United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

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December 1984

EPA

Superfund Record of Decision:

Tysons Dump Site, PA

TYSON'S DUMP SITE, PA

Record of Decision
Abstract

The Tyson's Dump site is located in southeastern Pennsylvania, approximately 15 miles northwest of Philadelphia. The dump is an abandoned septic and chemical waste disposal site which operated from 1960-1968. Unlined lagoons were filled with wastes and covered, and new lagoons were created. Major contaminants found at the site were volatile organic compounds, primarily xylenes, toluenes, and 1,2,3-trichloropropane. In addition, chlorinated benzene compounds were also detected.

The cost-effective remedial alternative selected for this site includes excavation and off-site disposal of contaminated soils and wastes; upgrading of the existing air-stripping facility to treat leachate, shallow ground water, and surface run-on; and excavation and off-site disposal of contaminated sediments within the tributary which receives effluent from the existing air-stripping facility. The estimated capital cost for the selected alternative is $5,718,000 and operation and maintenance costs for five years are estimated to be $351,000.

RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

TYSON's DUMP SITE, UPPER MERION TOWNSHIP, PENNSYLVANIA

DOCUMENTS REVIEWED

I am basing my decision principally on the following documents describing the analysis of cost effectiveness and feasibility of remedial alternatives for the Tyson's Dump Site:

- Remedial Investigation Report (Draft) Tyson's Dump Site, Montgomery County, Pennsylvania (Michael J. Baker, Jr., Engineers, Inc., August 1984)
- Feasibility Study Report (Draft) Tyson's Dump Site, Montgomery County, Pennsylvania (Michael J. Baker, Jr., Engineers, Inc., August 1984)
- Summary of Remedial Alternative Selection
- Recommendations by the Pennsylvania Department of Environmental Resources

DESCRIPTION OF SELECTED REMEDY:

- Excavation and off-site disposal of contaminated soils and wastes to a permitted RCRA landfill.
- Upgrading of existing air-stripping facility to treat leachate, shallow ground water, and surface run-on encountered during excavation. Operation of this facility is projected to remain on-line until residual ground water contamination is eliminated (est. 5 yrs.)
- Excavation and off-site disposal of contaminated sediments within the tributary which receives effluent from the existing air stripper.

DECLARATIONS:

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). and the National Contingency Plan (40 C.F.R. Part 300). I have determined that excavation and off-site disposal of contaminated material and upgrading the existing treatment facility for continued treatment of liquids collected from the site is a cost-effective remedy which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, and the environment. The remedial action will be designed to minimize the risk of potential evacuation and temporary inconveniences to the local environment during the excavation and transportation phases.

The State of Pennsylvania has been consulted and agrees with the approved remedy. Following excavation of contaminated soils and wastes from former lagoon areas, operation and maintenance activites will be required to ensure the continued effectiveness and level of protection of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies for a period of one year.

In addition, the off-site disposal of contamined soil and sediment to a secure hazardous waste facility is necessary to protect public health, welfare and the environment.

I am deferring selection of remedial response measures, if any, for the deep aquifer and floodplain/wetlands area. Additional studies will be conducted in the off-site areas to determine if off-site remedial action is required.

I have determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

12/2/82
DATE

Assistant Administrator
Office of Solid Waste and Emergency Response

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

TYSON'S DUMP SITE

SITE DESCRIPTION

Tyson's Dump site is an abandoned septic and chemical waste disposal site situated within an old sandstone quarry. As shown in Figure 1, the site is located in southeastern Pennsylvania, 15 miles northwest of Philadelphia, in Upper Merion Township, Montgomery County. Several former unlined lagoons were used to store various industrial, municipal, and chemical wastes. Spills and overflows reportedly occurred during the period of operation, thus allowing for the dispersal of wastes throughout the site. Surface water runoff and seeps also contributed to off-site migration of the wastes northeasterly toward the floodplain of the Schuylkill River.

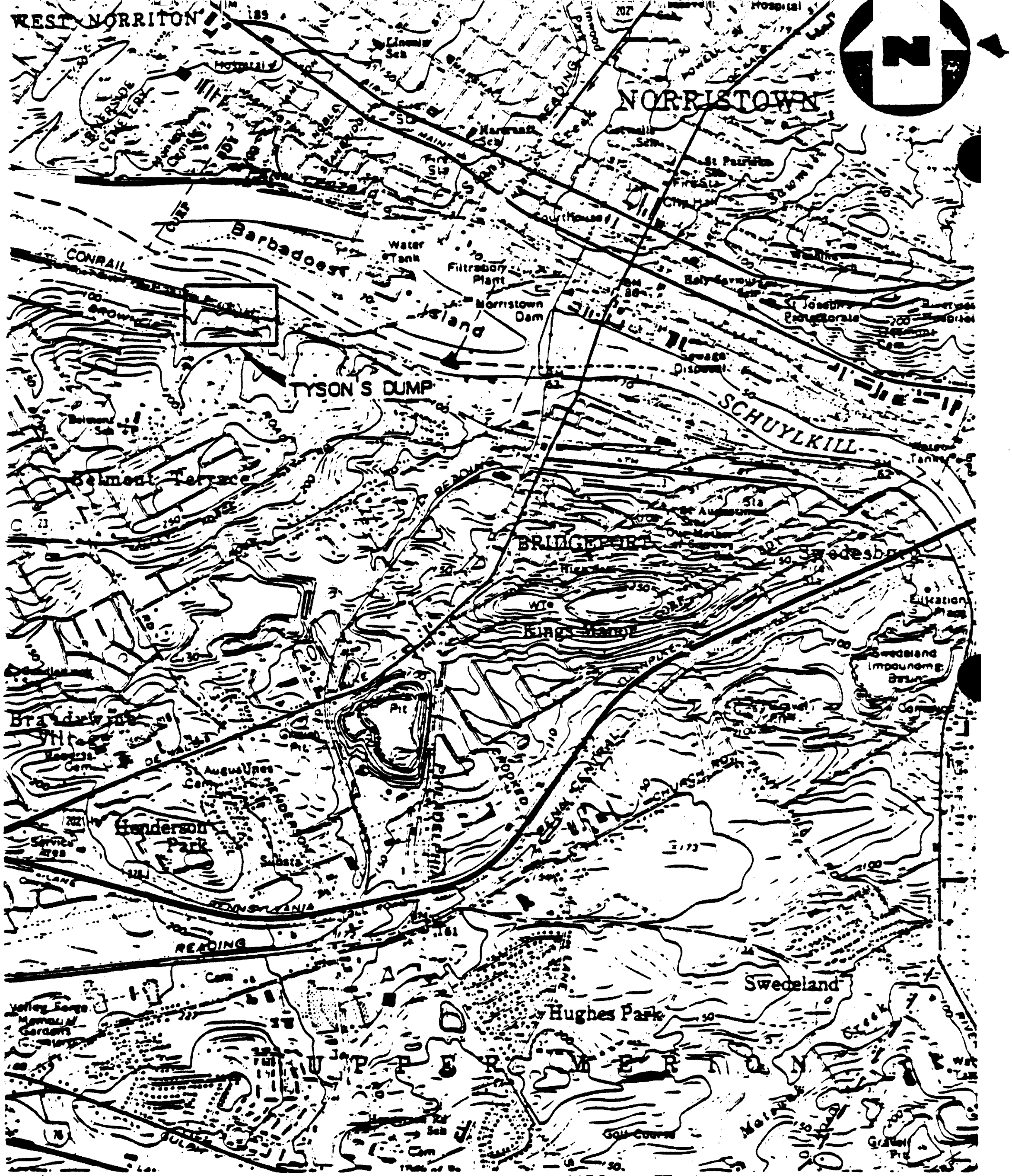
The four acre parcel comprising the former lagoons is bordered both to the east and west by unnamed tributaries to the Schuylkill River, a steep quarry highwall on the south, and a Conrail Railroad switching yard on the north (see Figure 2). The Schuylkill River floodplain is on the opposite side of the switching yard. No structures exist within the old lagoon area and heavy vegetation obscures visual observation of contaminated areas. Vehicular access to the site is from Brownlie Road. An access road used during previous dumping operations runs along the northern portion of the site.

