	10	ND
2,6-Dinitrotoluene	10	ND	10	ND	10.	ND
Diethyl phthalate	10	ND	10	ND	10	ND
4-Chlorophenyl phenyl ether	10	ND	10	ND	10	ND
Fluorene	10	ND	10	ND	10	ND
4-Nitroaniline	50	ND	50	ND	50	ND
4,6-Dinitro-2-methylphenol	50	ND	50	ND	50	ND
N-Nitrosodiphenylamine	10	ND	10	ND	10	ND
4-Bromophenyl phenyl ether	10	ND	10	ND	10	ND
Hexachlorobenzene	10	ND	10	ND	10	ND
Pentachlorophenol	50	ND	50	ND	50	ND
Phenanthrene	10	Tr	10	ND	10	ND
Anthracene	10	ND	10	ND	10	ND
Di-n-butyl phthalate	10	Tr	10	Tr	10	Tr
Fluoranthene	10	ND	10	ND	10	ND
Pyrene	10	ND	10	ND	10	ND
Butyl benzyl phthalate	10	ND	10	ND	10	ND
3,3'-Dichlorobenzidine	20	ND	20	ND	20	ND
Benzo(a)anthracene	10	ND	10	ND	10	ND
bis(2-Ethylhexyl)phthalate	10	Tr	10	Tr	10	Tr
Chrysene	10	ND	10	ND	10	ND
Di-n-octyl phthalate	10	ND	10	ND	10	ND
Benzo(b)fluoroanthene	10	ND	10	ND	10	ND
Benzo(k)fluoroanthene	10	ND	10	ND	10	ND
Benzo(a)pyrene	10	ND	10	ND	10	ND
Indeno(1,2,3-c,d)pyrene	10	ND	10	ND	10	ND
Dibenzo(a,h)anthracene	10	ND	10	ND	10	ND
Benzo(ghi)perylene	10	ND	10	ND	10	ND

All values expressed in ug/l (ppb).

ND = Not Detected
RL = Reporting Limit
Tr = Trace Detected
s = Filtered Sample

Table 3.10
Petroleum Hydrocarbon Groundwater Analytical Data
Clark Property
March 22 - 23, 1988

Monitoring Well Number	Total Petroleum Hydrocarbon(mg/L)	Qualititive Identification *
P-12	14	G/LO
P-14	9.5	LO
P-20	12	G/LO
DGC-8S	1.1	LO
DGC-8D	2.3	HC
DGC-10S	11	G/LO
DGC-10D	15	G/LO/FO
DGC-11	0.47	HC
DGC-12	5.6	LO
DGC-13	8.9	G/LO
X-3 (DGC-10D)	13	G/LO

X = Blind Duplicate
LO = Lubricating Oil
PAH = Polynuclear Aromatic Hydrocarbons
FO = Fuel Oil
G = Gasoline
HC = Higher Level Hydrocarbons

* The sample has GC/FID characteristics that are similar to one of the above materials.

APPENDIX C

SURFACE WATER AND SEDIMENT DATA

Table 3.12
Volatile Organic Surfacewater and Stream
Sediment Analytical Data
Clark Property
March 22 - 23, 1988
Hazardous Substance List (HSL) - Volatile Organics
EPA Method 624

Compound	Barge Canal RL	Barge Canal SP-1	Barge Canal RL	Barge Canal SP-2
Chloromethane	5	ND	5	ND
Bromomethane	5	ND	5	ND
Vinyl Chloride	5	ND	5	ND
Chloroethane	5	ND	5	ND
Methylene Chloride	10	ND	10	ND
Acetone	25	ND	25	ND
Carbon Disulfide	2	ND	2	ND
1,1-Dichloroethylene	2	ND	2	ND
1,1-Dichloroethane	2	ND	2	ND
1,2-Trans-Dichloroethylene	2	ND	2	ND
Chloroform	2	ND	2	ND
1,2-Dichloroethane	2	ND	2	ND
2-Butanone	10	ND	10	ND
1,1,1-Trichloroethane	2	ND	2	ND
Carbon Tetrachloride	2	ND	2	ND
Vinyl Acetate	10	ND	10	ND
Bromodichloromethane	2	ND	2	ND
1,2-Dichloropropane	2	ND	2	ND
1,3-Trans-Dichloropropene	2	ND	2	ND
Trichloroethylene	2	ND	2	ND
Dibromochloromethane	2	ND	2	ND
1,1,2 Trichloroethane	2	ND	2	ND
Benzene	2	ND	2	ND
1,3-Cis-Dichloropropene	2	ND	2	ND
2-Chloroethyl vinyl ether	10	ND	10	ND
Bromoform	2	ND	2	ND
4-Methyl-2-Pentanone	10	ND	10	ND
2-Hexanone	10	ND	10	ND
1,1,2,2-Tetrachloroethane	2	ND	2	ND
Tetrachloroethene	2	2	2	ND
Toluene	2	ND	2	ND
Chlorobenzene	2	ND	2	ND
Ethyl Benzene	2	ND	2	ND
Styrene	2	ND	2	ND
Total Xylenes	2	ND	2	ND

Values for aqueous samples expressed in ug/l (ppb).
Values for solid samples expressed in ug/kg (ppb) on dry weight basis.