The major watercourse in the project area is the Schuylkill River. The average discharge at a nearby upstream station is recorded to be 1907 cubic feet per second (cfs). Flood elevations in the vicinity of the site are

Flood Frequency	Elevation (feet above MSL)
10 year	70.5
50 year	77
100 year	80
500 year	87

Thus, over half of the area north of the railroad tracks is within the 10 year floodplain, while most of this area would be inundated by a 50 year flood and all of it would be covered by the 100 year flood. The site itself lies above the 100 year floodplain.(See Figure 2).

Tyson's Dump site is located within the lower member of the Stockton geologic formation outcrop area. Boring logs indicated that most natural soils appear to consist of a less than one foot thick layer of topsoil which is underlain to a depth of six to eight feet by clayey sand to sandy silt. This layer generally is underlain by fine to medium slightly silty sand with some gravel extending to a total depth of about 12 feet. Shallow bedrock in the vicinity of the site was observed to be highly fractured. A typical cross section is included as Figure 3.



BASE MAP IS A PORTION OF THE U.S.G.S. NORRISTOWN, PA QUADRANGLE (7.5 MINUTE SERIES, 1966, PHOTOREVISED 1973)
CONTOUR INTERVAL = 10'.

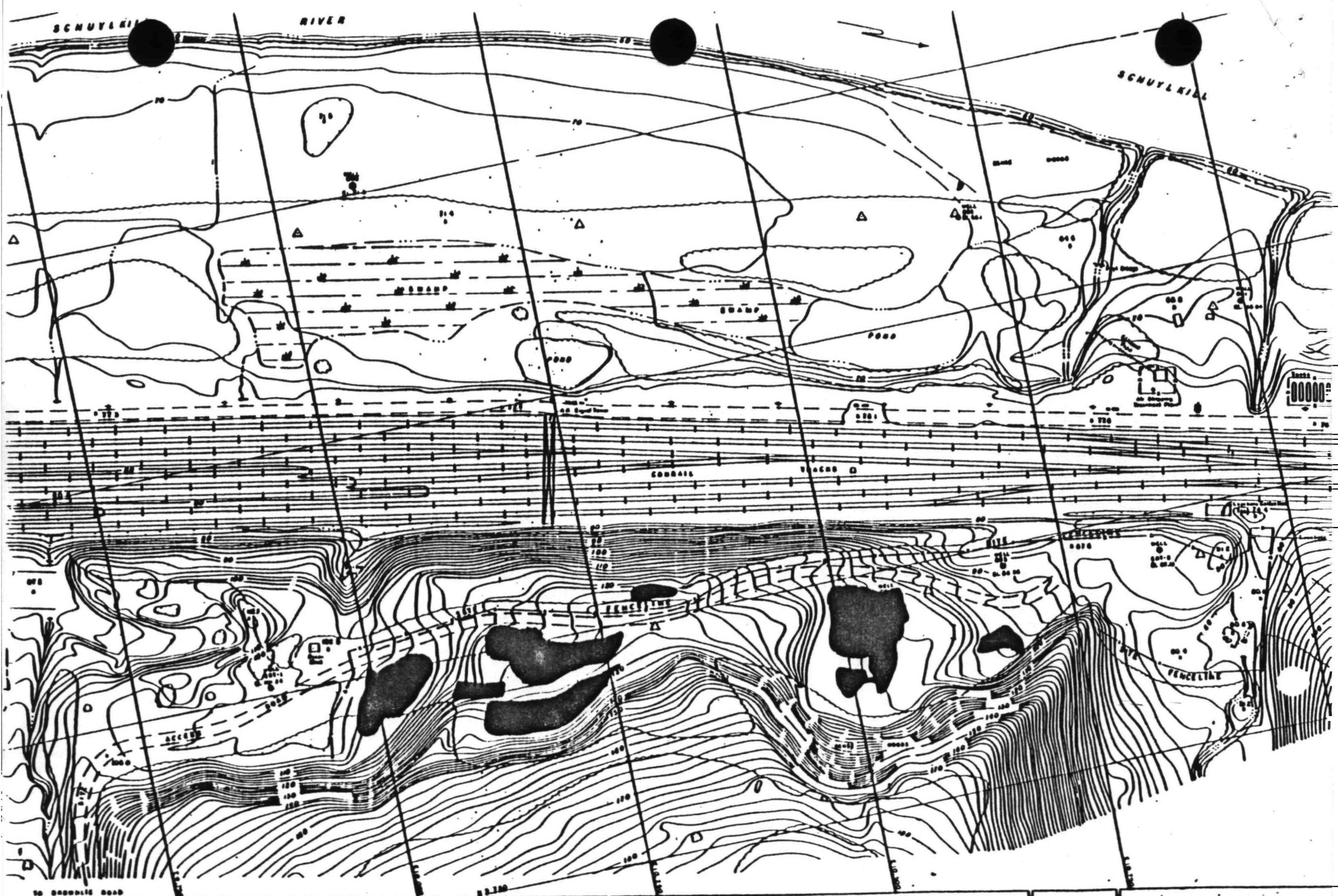
FIGURE 1

▲ DRINKING WATER INTAKE

LOCATION MAP

TYSON'S DUMP, UPPER MERION TWP., PA

SCALE: 1" = 2000'



LEGEND

LAGOON LOCATION ——— 1965

LAGOON LOCATION — — — 1973

Figure2

DESIGNED

DRAWN

CHECKED

REVIEWED

NORTH

TYSON'S DUMP SITE

UPPER MERION TOWNSHIP

MONTGOMERY COUNTY, PENNSYLVANIA

BAKER / TSA

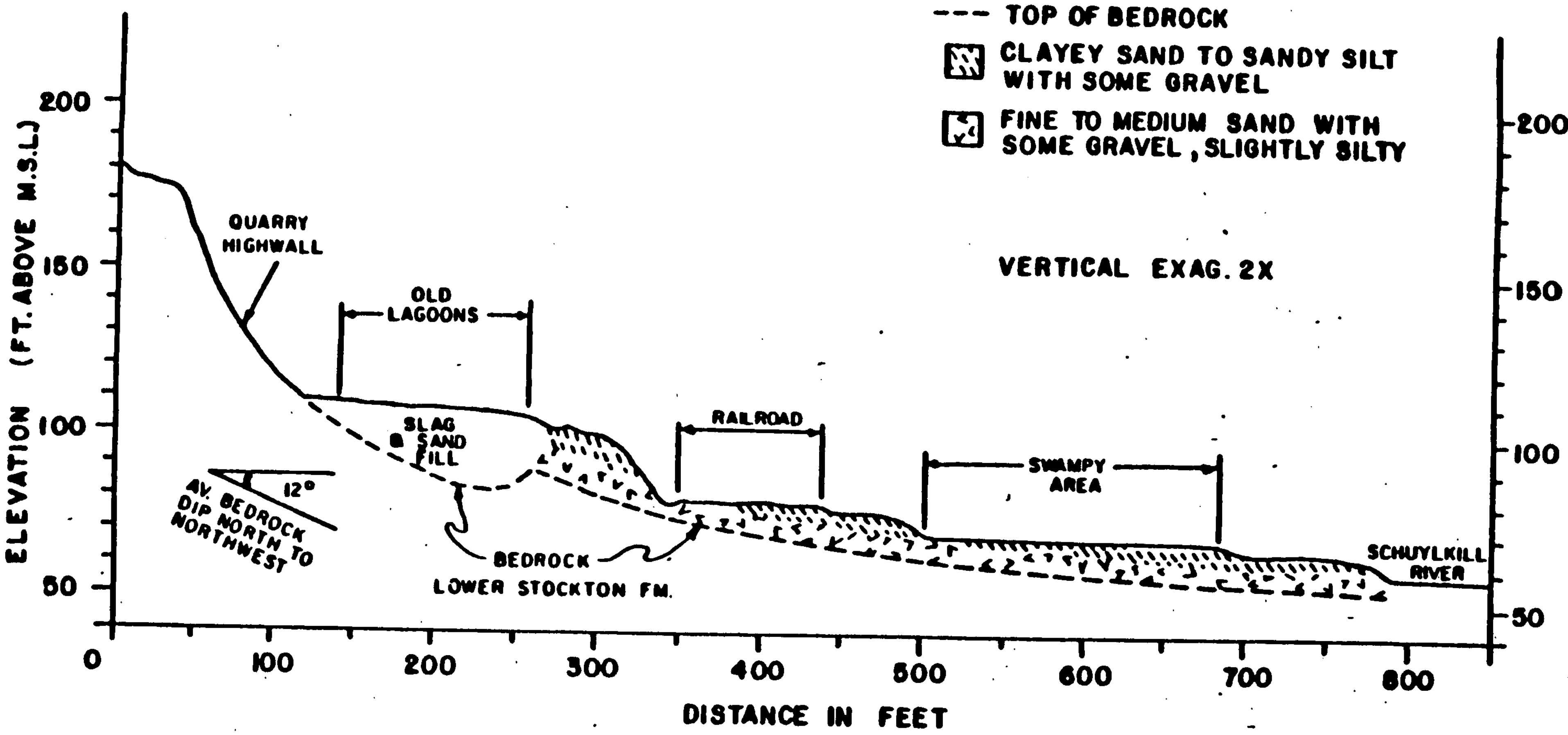
DIVISION OF MICHAEL BAKER CORPORATION

CONSULTING ENGINEERS BEAVER, PENNSYLVANIA

APPROXIMATE LAGOO[illegible] LOCATIONS BASED ON AERIAL PHOTOGRAPH[illegible]

SCALE 50' 25' 0 50'

DATE JANUARY



TYSON'S DUMP SITE

GENERALIZED GEOLOGIC SECTION

FIGURE 3

Ground water underlying Tyson's Dump Site behaves as two hydraulically connected aquifers. The shallow aquifer within the unconsolidated sediments exhibits a different flow pattern than the deeper aquifer in the fractured bedrock zone. The shallow aquifer is characterized by high permeabilities while the deeper aquifer flow pattern (the major ground water aquifer of the area) is controlled by the degree of fracturing and fracture orientation. The shallow aquifer discharges through the floodplain/wetlands area to the river. The deeper aquifer is considered a Class II aquifer as defined in the draft Ground Water Protection Strategy (GWPS).

Land use in the vicinity of the abandoned disposal site includes residential, commerical and industrial. Immediately adjacent to the site on the western border, is a newly developed residential subdivision. South of the site is zoned residential and agricultural while to the north, the zoning is heavy industrial. The Upper Merion Township as a whole is experiencing rapid growth with several new residential developments being recently completed or proposed. It is expected that land zoned agricultural will be re-zoned for high density residential use. Norristown is a large residential, commercial and industrial area with a population of 35,000 and is located across the Schuylkill River, approximately 1/2 mile northeast of the site. The smaller residential area of Bridgeport, (population 4,900) is located approximately one mile east and downstream of the site. Belmont Terrace, which contains several hundred single-family dwellings, is located approximately 1/2 mile southeast of the site.

A January 1984 draft planning study published by the Delaware Valley Regional Planning Commission recommends that a four-lane arterial be built in Upper Merion Township. This proposed Schuylkill Parkway is proposed to be routed directly over the former lagoon areas.

SITE HISTORY

The dump was owned and operated from 1960 to 1968 by companies owned by Franklin P. Tyson and Fast Pollutant Treatment, Inc. Ciba-Geigy Corporation had used the dump to dispose of various wastes during the same time period. General Devices, Inc., the present owner of the site, purchased the property from Tyson in 1968 and claims they did not dump anything since they acquired it. During active operations, several lagoons were constructed within the old quarry pits. Former lagoon locations, approximated from 1965 and 1973 aerial photos of the site area, are shown on Figure 2. Reportedly, liquid septic tank wastes and sludges were hauled to Tyson's Dump in bulk tank trucks and then were disposed in the lagoons. Apparently, lagoons were filled with wastes and covered, and new lagoons were created. These operations were carried out throughout the site thus dispersing contaminants over much of the four acre area. Since lagoons were not lined, wastes were not prevented from migrating off-site via seeps and shallow ground water. Although disposal at this site supposedly was confined to septic tank wastes, the presence of hazardous constituents in soils and ground water indicates that disposal operations included chemical wastes.

In 1973, the Pennsylvania Department of Environmental Resources ordered the site owners to close the facility. During closure, the lagoons were to be drained, backfilled and vegetated and the lagoon contents transported off-site. Since closure, the site has been commercially inactive.

In January 1983, EPA investigated an anonymous citizen complaint about conditions at Tyson's Dump and subsequently determined that immediate removal measures were required to limit exposure to public health by uncontrolled chemical odors and liquid waste releases from the unsecured site. Nearby residents were traversing the site daily and children were observed by Conrail workers to be frequently riding motorbikes throughout the site. The Schuylkill River received surface runoff from the site and is used as a municipal water supply. Norristown's main drinking water intake (10 MGD) is approximately 2000 feet downstream in the south channel between Barbados Island and the site. A drinking water intake for the City of Philadelphia is located approximately 13 miles downstream. The river is also used as an industrial water supply for the area, in addition to its recreational use by the general public.

A large quarry pit, located approximately 1 1/4 miles south of the site, is used by the Philadelphia Suburban Water Company as a drinking water source. This reservoir provides between 5 to 10 MGD. The floor elevation of the pit is 229 feet below MSL. Several private residences using wells for potable water are located within 1000 feet south and southwest of the site.

The initial environmental site survey and sampling results indicated that a variety of hazardous chlorinated and non-chlorinated chemical compounds were present in the soils, air and water within and around the former lagoon areas (on-site) and in the floodplain (off-site). EPA's On Scene Coordinator decided to institute the following immediate removal measures in March, 1983:

- A security fence was erected to limit unauthorized access to the site.

- A leachate collection system was constructed to minimize uncontrolled contaminant discharges to the Schuylkill River and also to reduce volatile organic air emissions.

- An air-stripping leachate treatment system was installed to remove volatile organic compounds from collected leachate.

- An activated carbon air exhaust system was installed to trap liberated organics from the air-stripper.

- A partial site soil cap was placed over the suspected lagoon areas and hydroseeded.

- The area was graded to divert uncontaminated runoff from the old lagoon areas.

- An extent-of-contamination survey was conducted to determine the need for additional remedial measures.

Data generated from the initial field activities conducted by EPA (January-June 1983) indicated the widespread presence of organic compounds within and surrounding the former lagoon areas. These materials were not removed during closure and still are present in substantial concentrations. The major contaminants found were volatile organic compounds (primarily xylenes, toluenes and 1,2,3-trichloropropane). In addition, chlorinated benzene compounds commonly were detected.

The data collected was used in applying the Hazard Ranking System to the Tyson's Dump site which resulted in an overall score of 63.10. Remedial Action Master Plan and Work Plan were prepared and approved in September, 1983. Funding for the Remedial Investigation and Feasibility Study was also approved in that month.

CURRENT SITE STATUS

Intensive field studies were conducted during December 1983 through March 1984 by Michael Baker, Jr., Inc. under subcontract to NUS Corpration. The findings and conclusions of the Remedial Investigation were submitted in August 1984.

Air Quality, as determined from volatile organic compound measurements had improved substantially subsequent to EPA's immediate removal actions. Results of air monitoring conducted December 1, 1983, revealed none of the 15 volatile organic compounds evaluated were present. Since winter conditions may have reduced or prevented the release of volatile compounds present in frozen surface or subsurface soils and other media, EPA requested that warm weather air monitoring be conducted to measure the potential for local adverse air quality conditions. Results of this monitoring did not reveal the presence of any of the volatile contaminants found during the subsurface soil sampling. Again, this may be attributed to EPA's emergency response.

Surface soils located in the central section of the fenced-in area were found to be highly contaminated with organic compounds. The level of organic compounds tend to decrease with increasing distance from the center of the site.

Indicator parameters and their isomers which were used in assessing the extent of surface soils contamination were chlorinated propanes and dimethyl benzenes (xylenes). The duplicate sample in the vicinity of the old lagoons had the highest reported values: compounds (or their isomers) which exceeded 100mg/kg included dimethyl benzene, ethylbenzene, methylbenzene, trichloropropane, hexadecanoic acid, and 2-chloro-10H-phenothiazine.

Low-lying areas downgradient from the site also show evidence of organic contamination. With the exception of Benzoic Acid, no other organic compound exceeded 6 ppm.

Metal concentrations in the surface soils exhibited no clear trend that would indicate that metal levels were higher or lower in a comparison of floodplain surface soils versus surface soils over the former lagoon locations. When these areas are subsequently compared to background levels (see figure 4), there is no significant difference. The field levels are also representative of typical soil concentrations as indicated by the reference levels.