ND = Not Detected
RL = Reporting Limit

Volatile Organic Surfacewater and Stream
Sediment Analytical Data
Clark Property
March 22 - 23, 1988
Hazardous Substance List (HSL) - Volatile Organics
EPA Method 624

Compound	Ditch water		Ditch sediment	
	RL	SW-2	RL	SED-2
Chloromethane	130	ND	1000	ND
Bromomethane	130	ND	1000	ND
Vinyl Chloride	130	2300	1000	3700
Chloroethane	130	ND	1000	ND
Methylene Chloride	500	ND	6000	ND
Acetone	630	5800	5000	8600
Carbon Disulfide	50	ND	2000	ND
1,1-Dichloroethylene	50	180	400	5400
1,1-Dichloroethane	50	1100	400	8300
1,2-Trans-Dichloroethylene	50	14000	400	280000
Chloroform	50	ND	400	ND
1,2-Dichloroethane	50	ND	400	ND
2-Butanone	250	ND	2000	ND
1,1,1-Trichloroethane	50	5000	400	190000
Carbon Tetrachloride	50	ND	400	ND
Vinyl Acetate	250	ND	400	ND
Bromodichloromethane	50	ND	400	ND
1,2-Dichloropropane	50	ND	400	ND
1,3-Trans-Dichloropropene	50	ND	400	ND
Trichloroethene	50	5700	400	100000
Dibromochloromethane	50	ND	400	ND
1,1,2 Trichloroethane	50	ND	400	ND
Benzene	50	ND	400	ND
1,3-Cis-Dichloropropene	50	ND	400	ND
2-Chloroethyl vinyl ether	250	ND	2000	ND
Bromoform	50	ND	400	ND
4-Methyl-2-Pentanone	250	300	2000	ND
2-Hexanone	250	ND	2000	ND
1,1,2,2-Tetrachloroethane	50	ND	400	ND
Tetrachloroethylene	50	ND	400	ND
Toluene	50	5700	400	1100000
Chlorobenzene	50	ND	400	ND
Ethyl Benzene	50	ND	400	19000
Styrene	50	ND	400	ND
Total Xylenes	50	170	400	190000

Values for aqueous samples expressed in ug/l (ppb).
Values for solid samples expressed in ug/kg (ppb) on dry weight basis.

ND = Not Detected
RL = Reporting Limit

Table 3.13
Petroleum Hydrocarbon Surfacewater and Stream
Sediment Analytical Data
Clark Property

Sample Identification and Location	Date	Total Petroleum Hydrocarbon(mg/L)	Qualititive Identification *
Ditch Sediment			
SED-1	3/9/88	140"	FO/LO
SED-2	3/22-23/88	4900"	LO
Ditch Water			
SW-1	3/9/88	ND	NA
SW-2	3/22-23/88	3.1	LO
Barge Canal			
SP-1	3/22-23/88	0.22	NA
SP-2	3/22-23/88	0.16	NA

LO = Lubricating Oil
PAH = Polynuclear Aromatic Hydrocarbons
FO = Fuel Oil
G = Gasoline

ND = Not detected at or above the reporting limit for total product of 0.50 mg/L.
NA = Not Applicable.
" = Results in ug/g (dry wt).

* The sample has GC/FID characteristics that are similar to one of the above materials.

APPENDIX D

AIR DATA

APPENDIX D

CALCULATIONS AND ADDITIONAL DATA USED TO ESTIMATE ONSITE AIR CONCENTRATIONS

I. Data used in Tables D-1 and D-2.

A. To calculate the concentration in air spaces in the soil, the following factors were used:

$$C_{sa} = \frac{C_i P_i MW_l}{RT}$$

C_{sa} = concentration in air space (g/cm^3)

C_i = concentration in soil (weight fraction: mg/mg)

*ug/kg = 10^{-9} mg/mg

P_i = Vapor Pressure (mm Hg)

R = gas constant (6.24×10^4 cm^3mm Hg/mole-K^o)

T = absolute Temp. (298^oK)

MW_i = molecular weight (g/mole)

B. To calculate the emission rate from the soil, the following factors were used:

$$E_i = \frac{C_{sa} D_i A \, O_T^{4/3}}{Z}$$

E_i = emission rate (g/sec)

C_{sa} = conc. in air spaces (g/cm^3)

D_i = Diffusion Coefficient (cm^2/sec)

A = exposed area (cm^2)

O_T = total soil porosity (0.1)

Z = depth of soil cover (cm)