Metal concentrations measured in surface water samples collected from the small tributaries, ponds, and the Schuylkill River did not exhibit any trends or patterns with regard to site influences. However, sampling was conducted during a period of low flow, and the streams and ponds were not receiving site runoff. Sediments provide a better indication of long-term conditions since typically the metals are sorbed onto solid matter and thus are more stationary, especially during periods of low flow. Sediment samples collected at each surface water sample location did not reveal an inorganic contamination problem (Figure 5). These concentrations were similar to those found in surface soils and thus may be due to native soil conditions.

Surface water samples typically contained only trace amounts of the Hazardous Substances List organic compounds analyzed. The two samples containing the most organic compounds were located in the tributary downstream of the leachate treatment plant discharge. Of the tentatively identified compounds determined to be in surface water samples, 1,2,3, trichloropropane was the most prevalent contaminant. This compound can be related to the site because the stations upstream of Tyson's Dump site either contained none of this substance, or for the Schuylkill River, only a trace amount. Figure 6 provides a summary of the occurence of the hazardous substanance.

Sediment samples taken in the tributaries, Schuylkill River, and ponds contained a wide variety of the tentatively identified compounds. The most frequently encountered substances were trichloropropane and methylated benzenes. Tracking the presence of trichloropropane in sediments, paralleled what was noted for this compound in surface water. Upstream of the site, there was little evidence of this compound, while downstream it was always present. A major area of concern on the floodplain is the gulley which receives the effluent from the present air stripping operations. These sediments were found to contain fairly high concentrations of 4-methylphenol (25,000 ppb) and 1,2,4, trichlorobenzene (44,000 ppb).

Metal concentrations above background were found in the ground water. However, these concentrations may not have been indicative of in-situ conditions since the samples were unfiltered (leaving sediments in the water), turbid, and acid preservatives may have removed metals bound to the sediment particles. A wide variety of organic compounds were detected in monitoring wells south of the railroad tracks. Contamination was also found to be widespread. Monitoring wells located in old lagoon areas contain high concentrations (generally exceeding 10,000 ppb) of a wide variety of organic compounds. Fewer organics were detected in floodplain wells (constituents rarely exceeded 100 ppb).

Figure 4

SURFACE SOIL COMPARISON FOR INORGANICS

Parameter	Sample Means			References		
	Background[1]	On-Site[2]	Floodplain[3]	Casarett[4] & Doull's	Lindsay[5] Low	Lindsay[5] High
Aluminum	7240	5220	5,580	81,300	10,000	300[illegible]
Chromium	7.0	7.4	9.9	200	1	1,000
Barium	106	50	90	400	100	3,000
Beryllium	0.77	0.41	0.56	-	0.1	40
Cobalt	4.1	2.7	5.6	23	1	40
Copper	20	116	98	45	2	100
Iron	6280	4,015	11,100	50,000	-	-
Nickel	7.4	7.4	7.8	80	5	500
Manganese	222	63	230	1,000	20	3,000
Arsenic	7.4	5.1	9.2	2	1	50
Antimony	<1	<1	<1	0.2	2	10
Selenium	1.1	1.1	1.1	0.09	0.1	2
Thallium	<0.5	<0.5	<0.5	-	-	-
Zinc	24	47	51	65	10	300
Vanadium	12	<10	15	110	20	500
Silver	<0.5	<0.5	<0.5	0.1	0.01	5
Mercury	<0.1	0.48	<0.1	0.5	0.01	0.3
Tin	18	13	72	3	2	200
Cadmium	0.41	0.43	0.91	0.2	0.01	0.7
Lead	28	26	59	15	2	200
Tox	<100	118	<100	-	-	-

All values are in ppm

1. Samples used 840019, 840020, 840030, 840031, 840032, 840152, 840153, 840154

2. Samples used 840024, 840025, 840026, 840027, 840028, 840155

3. Samples used 840034, 840035, 840036, 840037, 840038

4. Toxicology by Casarett and Doull's, 1980, p410

5. Chemical Equilibria in Soils by W. L. Lindsay, 1979

Figure 5

UPSTREAM (BACKGROUND) VS. DOWNSTREAM (SITE INFLUENCED)

SEDIMENT COMPARISON

FOR INORGANICS

Parameter	Sample Means		
	Upstream[1]	Downstream[2]	Background Surface Soils
Aluminum	2410	4030	7240
Chromium	2.5	10	7.0
Barium	38	83	106
Beryllium	0.28	0.64	0.77
Cobalt	<2.5	7.3	4.1
Copper	16	25	20
Iron	2840	10,030	6280
Nickel	2.4	9.1	7.4
Manganese	104	577	222
Arsenic	3.8	6.4	7.4
Antimony	<1	<1	<1
Selenium	<1	<1	1.1
Thallium	<0.5	<0.5	<0.5
Zinc	27	106	24
Vanadium	<10	11	12
Silver	<0.5	<0.5	<0.5
Mercury	<0.1	0.24	<0.1
Tin	5.1	6.2	18
Cadmium	0.25	1.1	0.41
Lead	15	47	28
Tox	<100	<100	<100
Oil & Grease	123	301	

All values in ppm

1. Samples used 840044, 840058, 840072, 840074, 840151

2. Samples used 840046, 840048, 840050, 840052, 840054, 840056, 8400[illegible], 840062, 840064, 840066

Figure 6

TYSON'S DUMP SITE
SUMMARY OF 1,2,3-TRICHLOROPROPANE (OR ISOMER)
RESULTS BY SAMPLE TYPES

Sample Type	Frequency[1]	ESTIMATED CONCENTRATION Range	Mean[2]
1. Surface Water	12/16	ND[3]-2,400 µg/l	450 µg/l
2. Groundwater	6/21	ND-280,000 µg/l	13,500 µg/l
3. Surface Soils	17/26	ND-320,000 µg/kg	22,200 µg/kg
4. Subsurface Soils	21/24	ND-25,000,000 µg/kg	3,200,000 µg/kg
5. Sediments	12/17	ND-87,000 µg/kg	8,400 µg/kg

[1]Frequency is shown as number of occurrences above the detection limit per the total number of samples analyzed.

[2]Means calculated using a value of zero for all samples in which the compound was not detected.

[3]ND - Not detected or reported for sample.

Subsurface test boring samples confirm the major finding of the ground water monitoring. Extensive organic contamination on-site (concentrations often exceeding 100 mg/kg extending down to at least 20 feet in several areas) and minimal organic contamination on the Schuylkill River floodplain.

The environmental data collected at Tyson's Dump Site show that the most severely contaminated media are subsurface soils located in old lagoon areas. Thus the major pathway for the migration of contaminants off-site is via ground water movement through these lagoon areas. Based on monitoring well static water level measurements, the direction of shallow ground water flow is estimated to be slightly east of north, toward the river. Permeability measurements taken at various monitoring wells indicate that ground water traveling from the center of the site to the Schuylkill River would take approximately ten years (60 feet per year).

Since the site was previously a sandstone quarry, the topsoil and overburden were removed during mining operations. With bedrock outcrops observed to be highly fractured throughout the site and due to the nature of the previous mining operations, a serious threat exists because leachate is probably migrating vertically into the fractured bedrock zone as well as horizontally atop of the bedrock surface.

Other pollutant pathways include volatilization of organic compounds from surface soils and on-site seeps. The emergency measures undertaken by EPA in early 1983 appear to have dramatically reduced air quality problems, however, these were only temporary actions until a permanent remedy could be implemented.

Surface runoff of contaminated surface soils has been substantially reduced due to the site regrading conducted during the emergency action. Since the most severe contamination is confined to subsurface materials in the old lagoons which is effectively isolated from direct surface runoff, surface transport of organic compounds is limited.

The potential for health effects from direct contact with contaminated materials is estimated to be low outside of the fenced area with the exception of sediments downstream from the leachate air-stripper effluent outfall. Inside the fence line a threat does exist should handling of contaminated surface soils occur which can be absorbed through the skin. Disturbance and handling of subsurface materials from the former lagoon area could pose a more serious threat due to the high concentrations of numerous organic compounds below ground.

As indicated earlier, surface water downstream from the leachate treatment plant was the most contaminated. The plant is effective in removing many volatile organic compounds, however, its efficiency for reducing other organic compounds particularly xylenes and 1,2,3 trichloropropane is undoubtedly lower.