TABLE D-1

EMISSION RATES FOR CONTAMINANTS IN SOIL FROM PLUMES a & b

INDICATOR CHEMICALS	worst case soil conc.* Plume a mg/mg	worst case soil conc.* Plume b mg/mg	VP mmHg *	MW * g/mole	Csa Plume a g/cm3	Csa Plume b g/cm3	diffusion coeff.** cm2/sec	Emission Rate worst case Plume a g/sec	Emission Rate worst case Plume b g/sec
ACETONE	1.50E-04	1.60E-06	270 @ 30 deg C	58.08	1.26E-07	1.35E-09	0.09699	1.66E-05	2.14E-08
BENZENE	--	9.40E-08	76 @ 20 deg C	78.11	--	3.00E-11	0.08195	--	4.02E-10
2 BUTANONE (MEK)	--	--	77.5 @ 20 deg C	72.10	--	--	0.08417	--	--
1,1 DICHLOROETHANE	1.80E-05	8.60E-06	180 @ 20 deg C	98.96	1.72E-08	8.24E-09	0.08557	2.00E-06	1.15E-07
1,1 DICHLOROETHENE	2.40E-06	1.20E-06	500 @ 20 deg C	96.95	6.26E-09	3.13E-09	0.07442	6.30E-07	3.81E-08
t 1,2 DICHLOROETHENE	6.80E-05	5.40E-05	200 @ 14 deg C	96.95	7.09E-08	5.63E-08	0.07442	7.14E-06	6.85E-07
ETHYLBENZENE	4.40E-06	2.70E-06	7 @ 20 deg C	106.17	1.76E-10	1.08E-10	0.06274	1.49E-08	1.11E-09
METHYLENE CHLORIDE	1.50E-05	1.10E-04	349 @ 20 deg C	84.93	2.39E-08	1.75E-07	0.08557	2.77E-06	2.45E-06
TOLUENE	4.60E-04	4.90E-04	22 @ 20 deg C	92.10	5.01E-08	5.34E-08	0.07367	4.99E-06	6.43E-07
1,1,1 TRICHLOROETHANE	1.60E-04	1.60E-04	100 @ 20 deg C	133.41	1.15E-07	1.15E-07	0.07496	1.16E-05	1.41E-06
TRICHLOROETHENE	9.70E-04	1.10E-04	60 @ 20 deg C	131.50	4.12E-07	4.67E-08	0.07638	4.25E-05	5.83E-07
VINYL CHLORIDE	2.90E-05	8.00E-06	2660 @ 25 deg C	62.50	2.59E-07	7.15E-08	0.10094	3.54E-05	1.18E-06
XYLENES (total)	3.40E-05	5.20E-05	6 @ 20 deg C	106.17	1.16E-09	1.78E-09	0.06742	1.06E-07	1.96E-08

* Values used in Equation 1 to calculate Csa value
(not shown in the table are constants R & T found in section D-I.A.)

** Value used in Equation 2 to calculate emission rate
(not shown in table are variables A, Z, O_T found in section D-I.B.)

TABLE D 2

CALCULATED AVERAGE EMISSION RATE FOR CONTAMINANTS IN SOIL

INDICATOR CHEMICALS	soil conc. (avg)* mg/mg	VP mmHg **	MW ** g/mole	Csa (avg) g/cm3	diffusion coeff.*** cm2/sec	Emission Rate most prob. Ei (avg) g/sec
ACETONE	1.33E-06	270 @ 30 deg C	58.08	1.12E-09	0.09699	1.49E 06
BENZENE	6.61E-08	76 @ 20 deg C	78.11	2.11E-11	0.08195	2.37E-08
2 BUTANONE (MEK)	--	77.5 @ 20 deg C	72.10	-	0.08417	-
1,1 DICHLOROETHANE	8.55E-07	180 @ 20 deg C	98.96	8.19E-10	0.08557	9.62E-07
1,1 DICHLOROETHENE	1.83E-07	500 @ 20 deg C	96.95	4.77E-10	0.07442	4.87E-07
t 1,2 DICHLOROETHENE	4.80E-06	200 @ 14 deg C	96.95	5.01E-09	0.07442	5.11E-06
ETHYLBENZENE	2.50E-07	7 @ 20 deg C	106.17	9.99E-12	0.06274	8.60E-09
METHYLENE CHLORIDE	1.71E-06	349 @ 20 deg C	84.93	2.73E-09	0.08557	3.20E-06
TOLUENE	3.55E-05	22 @ 20 deg C	92.10	3.87E-09	0.07367	3.91E-06
1,1,1-TRICHLOROETHANE	2.20E-06	100 @ 20 deg C	133.41	1.58E-09	0.07496	1.62E-06
TRICHLOROETHENE	1.32E-05	60 @ 20 deg C	131.50	5.60E-09	0.07638	5.87E-06
VINYL CHLORIDE	8.64E-07	2660 @ 25 deg C	62.50	7.72E-09	0.10094	1.07E-05
XYLENES (total)	2.46E-06	6 @ 20 deg C	106.17	8.43E-11	0.06742	7.80E-08

* Average concentrations based on geometric means

** Values used in Equation 1 to calculate Csa
(not shown in table are constants R & T found in section D-1.A.)

*** Value used in Equation 2 to calculate emission rate
(not shown in table are variables for A,Z,O_T found in section D 1.

Values for Areas and Depth of Soil Cover

1. Worst Case

   a. Plume a

      1. Area (A) = 9560.91 sq. ft. (8.88 E06 cm^2)
      2. Depth of Soil Cover (Z) = 10 ft. (304.8 cm)
      3. Samples used to determine contaminant concentration for the area:

         - TB-6 (12-14')
           (14-16')
           (16-18')
         - TB-10 (10-12')
           (12-14')
         - TB-11 (10-12')

   b. Plume b

      1. Area (A) = 693.08 sq. ft. (6.44 E05 cm^2)
      2. Depth of Soil Cover (Z) = 6 ft. (182.88 cm)
      3. Samples used to determine contaminant concentration for the area:

         - TB-2 (6-8')
           TB-2 (8-10')
           TB-2 (10-12')
           TB-2 (12-14')

2. Average/Most Probable Case

   a. Area (A) = 38,800 sq. ft. (3.604 E07 cm^2)
   b. Depth of Soil Cover (Z) = 4 ft. (121.92 cm)
   c. Average contaminant concentration was based on the geometric mean:

      1) $(X_1.X_2.X_3.X...n)^{1/n}$
      2) Non-detects were calculated as 10% of the detection limit
      3) Data used to calculate geometric mean includes results from all samples collected below 4 ft.
      4) Results from the following samples were not included: TB-1; TB-5 (2-4 ft.); TB-11 (2-4 ft)

II. Data used to construct Table D-3

A. To calculate the emission rate from ditch water, the following factors were used:

1. k_l and k_g

The liquid phase mass transfer coefficient (k_l) and the gas phase mass transfer coefficient (k_g) are calculated as follows:

$$k_l = (20)\left(\frac{44}{MW}^{1/2}\right) \text{cm/hr}$$

$$k_g = (3{,}000)\left(\frac{18}{MW}^{1/2}\right) \text{cm/hr}$$

where

MW = molecular weight (g/mole)

2. K_L

The two terms defined above can be used to calculate the overall liquid-phase mass transfer coefficient, K_L:

$$K_L = \frac{(H)(k_g)(k_l), \text{ cm/hr}}{[(H)(k_g)] + k_l}$$

where

H = Chemical specific Henry's Law constant.