No ground water users are located between the site and the Schuylkill River, which is the direction of ground water flow. Several private water supply wells are located within 1000 feet of the abandoned dump but are hydraulically upgradient in terms of ground water flow patterns in the area. Five residences sampled during the RI showed no evidence of contamination from the site. Ten organic compounds were detected in low concentrations in downgradient floodplain monitoring wells. This indicates that either dilution of contaminants has occurred or higher levels of contamination have not yet reached these wells.

The gross organic compound contents of on-site ground water and subsurface materials, even after the site has been inactive for more than ten years, demonstrates the persistance of contamination at Tyson's Dump site. One of the major site contaminants, tetrachloroethene, is a known animal and a suspected human carcinogen if ingested. Several other contaminants found on-site such as benzene and trichloroethene are also known animal and suspected to have human carcinogenic effects if ingested. Xylene, toluene, and ethylbenzene produce narcotic effects in high concentrations. Due to inhalation, ethylbenzene and trichloropropane are irritating to eyes, skin, and mucous membranes; dichlorobenzene and trichloropropane can cause damage to liver and kidneys and depression of the central nervous system if ingested. Phenol is highly poisonous either by inhalation, ingestion, or skin absorption. 4-Methylphenol (p-Cresol) can be absorbed through the skin and is known to cause kidney damage. It can also lead to a sensitvity reaction. The compound, 1,2,4-trichlorobenzene, can be absorbed through the skin and is an irritant.

ALTERNATIVES EVALUATION

The major objective of remedial actions to be taken at Tyson's Dump Site is to mitigate and/or eliminate environmental contamination present; (1) in the areas of the former lagoons which is roughly defined as within the fenceline, (2) the hillside between the former lagoon areas and the railroad tracks, and (3) the floodplain/wetlands. The overall strategy for former lagoon remedial action will be to implement source control techniques to confine or remove contaminated soils and subsurface materials as well as to ameliorate ground water contamination.

Off-site (the hillside and the floodplain/wetlands) concerns stem mainly from previous migration of hazardous constituents from the abandoned dump. Surface soil samples showed organic contamination in some areas. With the exception of the intercepted leachate and contaminated ground water between the hillside and the railroad tracks, subsurface soils and ground water contamination were found to be low as indicated by the RI. On-site remedial measures should focus mainly on assuring that the potential for additional contamination of these areas is minimized. A key aspect in determining whether off-site remedial measures are necessary is the resolution of the effectiveness potential protection factor associated with remediation of the scattered contamination found on the hillside and on the floodplain/wetlands versus the detremental effect of disturbing the wetland.

Initial formulation and development of potential alternative actions were based both on generic remedies and possible technologies applicable to these remedies. A summary of initial sreening of technologies is presented in Figures 7, 8, and 9. Initial screening of technologies was based on 1) the reliability/

Figure 7

SUMMARY OF INITIAL TECHNOLOGIES SCREENING PROCESS

Problem Type	Potential Technology	Screening Assessment
1. Air Pollution	Capping with clay, asphalt, etc.	- Hazard potential from airborne contamination does not warrant control measures based on RI data.
	Application of chemical sealants, fixants, stabilizers	- Hazard potential from airborne contamination does not warrant control measures based on RI data.
	Gas collection system with carbon adsorption system	- Gas generation from site not a problem; present air stripping leachate treatment system does employ carbon adsorption for exhaust vapors.
2. Soils/Sediments Contamination	Excavation/offsite disposal operation	- Viable option since most severe contamination is within a defined area (i.e., old lagoons).
	Site capping	- Viable option to prevent direct contact with contaminated surface soils and to reduce leachate generation.
	Application of chemical sealants	- Unproven technology given type of chemical contamination in surface soils; may be interference with sealant properties. Require pilot or bench scale study using site soils.
	Encapsulation	- Considered unproven technology for use at this site.
	Bulkhead construction	- Due to large volume of contaminated soils and physical characteristics of the site, this technology judged to be infeasible without large capital expenditures to modify site (i.e., extensive excavation, much of which would be in bedrock).

- Continued -

Problem Type	Potential Technology	Screening Assessment
2. Soils/Sediments Contamination (Continued)	Chemical fixant/solidification	- Judged to be unproven technology for large volume of chemical wastes.
	In-situ treatment	- Position of wastes, difficulty in verifying success and the requirement of a significant effort to test methods prior to determining feasibility eliminates in-situ treatment as a technology for future consideration.
	Onsite landfill	- Viable option for isolating wastes/contaminated subsurface soils.
	Flushing	- Waste characteristics (low water solubility) and potential for spreading contamination (particularly into deeper aquifers) rules out flushing.
3. Contaminated Groundwater	Upgradient diversion via barriers	- Possible technology although past disposal of wastes practically against the old quarry highwall limits area in which to construct an upgradient barrier.
	Upgradient pumping	- No suitable locations to place upgradient wells to divert groundwater from site.
	Upgradient trenches	- Insufficient area to excavate trench onsite.
	Interception trench/subsurface collection drains	- Viable alternative if coupled with groundwater treatment.

Figure 9

- Continued -

Problem Type	Potential Technology	Screening Assessment
3. Contaminated Groundwater (Continued)	Well pumping system	- Possible technology, but would provide the same effect as trench. Trench preferred because it is a passive method not requiring collection pumps and should be more effective in collecting shallow groundwater migrating off site.
	Permeable treatment beds	- Insufficient area to install beds; potential for shortcircuiting; doubtful that treatment would be successful in removing chemical constituents.
	Offsite disposal	- As long as buried wastes remain in place, removal and offsite disposal of groundwater would be necessary. Disposal costs high.
	Onsite treatment	- Possible measure since leachate treatment plant already at the site (although upgrading system necessary).
	In-situ treatment	- Insufficient proof that method would be successful. Would require bench scale, then pilot plant studies before feasibility determined.
	Dilution	- Potential for forcing contaminated groundwater into deeper aquifer; no known aquiclude underlying site to prevent this from occurring. Also potential for increasing offsite contamination, increasing contaminant migration rate and levels toward Schuylkill River.

effectiveness of the technology in protecting the population and environment potentially at risk from site contamination, 2) the engineering feasibility of the technology for implementation at Tyson's Dump and 3) costs involved of installing or implementing the technology.

The initial screening process resulted in a reduced list of possible remedial actions for further evaluation. These alternatives selected for consideration, addressing both on-site and off-site contamination, are listed in Figure 10.

ON-SITE AND HILLSIDE REMEDIAL ALTERNATIVES

ALTERNATIVE 1. EXCAVATION/OFF-SITE REMOVAL

This alternative consists of excavating the contaminated soils, fill material, and wastes (est. total volume approx. 30,000 cu. yds.) and transporting these to a secure permitted landfill with a double liner, double leachate collection system for disposal. Excavation limits will be based on organic contamination found on the surface and on bedrock depth at the locations of the former lagoons and well-defined quarry pits. Removal of contaminated materials is a highly effective, permanent (useful life) solution to prevention of 1) hazardous subtances migration off-site and into ground water, and 2) direct contact exposure with contaminated soils. It is highly reliable as successfully demonstrated at previous sites and requires little or no operation and maintenance.

Criteria for excavation will be based on removal of unconsolidated materials down to bedrock in the lagoon areas. The lateral extent of excavation will be based on detectable background levels in the on-site area. Contaminated ground water/bedrock will be dealt with through the waste management treatment process to assure that hazardous substances do not continue to migrate into the ground water. Under RCRA, a facility needs to remove waste to background levels or cover area with a cap. A cap in this situation would not be desirable since any residual contamination could be flushed out and treated in the waste management treatment system.

Shallow contaminated ground water encountered within the excavated areas will be routed to an upgraded treatment facility, and then discharged in similar fashion as the present air-stripping system. Air-stripping will reduce the amount of hazardous substances discharged to levels which will assure protection of water quality. The treatment system is located in the flood plain and will be designed to protect against washout. With excavation only planned to occur in the former lagoon locations, an off-site remedial measure is necessary to handle residual leachate and shallow contaminated ground water within the steep hillside between the former lagoons and the railroad tracks. Residual flow collected in the existing interceptor trench installed during the removal will be processed in the upgraded treatment facility. Effluent from this facility will then be discharged to the same tributary which is currently receiving the air stripper's effluent. This is estimated to continue for about five years as clean shallow ground water purges this area. Acceptable levels of contaminants in the ground water will be established in the off-site ROD. These levels will assist in the determination of when additional treatment of ground water is no longer needed.