3. K_V

The volatilization rate constant, K_V, which determines the rate at which a chemical is released into the air, is

$$K_V = \frac{K_L \quad ,hr^{-1}}{h(3.6x10^5)}$$

where

h = depth of the surface water body (cm).

TABLE D 3

EMISSION RATE OF CONTAMINANTS FROM SURFACE WATER

INDICATOR CHEMICALS	sw/ditch conc.* ug/L	MW g/mole	K1	Kg	Henry's Law Constant atm m3/mole	KL	KV	Emission Rate Ei g/sec
ACETONE	5.80E+03	58.08	17.41	1670.11	2.06E 05	3.43E-02	3.13E 09	4.10E-04
BENZENE	--	78.11	15.01	1440.14	5.50E 03	5.18	4.72E-07	--
2-BUTANONE (MEK)	-	72.10	15.62	1498.96	2.74E 05	4.09E 02	3.73E 09	
1,1 DICHLOROETHANE	1.10E+03	98.96	13.34	1279.46	4.26E 03	3.87	3.53E-07	8.78E-03
1,1-DICHLOROETHENE	1.80E+02	96.95	13.47	1292.66	1.90E-01	12.77	1.16E 06	4.72E-03
t-1,2 DICHLOROETHENE	1.40E+04	96.95	13.47	1292.66	6.70E 02	11.66	1.06E-06	3.35E 01
ETHYLBENZENE	--	106.17	12.88	1235.25	6.60E 03	4.99	4.55E 07	--
METHYLENE CHLORIDE	--	84.93	14.39	1381.11	2.03E-03	2.35	2.14E 07	-
TOLUENE	5.70E+03	92.10	13.82	1326.26	6.66E 03	5.39	4.91E-07	6.33E-02
1,1,1 TRICHLOROETHANE	5.00E+03	133.41	11.49	1101.95	3.00E 02	8.53	7.77E-07	8.78E-02
TRICHLOROETHENE	5.70E+03	131.50	11.57	1109.93	9.10E-03	5.39	4.91E-07	6.33E-02
VINYL CHLORIDE	2.30E+03	62.50	16.78	1609.97	8.14E 02	14.87	1.35E 06	7.02E 02
XYLENES (total)	1.70E+02	106.17	12.88	1235.25	7.04E 03	5.19	4.73E 07	1.82E 03

* Surface(ditch) water concentration based on one sample collected for analysis

Note: Not included in the table is the value used for the volume of the ditch

B. Emission rate (E_i)

The volatilization rate constant is used to determine the emission rate of the contaminant into the air.

$$E_i = (K_V)(C_{water})(V)$$

E_i = emission rate

K_V = volatilization rate constant

C_{water} = concentration in ditch water (mg/L)

V = volume of the onsite ditch;
based on the following dimensions of the ditch:

1 ft x 2 ft x 400 ft =

30.48 cm x 60.96 cm x 12,192 cm = $2.26 \times 10^7 cm^3$

where 1 cm^3 = 0.001L

$2.26 \times 10^7 cm^3 = 2.26 \times 10^4 L$

III. Ambient air levels were determined by using the worst case and average case E_i values for onsite soils and ditch water in the following equation.

$$\text{Air Concentration } (g/m^3) = \frac{E_i(g/sec)}{r(m/sec) \times u\ (m) \times 1\ (m)}$$

E_i - Emission rate

r - wind speed (assumed 5m/sec)

u - atmospheric mixing zone (assumed 2m for onsite exposures)

1 - Distance to receptor (assumed 1m for onsite exposures)

APPENDIX E

APPENDIX E

METHODOLOGY FOR CALCULATING POTENTIAL ONSITE CHEMICAL EXPOSURES

A. Chemical intake resulting from direct contact with onsite soils.

1. The Exposure Factors Handbook (EPA, 1988) estimates the overall chemical intake via direct contact with soils to be 537 mg/day based on the following assumptions:

   - A 70 kg. adult performing outdoor work (eg. yard work, gardening)

   - No personal protective equipment (eg. gloves, tyvek)

   - ~~537 mg of soil is equivalent to 537 mg of chemical~~ (i.e. 100% absorption)

   - 57 mg of chemical would be absorbed through intact skin and 480 mg would be ingested from oral contact with contaminated hands via eating, smoking, etc.

2. The soil intake factor (SIF) is multiplied by the soil concentration as follows:

   SIF (mg/day) x Soil conc (mg/mg)=Chemical Intake (mg/day)

B. Chemical intake from onsite inhalation exposure.

1. The Toxicology Handbook (EPA, 1985) estimates the volume of air inhaled during an average workday to be 10 cu. meters.

2. The air concentration (determined in Appendix D-III) is multiplied by

the workday inhalation volume as follows:

10 cu.m. air x Air conc (g/cu.m.) = Chemical Intake (g/day)

Chemical Intake (g/day) x 1000 mg/g = Chemical Intake (mg/day)

C. Intake factors assume 100% absorption of the chemicals.

APPENDIX F

APPENDIX F

METHODOLOGY FOR ESTIMATING POTENTIAL OFFSITE CHEMICAL EXPOSURES

I. Quantitation of potential offsite chemical exposures has been limited to inhalation of volatile indicators at the property boundary.

II. New York State: Air Guide I (NYSDEC, 1986) presents the following methodology for predicting the reduction in ambient air concentration from onsite to offsite receptors:

A. Determine the distance to the property boundary (approximately 800 ft).

B. Determine the length of the side of the contaminated area (approximately 300 ft).

C. The distance to the property boundary is divided by the length of the side of the contaminated area as follows:

$$\frac{800}{300s} = 2.6s$$

D. According to Air Guide I methodology, when the receptor is approximately 2.5 times away from the source (i.e., 2.6s) then the onsite air concentration is divided by 35 to yield the offsite air concentration.

APPENDIX G

APPENDIX G

METHODOLOGY FOR CALCULATING HEALTH BASED CRITERIA

I. In the absence of media specific ARARs, EPA advises that health based criteria be used as a comparison to estimated exposure concentrations.

A. Health criteria for oral exposures

1. Reference doses (RfDs) are acceptable daily intake levels set by the EPA for noncarcinogenic compounds. RfDs are expressed in mg/day and are directly comparable to estimated exposure concentrations.

2. Cancer potency factors (q_1^*) are used to set "not to exceed" levels for exposure to carcinogenic compounds. For Superfund sites, the cancer risk level should not exceed 10^{-4} (i.e. an excess risk of 1 cancer death per 10,000 people exposed). The following equation is used to set a "not to exceed" level for adults:

$$\frac{70 \text{ kg} \times 10^{-4} \text{ risk}}{q_1^* \text{ (oral)}} = \text{"Not to exceed" level for exposure to carcinogens (mg/day)}$$

B. Health Criteria for inhalation exposures

1. RfDs and q_1^* based on inhalation studies were not available for all of the indicator chemicals.

2. Oral RfDs values were used to calculate inhalation health criteria based on relative absorption rates found in the available literature, as follows:

a. Ethylbenzene

1) 64% of the inhaled dose is absorbed (EPA, 1987)

2) The oral RfD was multiplied by a factor of 1.56 to account for the difference in relative absorption between the oral and inhalation route.

3) Oral RfD → Inhalation RfD

1.00E-1 (mg/kg/day) x 1.56 → 1.56E-1 (mg/kg/day)

b. The same methodology was applied to the other indicator chemicals that had relative absorption criteria available, as follows:

	Oral RfD (mg/kg/day)		Inhalation RfD (mg/kg/day)
Toluene	3.00E-1	x 2 →	6.00E-1
	(based on 50% relative absorption-ATSDR, 1988)		
1,1,1-TCA	9.00E-2	x 3.33 →	2.99E-1
	(based on 30% relative absorption-EPA, 1987)		
Xylenes	2.00E+00	x 1.56 →	3.12E+00
	(based on 64% relative absorption-EPA, 1987)		

c. Relative absorption data was not available for inhalation exposure to acetone or trans-1,2-dichloroethene; therefore, the oral RfD was used to represent the inhalation RfD.

d. The calculated inhalation RfD values were multiplied by 70 kg to convert from mg/kg/day to mg/day.

C. Using Health Criteria to Estimate Level of Carcinogenic Risk from a Known Exposure Concentration

1. For carcinogenic compounds, the q_1^* value can be used to predict the level of risk posed by a known exposure level.

2. The exposure level is multiplied by the q_1^* value as follows:

$$\text{Exposure Level (mg/kg/day)} \times q_1^* \text{ (mg/kg/day)}^{-1} = \text{Risk Level}$$

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APPENDIX H

USEPA Weight of Evidence Classification for Carcinogenic Chemicals

TOXICITY DATA FOR POTENTIAL CARCINOGENIC EFFECTS – RISK CHARACTERIZATION

Data presented in this appendix are for use in risk characterization. Values in Exhibit H-1 were derived in the following manner:

Carcinogenic Potency Factors

Carcinogenic potency factors are upper 95 percent confidence limits on the slope of the dose-response curve. These values were recorded directly from Health Effects Assessment Group (HEAs) or Evaluations by the carcinogenic Assessment Group (CAGs) summary tables, with the actual source cited at the end of the exhibit. Potency factors are used to estimate potential carcinogenic risk. These factors, specific to different exposure routes, are given in units of 1/ (mg/kg/day).

Weight of Evidence Ratings

Weight of evidence ratings qualify the level of evidence that supports designating a chemical as a human carcinogen. This exhibit lists ratings based on USEPA categories for potential carcinogens, which are fully itemized in Exhibit H-2. These ratings were recorded directly from EPA's Reportable Quantities database.

(From SPHEM, 1986).