A sufficient number of monitoring wells (at least four) designed for potentia' ground water recovery will be installed during the design phase to determine if the lower aquifer is contaminated. Additional monitoring wells may be necessary due to the invariability of the Stockton Formation, the complexity of ground water flow in this aquifer, and the heavy immiscible compounds such as the 1,2,3 trichloropropane; it is conceivable that the contaminant plume may bypass this monitoring system. If these wells do not indicate contamination in the deep aquifer, it will support a no-action solution. Should contamination be present, a subsequent RI/FS will be necessary to determine lateral extent and levels of contamination, and to identify proposed remedial measures to address such contamination.

This alternative would require improving the site access road to haul hazardous materials out by truck and rehabilitating the local township roads due to the movement of heavy equipment and truck traffic.

Air emission controls and surface water run off controls will be implemented during the design phase to minimize releases. However, a temporary evacuation plan for local residents and other safety measures can adequately address these concerns.

ALTERNATIVE 2. - SITE CAPPING AND GROUND WATER DIVERSION

This alternative involves sealing the areas overlying the former lagoons with an impervious material and controlling the movement of ground water through these areas. Utilizing both a synthetic liner and a clay cap is highly effective in preventing 1) surface water infiltration, 2) volatile organic air emissions, and 3) direct contact exposure with contaminated soils. If the grout curtain is successful in diverting ground water away from the contaminated subsurface materials, the major pathway for off-site pollutant migration would be eliminated.

The reliability and useful life of these techniques would be determined by the long term integrity of the surface cap, the ability to install a continous barrier, and the compatibility of the grout and waste materials.

Primary operation and maintenance requirements associated with this action consists of (1) using the present leachate and shallow ground water collection trench, and (2) routing this flow to an upgraded treatment facility and discharged similar to Alt. 1. This shallow ground water management scheme will remain operational until flows are eliminated as a result of the source control measures. The need for deep aquifer actions would be assessed as discussed in alternative 1.

In evaluating this alternative with reference to site characteristics, there are several disadvantages. Difficulties are expected in anchoring the surface cap into the quarry highwall. In addition, wastes may be incompatible and could cause the grout curtain to fail. Due to fractured nature of the bedrock a continuous grout curtain is complicated to install and it is difficult to ascertain whether a complete barrier to ground water flow is established. Should the grout curtain fail to provide a complete barrier, the contaminants would continue to migrate through ground water transport off-site. In addition, upwelling of the ground water into the contaminated area is anticipated and therefore would allow the contaminants to continue to migrate. Finally, contamination could move into deeper aquifer through fractures, and if so probably would not be intercepted by leachate collection trench.

ALTERNATIVE 3. - GROUNDWATER/LEACHATE COLLECTION AND TREATMENT; SURFACE SEALING OF CONTAMINATED AREAS

Under this alternative the contents in the old lagoons would remain undisturbed, while covering the surface with an impervious material to eliminate infiltration of precipitation. This should reduce the quantity of leachate generated but won't totally eliminate migration of wastes still in contact with shallow ground water. Any contaminated ground water/leachate originating from the site would then be collected in a deeper and longer interception trench similar to the existing collection system constructed during the immediate removal. A permanent and expanded treatment facility will be needed to handle the estimated collected flows (100,000 gpd).

As mentioned in the previous alternative, site capping can be effective in isolating contaminated materials from precipitation. Intercepting contaminated ground water/leachate can be effective in reducing further off-site migration of hazardous substances. Treating this contaminated flow will diminish quantities of hazardous compounds contained in the site. These techniques are proven measures which have been applied to uncontrolled hazardous waste sites. Clean-up of contaminants is achieved through long term collection and treatment of the ground water/leachate (Greater than 30 years).

A major unknown is the percentage of contaminated ground water/leachate which will be intercepted since the two existing aquifers are hydraulically connected. If the upper zone of bedrock is as highly fractured as indicated from observations of outcrops and test boring information, then it is likely that these fractures serve as conduits for deep ground water flow and migration would not be intercepted by the trench. Again, as described in the previous alternative, the wastes remain on-site. A treatment facility capable of producing an acceptable high quality effluent will warrant daily inspection and probably periodic replenishment of activated carbon for probably greater than 30 years as compared to other alternatives, which would require treatment for approximately 5 years.

ALTERNATIVE 4. - CONSTRUCTION OF AN ON-SITE, SECURE LANDFILL

Placement of wastes and contaminated soils in a properly designed and constructed on-site landfill will reduce off-site migration of hazardous constituents through ground water or air, and prevent direct contact with contaminated soils. A double-lined system with leak detection and leachate collection should have a useful life of greater than 30 years. The level of clean-up would be similar to the excavation alternative. Operation and maintenance requirements entail perpetual ground water monitoring and inspection of the leak detection and leachate collection systems. The landfill portion of the site will be permanently restricted. The present air-stripping facility would also need to be retrofitted based on results of a treatability study of the leachate. The Hillside subsurface soil contamination will be handled similarly as described in Alternate 1.

RCRA permitting personnel from Region III reviewed the site characteristics and location and compared that to their locational guidances. The determination was made that it was highly unlikely that a RCRA Landfill would be permitted at the Tyson's site location, for the reasons indicated below as "critical factors". In addition, the cost estimate in the feasibility study could be increased by approximately $800,000 or more to address other factors. The problems associated with establishing a landfill in this location (eg. foundation, liner and slope stability, need for additional ground water monitoring wells) could effect the quality of installation and also result in a further increase in cost. (See Appendix A for more specific detail). Following are the critical factors viewed as disadvantages for the on-site, secure landfill.

<u>CRITICAL FACTORS</u>

Protected Lands - Siting of a landfill near protected lands such as wetlands is not recommended based on the potential detrimental effect the landfill could have on these lands if releases occurred and were not remediated in sufficient time.

Ground Water Monitoring - Monitoring must be established at a landfill to immediately detect contamination release. Due to fracturing in the bedrock, releases could occur without being detected in monitoring wells. Also, fractured bedrock would significantly increase the difficulty of cleaning up any contamination.

Ground Water Vulnerability - Time of travel to target areas (wetlands and surface water drinking intakes) is much less than the recommended time of 100 ft in 100 years. At Tysons, time of travel is 100 ft in 10 years.

Time to Achieve Remediation - The on-site RCRA landfill would require the longest amount of time to achieve remediation (the excavation and Off-Site Removal Alternative is expected to require only 6 months). Delays in remediation would allow further migration of leachate from the former lagoons which may increase both lateral and deeper contaminant levels, and place an additional burden on the temporary measures installed during the immediate removal.

ALTERNATIVE 5 - NO ACTION

This alternative represents a situation where there would be no further remedial actions implemented on-site. Although the leachate collection and air-stripping equipment does reduce air emissions, it does not reduce all organic concentrations in the leachate prior to discharging to a tributary of the Schuylkill River. Ground water vulnerability of the Class II aquifer and impacts to flood-plain/wetlands and the downstream river intake necessitates isolating/removal on-site wastes. Without eliminating or isolating the contaminated subsurface soils and preventing migration of contaminated ground water, the site probably will revert to a situation similar to that which existed prior to EPA's emergency response actions which would be a reoccurance of localized air emissions, additional ground water contamination seeps from the hillside, and contaminated surface water run-off. In addition, surface soils, through erosion and dissolution processes, could contribute to contamination of surface waters on and off-site. Contaminated subsurface materials in direct contact with the shallow ground water or through downward migration of surface precipitation will adversely affect ground water quality. Additional intermingling of contaminanted soils with the rising ground water table would also increase contamination to the ground water. Thus direct contact threats and additional environmental contamination from the migration of the contaminants into the ground water and wetland area would continue.