Date Prepared: October 1, 1986

Exhibit H-1

TOXICITY DATA FOR POTENTIAL CARCINOGENIC EFFECTS -- RISK CHARACTERIZATION [1]

Chemical Name	Oral Route: Potency Factor (PF) (mg/kg/d)-1	Oral Route: Source[2]	Oral Route: EPA Weight of Evidence	Inhalation Route: Potency Factor (PF) (mg/kg/d)-1	Inhalation Route: Source[2]	Inhalation Route: EPA Weight of Evidence
2-Acetylaminofluorene			B2			B2
Acrylonitrile			B1	2.40E-01	CAG	B1
Aflatoxin B1	2.90E+03	CAG	B2			B2
Aldrin	1.14E+01	CAG	B2			B2
Amitrole			B2			B2
Arsenic and Compounds	1.50E+01	HEA	A	5.00E+01	HEA	A
Asbestos			A			A
Auramine			B2			B2
Azaserine			B2			B2
Aziridine			B2			B2
Benzene	5.20E-02	HEA	A	2.60E-02	HEA	A
Benzidine			A	2.30E+02	CAG	A
Benz(a)anthracene			B2			B2
Benz(c)acridine			C			C
Benzo(a)pyrene	1.15E+01	HEA	B2	6.10E+00	HEA	B2
Benzo(b)fluoranthene			B2			B2
Benzo(k)fluoranthene			D			D
Benzotrichloride			B2			B2
Benzyl Chloride			C			C
Beryllium and Compounds	NA		B1	4.86E+00	CAG	B1
Bis(2-chloroethyl)ether	1.10E+00	CAG	B2			B2
Bis(chloromethyl)ether			A	9.30E+03	CAG	A
Bis(2-ethylhexyl)phthalate (DEHP)	6.84E-04	CAG	B2			B2
Cacodylic Acid			D			D
Cadmium and Compounds	NA			6.10E+00	HEA	B1
Carbon Tetrachloride	1.30E-01	HEA	B2			B2
Chlordane	1.61E+00	HEA	B2			B2
Chloroform	8.10E-02	HEA	B2			B2
4-Chloro-o-toluidine Hydrochloride			B2			B2
Chromium VI and Compounds	NA			4.10E+01	HEA	A
Chrysene			B2			B2
Cyclophosphamide			B1			B1
DDD			B2			B2
DDE			B2			B2
DDT	3.40E-01	HEA	B2			B2

Date Prepared: October 1, 1986

Exhibit H-1 continued

TOXICITY DATA FOR POTENTIAL CARCINOGENIC EFFECTS -- RISK CHARACTERIZATION

Chemical Name	Oral Route: Potency Factor (PF) (mg/kg/d)-1	Oral Route: Source[2]	Oral Route: EPA Weight of Evidence	Inhalation Route: Potency Factor (PF) (mg/kg/d)-1	Inhalation Route: Source[2]	Inhalation Route: EPA Weight of Evidence
Ethylene Oxide			B1/B2	3.50E-01	CAG	B1/B2
Ethylenethiourea			B2			B2
Ethyl Methanesulfonate			B2			B2
1-Ethyl-nitrosourea	3.30E+01	CAG	B2			B2
Formaldehyde			B2			B2
Glycidaldehyde			B2			B2
Heptachlor	3.40E+00	CAG	B2			B2
Heptachlor Epoxide	2.60E+00	CAG	B2			B2
Hexachlorobenzene	1.69E+00	HEA	B2			B2
Hexachlorobutadiene	7.75E-03	HEA	C			C
alpha-Hexachlorocyclohexane (HCCH)	1.10E+01	CAG	B2			B2
beta-HCCH	1.80E+00	CAG	C			C
gamma-HCCH (Lindane)	1.33E+00	HEA	B2/C			B2/C
Hexachloroethane	1.40E-02	CAG	C			C
Hydrazine			B2			B2
Indeno(1,2,3-cd)pyrene			C			C
Iodomethane			C			C
Isosafrole			B2			C
Kepone			B2			B2
Lasiocarpine			B2			B2
Melphalan			B1			B1
Methyl Chloride			C			C
3-Methylcholanthrene			B2			B2
4,4'-Methylene-bis-2-chloroaniline			B2			B2
Methylnitrosourea	3.00E+02	CAG	B2			B2
Methylnitrosourethane			B2			B2
Methylthiouracil			B2			B2
Methylvinylnitrosamine			B2			B2
N-Methyl-N'-nitro-N-nitrosoguanadine			B2			B2
Mitomycin C			B2			B2
1-Napthylamine			C			C
2-Napthylamine			A			A
Nickel and Compounds	NA		A	1.19E+00	HEA	A
N-Nitrosopiperidine			B2			B2
N-Nitrosopyrrolidine	2.10E+00	CAG	B2			B2
5-Nitro-o-toluidine			C			C