OFF-SITE REMEDIAL ALTERNATIVES

The evaluation and selection of off-site remedial action is being deferred with the exception of the tributary that recieves air-stripper effluent. Due to high organic levels in the sediment, which are presently a direct contact threat, approximately 50 cubic yards will be excavated from the tributary and disposed of off-site at a RCRA landfill. This is considered to be an interim measure. A determination if futher remedial action is needed will be made in the off-site ROD. The factors for deferal are:

(1) the four existing monitoring wells in the floodplain/wetland area will be further sampled using field filtered methods to obtain accurate results for the metal concentrations in the ground water

SUMMARY OF ALTERNATIVES

Alternative and Components	Costs Cap.	($K) O&M	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
1. Excavation and Removal	5.718 *	351	Temporary evacuation of local residents may be warranted. Potential for road spills and accidents during transport.	Eliminates future air and GW deterioration. Removes threat of direct contact w/onsite soils. Level of clean-up is maximized.	Contaminants will be removed to background or bedrock if possible. If a cap is needed it will be decided in later ROD	A double lined LF in compliance with RCRA must be identified. Only alternative community feels is acceptable.
2. Site Capping and GW Diversion (Grout Curtain)	3,030	3,5	Contaminated soils still remain unlined potential for deep aquifer contamination.	Components are not expected to achieve a high level of isolation of contaminated materials. Therefore. contaminants will continue to migrate into the environment.	Cap may be difficult to construct against quarry face. Effectiveness and reliability of Grout Curtain is highly suspect.	Does not meet closure requirements under RCRA. Time required for O&M is expected to be greater than 5 years therefore O&M costs should be higher than specified. Land use will be restricted
3. GW/Leachate and Collection Treatment Site Capping	1,161	733	Same as 2. During interception trench installation, leachate will be exposed for a short term.	Percentage of intercepted GW is unknown since aquifers are hydraulically connected and fracturing occurs under site.	Installation of trench is not expected to capture contamination in deep aquifer and installation could cause additional fracturing. Cap may be difficult to construct against quarry face.	Land use will be restricted. Permanent treatment plant and long-term O&M commitment.
4. Construction of an On-site RCRA LF	3,138	415	Double handling of contaminated materials could cause increases in the possibility of temporary evacuation of local residences and worker saftey.	Best option of on-site long-term isolation and containing of contaminanted materials, however. additional GW, soil, and leachate contamination would occur during 3 yr construction period.	Inability to establish an effective GW monitoring system due to fracturing and the inability to detect and implement timely corrective action for GW. Site loc. difficulties	Land use will be restricted. Long-term O&M requirements.
5. No Action	0	448	This alt. will not correct or reduce migration of contaminated GW. Possible risk w/direct contact of contam. sed/soils.	Immediate removal measures are temporary in nature. Environmental threats increase to all pathways	Air stripper is only effective in reducing volitile constituents of leachate.	Known animal and suspected human carcinogens exist onsite in both subsurface soils SW and GW.

*Cost base[illegible] single-lined landfill facility. An additional [illegible] million has been estimated to remove contamin[illegible] to a double-lined facility.

(2) A **wetland** assessment will be done in order to better determine the **benefits** and/or detriments that any remedial action would have on the **wetland** area

(3) A biological study will be done in order to better determine any effects that off-site contamination would have on the wildlife in the wetland area

For purposes of an interim cleanup measure, based on a toxicological assessment (attached) * The levels to be removed are as follows: above 500 ug/kg for 4 -methylphenol and 2 mg/kg for 1, 2, 4, trichlorobenzene.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

Alternatives were examined in light of relevant Federal, State, and local environmental program requirements for actions such as disturbance of floodplains, temporary and permanent discharges to the Schuylkill River for treated wastewater, air emissions from the treatment plant and disturbances of contaminated soils, and RCRA requirements for new landfill facilities or existing landfills to receive excavated wastes.

The design and construction of the upgraded treatment facilities will be coordinated with the State to assure that receiving water and air quality will be aduquately protected.

RECOMMENDED ACTION

Section 300.68(j) of the National Contingency Plan (NCP) states that the appropriate extent of remedy shall be determined by the lead agency's selection of the remedial alternative which the agency determines is cost-effective (i.e., the lowest cost alternative that is technologically feasible and reliable) and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment. Based on our evaluation of the cost-effectiveness of each of the proposed alternatives, the comments received from the public, and information received from the Pennsylvania Department of Environmental Resources, we recommend:

FORMER LAGOON AREA - Source Control Measures. Excavation and off-site disposal of contaminated materials at a permitted RCRA landfill in compliance with the current off-site disposal policy.

HILLSIDE AREA - Off-site Remedial Measures. Continued use of existing leachate and shallow GW collection trench. Upgrading air stripper to treat flows. Discharge to tributary which is currently receiving air stripper effluent. Further studies will be conducted to determine if removal of surface soils will be necessary.

FLOODPLAIN/WETLANDS -Interim remedy of selective excavation in the tributary which receives air stripper effluent to decrease direct contact threat and enviornmental damage. Final decision on Floodplain/wetlands remedial action will be made in off-site ROD.

The alternative of excavation and off-site disposal of contaminated soils, fill materials, and wastes to a permitted RCRA landfill was selected based on its reliability in eliminating the continued generation and off-site migration of leachate from the former lagoon locations and the continued contamination of both shallow and probably deep ground-water zones. Based on the results of soil borings, there are no appreciable clay layers between the fill in the former lagoons and the fractured bedrock. This condition leaves little doubt that the contaminants have a pathway into the fractured bedrock aquifer.

In defining, excavation limits must be carefully defined. Analytical data from test borings taken in former lagoon locations indicate that organic concentrations tend to increase with depth down to bedrock (approximately twenty-five feet at the deepest point). Based on aerial photographs of the former lagoon areas coupled with analytical results and cross-sections from the test boring program, it is believed that most of the unconsolidated soils and materials in these areas are contaminated by various organic compounds. Therefore, the maximum limit of excavation is estimated to be approximately 30,000 cubic yards and is represented on figures 11 and 12. This limit is also reflected in the cost estimate for this alternative. An ongoing contamination detection program will be conducted during excavation to separate clean materials that could be used in site reclamation from contaminated materials. Any unconsolidated materials in where no contamination is detected above background soil levels will be used as clean fill on-site.

Excavation of unconsolidated materials and wastes is expected to progress without difficulty until encountering bedrock. The bases of the former lagoons are probably contaminated along with vertical fractures and deep ground water below the bases. Retrieval and/or containment of deep aquifer migration from the former lagoons will be further investigated.

In an effort to avoid creating a depression which would accelerate the natural flushing of the bedrock and the deep aquifer, and also to prevent the potential for direct contact should an upgradient flow of contaminated ground water occur, the excavated pits will be backfilled, and graded to prevent surface run-on and direct run-off. Site reclamation after removal will include grading, and revegetation to eliminate physical hazards from the excavation pits.

Prior to commencing excavation, the following measures will be implemented:

- Improving an access road to the site to handle the movement of heavy equipment and truck traffic.
- Upgrading and retrofitting the present air stripper to treat leachate, contaminated ground water, and surface run-on encountered during excavation. Design parameters for the upgrade will be based on a treatability study of the collected leachate and shallow ground water. This facility will also continue to operate after excavation until monitoring data indicates the quality of any residual flow is no longer contaminated.
- Formulating an air monitoring plan and temporary evacuation plan for protection of local residents.

Transport and off-site disposal of all solid wastes will be conducted in accordance with RCRA. Off-site incineration of excavated materials was investgated but due to the limited availability of commercial facilities, the time required to process the materials (minimum of three (3) years - no staging of wastes at incinerator) and the lowest estimated cost obtained ($21M, just for incineration), it was decided that the to landfill alternative was more appropriate. As a less expensive approach to transporting the excavated materials, "piggybacking" (rail and truck) was also considered but did not project significant cost savings.

The one area of concern off-site is the tributary which recieves the air stripper effluent. Concentrations of organics are much higher compared to other areas of the floodplain. It is estimated that fifty cubic yards of contaminated soil and sediment will be removed from the tributary where the air stripper discharge outfall is located. This involves excavating approximately the top six (6) inches of soil/sediment within the tributary from the outfall point to the Schuylkill River. Clean fill will be used to restore this area so as not to affect the original drainage pattern. Upgrading the air stripper facility will further prevent surface water and sediment contamination.

Removal and disposal of spent carbon cannisters from the existing air stripper will also be required regardless of which alternative was chosen. There are presently seventy-two exhausted cannisters which increase at a rate of four per month. Regeneration of the spent carbon will be investigated during design.

OPERATION AND MAINTENANCE

Post excavation activities include continued collection and treatment of residual leachate and contaminated shallow ground water. Monitoring, until data indicates that treatment is no longer required, will be performed periodically. It is anticipated that by removing the source of contamination, the quality of leachate and contaminated ground water will gradually improve so that the operation of the treatment system will no longer be warranted. This time period is estimated to be five years.