Date Prepared: October 1, 1986

Exhibit H-1 continued

TOXICITY DATA FOR POTENTIAL CARCINOGENIC EFFECTS -- RISK CHARACTERIZATION

Chemical Name	Oral Route: Potency Factor (PF) (mg/kg/d)-1	Oral Route: Source[2]	Oral Route: EPA Weight of Evidence	Inhalation Route: Potency Factor (PF) (mg/kg/d)-1	Inhalation Route: Source[2]	Inhalation Route: EPA Weight of Evidence
Pentachloronitrobenzene			C			C
Pentachlorophenol			D			D
Phenacetin			B2			B2
Polychlorinated Biphenyls (PCBs)	4.34E+00	HEA	B2			B2
Polynuclear Aromatic Hydrocarbons	1.15E+01	HEA		6.11E+00	HEA	
Propane Sultone			B2			B2
1,2-Propylenimine			B2			B2
Saccharin			C			C
Safrole			B2			B2
Streptozocin			B2			B2
2,3,7,8-TCDD (Dioxin)	1.56E+05	HEA	B2			B2
1,1,1,2-Tetrachloroethane			B2			C
1,1,2,2-Tetrachloroethane	2.00E-01	HEA	C			C
Tetrachloroethylene	5.10E-02	HEA	B2	1.70E-03	HEA	B2
Thioacetamide			B2			B2
Thiourea			B2			B2
o-Toluidine hydrochloride			B2			B2
Toxaphene	1.10E+00	CAG	B2			B2
1,1,2-Trichloroethane	5.73E-02	HEA	C			C
Trichloroethylene	1.10E-02	HEA	B2	4.60E-03	HEA	B2
2,4,6-Trichlorophenol	1.98E-02	HEA	B2			B2
Tris(2,3-dibromopropyl)phosphate			B2			B2
Trypan Blue			B2			B2
Uracil Mustard			B2			B2
Urethane			B2			B2
Vinyl Chloride	2.30E+00	HEA	A	2.50E-02	HEA	A

[1] The list of chemicals presented in this exhibit is based on EPA's Reportable Quantities Analysis and should not be considered an all-inclusive list of suspected carcinogens. Refer to Exhibit A-3 for toxicity constants for indicator selection for the chemicals listed here.

[2] Sources for Exhibit A-4:

HEA = Health Effects Assessment, prepared by the Environmental Criteria and Assessment Office, U.S. EPA, Cincinnati, Ohio, 1985 (updated in May 1986).

CAG = Evaluation by Carcinogen Assessment Group, U.S. EPA, Washington, D.C., 1985.

Exhibit II-3

Summary of RfD (ADI), q_1^*, and Other Toxicity Indices

EPA Document Series, EPA or SRC Doc. No.	Toxicity Benchmark NOAEL, q_1^* or F Factor	RfD (ADI), 10^{-5} Risk Level, Human MED, CAG and IARC Group	CERCLA $RV_d \times RV_e$ or Potency Group	CERCLA CS/RQ or Hazard Ranking	Species/Route	Target Organ(s) Cancer Type	Primary Effects	Reference
WQCD PA, 1980 10/5-80-029	NOAEL: ID	ADI: ID	NA	NA	NA	NA	NA	NA
WQCD Update IC, 1983 -83-516	NOEL: 57.9 mg/kg/day[a] (810 mg/m^3) TLV	ADI: 0.81 mg/day for oral exposure UF: 5000[b]	NA	NA	human/ inhalation (occupational)	NA	NA	ACGIH, 1981
EP PA, 1983 AO-CIN irst Draft	NOEL: 60.2 mg/kg/day[c] [500 ppm (2024 mg/m^3), 7 hours/day, 5 days/week]	ADI: 4.2 mg/day for oral exposure UF: 1000	NA	NA	rats	NA	histological alterations and increased BUN at a higher dose in cats	Dow, n.d.
W-CD PA, 1983 AO-CIN-303	NOAEL: 115 mg/kg/day[d] [500 ppm (2025 mg/m^3), 6 hours/day, 5 days/week]	ADI: 8.1 mg/day UF: 1000	NA	NA	rat/inhalation	kidney	histological alterations and increased BUN at a higher dose in cats	Hofmann et al., 1971
A PA, 1984 AO-CIN-H027	NOEL: 115 mg/kg/day[d]: [500 ppm (2025 mg/m^3), 6 hours/day, 5 days/week]	AIC for oral exposure: 8.1 mg/day[e] UF: 1000	NA	NA	rat/inhalation damage at higher dosage	kidney	histological alterations and increased BUN at a higher dose in cats	Hofmann, 1971; U.S. EPA, 1983
		AIS for oral exposure: 81 mg/day[f] UF: 100	NA	NA	rat/inhalation	kidney	histological alterations and increased BUN at a higher dose in cats	Hofmann, 1971; U.S. EPA, 1983
A A, 1984 AO-CIN-H027	NOEL: 138 mg/kg/day[g] [500 ppm (2025 mg/m^3), 6 hours/day, 5 days/week]	AIC for inhalation exposure: 9.7 mg/day UF: 1000	NA	NA	cat/inhalation	kidney	histological alterations and increased BUN at a higher dose in cats	Hofmann et al., 1971
	NOEL: 138 mg/kg/day[g] [500 ppm (2025 mg/m^3), 6 hours/day, 5 days/week]	AIS for inhalation exposure: 96.6 mg/day UF: 100	NA	NA	cat/inhalation	kidney	histological alterations and increased BUN at a higher dose in cats	Hofmann et al., 1971

Exhibit II-3 continued

Chemical: 1,1-Dichloroethane (cont.) (CAS No. 75-34-3)

Summary of RfD (ADI), q_1^*, and Other Toxicity Indices

EPA Document Series, EPA or SRC Doc. No.	Toxicity Benchmark NOAEL, q_1^* or F Factor	RfD (ADI), 10^{-5} Risk Level, Human MED, CAG and IARC Group	CERCLA $RV_d \times RV_e$ or Potency Group	CERCLA CS/RQ or Hazard Ranking	Species/Route	Target Organ(s) Cancer Type	Primary Effects	Reference
Rev. Eval. ADI DRC, 1986 DR-85-200-U076	NOEL: 134 mg/kg/day[d] [2024 mg/m^3 (500 ppm), 7 hours/day, 5 days/week]	ADI: 93.8 mg/day UF: 100[e]	NA	NA	rat/inhalation	kidney	histological alterations and increased BUN at a higher dose in cats	Dow Chemical Co., n.d.
HEEP EPA, 1985 ECAO-CIN-P139	NOAEL: NA	ADI: NA	NA	NA	NA	NA	NA	NA
DW-HA DRC, 1986 DR-86-042	NOAEL: 114 mg/kg/day[d] [2025 mg/m^3 (500 ppm), 6 hours/day, 5 days/week]	DWEL: 8.0 mg/day UF: 1000 Cancer risk at DWEL: 1.0×10^{-2}	NA	NA	rat/inhalation	kidney	histological alterations and increased BUN at a higher dose in cats	Hofmann et al., 1971
DW-HA (see above)	NOAEL: 114 mg/kg/day[d] [2025 mg/m^3 (500 ppm), 6 hours/day, 5 days/week]	longer-term HA for adult: 80 mg/day; for child: 11 mg/day UF: 100	NA	NA	rat/inhalation	kidney	histological alterations and increased BUN at a higher dose in cats	Hofmann et al., 1971
DW-HA (see above)	NOAELs: ID	10-day or 1-day HA for child: ID	NA	NA	NA	NA	NA	NA
HQCD, HQCD Update, DW-CD, HEEP, HEA (see above)	q_1^*: ID	10^{-5} risk level: ID CAG Group: D (HEA)	NA	NA	NA	NA	NA	NA
HEEP EPA, 1985 ECAO-CIN-P139	q_1^*: 9.1×10^{-2} $(mg/kg/day)^{-1}$ [h]	10^{-5} risk level: NR[i] CAG Group B2 IARC Group 2B	NA	NA	rat/oral (gavage)	hemangiosarcoma	NA	NCI, 1978b
DW-HA (see above)	q_1^*: 9.1×10^{-2} $(mg/kg/day)^{-1}$ [j]	10^{-5} risk level: 7.69×10^{-3} mg/day CAG Group B IARC Group NR	NA	NA	rat/oral (gavage)	hemangiosarcoma	NA	NCI, 1978

Exhibit II-3 continued

Chemical: 1,1-Dichloroethane (cont.) (CAS No. 75-34-3)

Summary of RfD (ADI), q_1^*, and Other Toxicity Indices

'A Document ies, EPA or C Doc. No.	Toxicity Benchmark NOAEL, q_1^* or F Factor	RfD (ADI), 10^{-5} Risk Level, Human MED, CAG and IARC Group	CERCLA $RV_d \times RV_e$ or Potency Group	CERCLA CS/RQ or Hazard Ranking	Species/Route	Target Organ(s) Cancer Type	Primary Effects	Reference
onic Tox RQ , 1983 0-CIN-R101	NA	MED: 542 mg/day	1.4x7	9.8/1000	cat/inhalation	kidney	histological alterations and increased BUN	Hofmann et al., 1971
e above)	NA	MED: 542	1.4x7	9.8/NR	cat/inhalation	kidney	histological alterations and increased BUN	Hofmann et al., 1971; Bosch, 1983
P , 1985 0-CIN-P139	NA	MED: 5234 mg/day[e]	1x7	7/1000	cat/inhalation	kidney	histological alterations and and increased BUN	Hofmann et al., 1971
P e above)	F Factor: ID[k]	CAG Group C[k] IARC Group NR	NA	NA	NA	NA	NA	NA

mments/Issues:

sumptions: 10 m^3/day human workday inhalation volume, 50% retention of exposure dose. A 5-day workweek correction was not applied.
certainty factor of 5000 was used because of suggestive evidence of carcinogenicity.
sumptions: 20 m^3/day human inhalation volume, 50% retention of exposure dose, 70 kg human body weight.
umptions: 0.223 m^3/day rat inhalation volume, 50% retention of exposure dose, 0.35 kg rat body weight.
ertainty factor of 10 to extrapolate from subchronic to chronic data not applied because t 1/2 <2 hours and steady state would have been attained in months.
hough HEA methodology did not originally permit derivation of ADIs across routes of expousre, this oral ADI for 1,1-dichloroethane had been derived m inhalation exposure by the U.S. EPA (1983) and was adopted in the HEA.
umptions: 1.26 m^3/day cat inhalation volume, 50% retention of exposure dose, 3.3 kg cat body weight.
vious evaluations (e.g., AWQCD, 1983 HEEP, HEA, ODW-CD) concluded that the evidence for carcinogenicity of 1,1-dichloroethane, with essentially the data base, was equivocal and insufficient for calculation of a q_1^*. Calculation of the q_1^* is based on the presumption of carcinogenicity.
upper-bound estimate of the incremental cancer risk due to 1 µg/ℓ of 1,1-dichloroethane in drinking water is 2.6×10^{-4}. Upper-bound estimates he incremental cancer risk due to 1 µg/m^3 of 1,1-dichloroethane in air were calculated from the NCI (1978) gavage study with 1,1-dichloroethane 5×10^{-5}) and from a negative inhalation study with 1,2-dichloroethane by Maltoni et al. (1980) (1.0×10^{-4}).
1985 HEEP; ODW, HA reports did not calculate q_1^* values but reported CAG-derived carcinogenic potency estimates.
limited evidence of carcinogenicity was considered insufficient for calculation of an F Factor. Also, 1,1-dichloroethane was classified as a CAG p C chemical in the RQ section of this HEEP. It appears that the discrepancies with the risk assessment section of the same report may reflect an sight (i.e., risk assessment but not RQ section revised by CAG).

Insufficient data; NA = not applicable; NR = not reported in document; UF = uncertainty factor