SCHEDULE

Approve Remedial Action (Sign ROD)	12/29/84
Amend Cooperative Agreement for Design	12/31/84
Complete Enforcement Negotiations	2/28/85
Start Design	March 1985
Complete Design	July 1985
Amend Cooperative Agreement for Construction	July 1985
Start Construction	Sept. 1985
Complete Construction	March 1986

EVALUATION OF ALTERNATIVES NOT SELECTED

The GW Diversion and Site Capping alternative was not selected due to the inability of this alternative to deal with the existence of shallow ground water and the threat to deep aquifer contamination. Some of the cross sections representative of different stations through the former lagoon areas show the shallow water table to be within the contaminated sub-surface materials (see figure 10). Higher water table levels would be expected than those measured during the remedial Investigation since in-situ ground water elevations taken during the winter would normally be lower when compared to elevations taken in the Spring. Even with an effective grout curtain the water table may well-up behind the curtain and again come in contact with contaminated materials.

The difficulty of constructing an effective grout curtain at this site (due to fractured nature of bedrock) lowers this alternative's reliability. Even if the barrier is originally structurally reliable, the existance of large hydrostatic pressures on one side and corrosive organic compounds on the other side of the grout curtain raises the likelihood of diversion failure. Should this barrier not be fully effective, or later fail, there is no secondary or back-up protection which would prevent ground water flow through the contaminated soils, and therefore would result in futher migration.

The Collection and Treatment alternative was not chosen since the threat to deep aquifer contamination will not be mitigated. As noted earlier, this alternative will not assure that hazardous substances will not migrate into the ground water, moreover, since there is no means of estimating the quantities of hazardous substanceswhich may migrate into the ground water,this alternative is most inappropriate. With shallow ground water flowing toward the Schuylkill River, the intercepting trench should collect most of this flow. However, even with the trench constructed 5 to 10 feet deeper into bedrock (of which itself could cause additional fracturing), leachate which exits through the base of the unlined former lagoons into a fracture will very likely not be intercepted. As mentioned in the site description, the Stockton Formation aquifer is controlled by degree of fracture and fracture orientation. Heavier, immiscible organic compounds would pass below the intercepting trench even assuming that the general direction of flow in the deep aquifer is similar to that of the shallow aquifer. This collection and treatment alternative entails

This collection and treatment alternative entails longer and more complex operation and maintenance requirements than the other alternatives. Based on the potential for recontamination, due to the unlined former lagoons, this factor would lower the alternative's reliability. The service life of the surface cap if allowed to remain undisturbed can be considered permanent. Another drawback with this system is the problems which might be encountered during the operation and maintenance period,(eg. clogging of the interception trench, malfunction of collected flow pumps, a decrease in removal efficiency) then any extended break in operation would result in recontaminating the flood-plain/wetlands since there is no back-up system.

The On-Site Landfill was not selected based on various factors. The major drawbacks to this alternative are: 1) ground water vulnerability, 2) ground water monitorability, 3) potential impacts of protected lands, 4) double-handling of contaminated materials and hazardous wastes, 5) long time frame needed to acheive remediation. In light of these factors, the on-site landfill is not adequately protective of human health and the environment.

EVALUATION OF POTENTIAL RESPONSIBLE PARTY'S PROPOSED ALTERNATIVE

Ciba-Geigy, one of the potential responsible parties at this site, had submitted comments and also discussed in a meeting their recommended remedial actions to be implemented at the site. Their proposal is similar to Alternative

3 (Interception Trench; Treatment of Leachate/GW; Surface Cap) with several modifications.

Ciba-Geigy's proposed major modification to Alternative 3 involves the use of deep (20-30 feet) interception wells instead of the proposed (5-10 feet deep) interception trench. Their reasoning based on the belief that "by virtue of pumping the wells and creating cones of depression and areas of influence around the wells, water within fractures not directly penetrated but interconnected throughout the rock mass would result in interception of that water through the pumping wells."

A major defficiency in this alternative would be the potential for continued migration of contaminants into the lower aquifer. This particular remedial technology had been eliminated during the initial screening in the Feasibility Study report. It was judged to be ineffective because the wells would have to be spaced such that they are within the fractures in order to prevent ground water from bypassing this collection system, which is impractical. This was the basis for selecting a trench over downgradient wells. The trench would intercept more fractures.

Of additional concern is whether the migration of heavier organic contaminants will be toward the line of interception wells. Heavier contaminants tend to be affected by gravity rather than the ground water flow field. Even with additional interception wells installed on three sides of the site (Ciba-Geigy proposed only one line), the heavier immiscible contaminants will probably flow through the secondary structure of vertical joints and not necessarily along isotropic flow paths to the interception wells.

An important feature of the interception well strategy is developing cones of depression in an attempt to maximize collection of contaminated ground water. Although the Ciba-Geigy proposal does mention the collection of large quantities of ground water, there is no estimate as to these quantities during the design life of this alternative. It is expected that pumping will be continuous due to high yields characterized by the Stockton Formation and high water table levels in the vicinity of the site due to the area being an aquifer discharge zone. Very steep depression gradients will need to be maintained in order to direct contamination toward the wells. The extensive pumping and subsequent treatment requirements were not factored into the operational cost of the Ciba-Geigy proposal.

Ciba-Geigy's a second proposed modification to Alternative 3 is the installation of a freshwater recharge system (similar to an on-lot sewage disposal system) to accelerate the flushing and removal of contaminants from the former lagoon areas. The present (non-recharge) Alternative 3 estimates that migration of contaminants will last greater than thirty years based on the persistent nature of the contaminants, while Ciba-Geigy's modification would be intended to purge the former lagoon contents in a five to ten year period. Even if this could in fact be accomplished, the recharge operation would probably also drive the contaminants deeper into bedrock fractures, exasperating the threat to the deeper aquifer.

Ciba-Geigy Corporation also provided comments indicating that the Excation and Off-Site Removal Alternative is not desirable because of potential adverse impacts to human health, engineering and technical constraints, and the low cost effectiveness. The Agency believes that the need to prevent further migration of hazardous wastes from the former lagoons into the underlying bedrock aquifer (a Class II aquifer), outweighs the risk of evacuation and the temporary inconveniences caused during the excavation of wastes.

Thus, at this site excavation/off-site disposal is the only alternative which is feasible, reliable, and provides adequate protection of public health, welfare and the environment.

ENFORCEMENT HISTORY

After discovery of a release of hazardous substances in January 1983 and prior to initiation of the immediate removal action, EPA gave notice and opportunity to perform the immediate removal action to General Devices Inc. and Frank Tyson. Both parties declined to take immediate action.

In April 1984 a CERCLA 107 cost recovery action was filed against General Devices Inc., Frank Tyson and Ceiba-Geigy Corporation (identified as a generator based on information received in response to a 104(e) response). The case was filed to recover the immediate removal costs and remedial response costs to date (amendments to the case will be made as remedial costs are incurred). The case is now in discovery.

On August 1, 1984, as the RI/FS was nearing completion, EPA sent notice letters to all three parties asking them to consider implementing EPA's chosen remedial action (although the action was not known at the time). Frank Tyson repsonded by stating he could not afford to take any action. Ceiba-Geigy and General Devices did not commit to taking any action, but did indicate an interest in engaging in discussions that could lead to a clean-up. On October 26, 1984, Ceiba-Geigy wrote to EPA and again stated they have not ruled out the possibility of voluntary remedial action and asked EPA not to make commitments to federally-funded remedial response until discussions are held.

TYSON'S DUMP SITE
MONTGOMERY COUNTY, PENNSYLVANIA

RESPONSIVENESS SUMMARY

Tyson's Superfund Site is located in Upper Merion Township, Pennsylvania. It is a highly eduacated, and knowledgable community, where people are predominately upper middle class. Citizens and local officials are willing to cooperate with EPA officials in supplying information about the site. A strong working rapport has developed between the community and local officials and EPA officials.

Tyson's Dump Site was of major concern to residents and local officials during the remedial planning stage of the project. Community interest began in March of 1983, when a press conference and a public meeting were held to discuss emergency actions to be taken at the site. Approximately sixty residents were in attendance. The citizen's main concern was the high level of cancer deaths within a one-half mile radius of the site. Residents attributed the deaths to the fact that the young men lived close to the site. They were four youths in their late teens who used to play, hunt, and ride motorbikes through the area over the years before the site was known to be a hazardous area. In reply to these concerns, the Environmental Protection Agency, Region III contacted the Center for Disease Control. CDC compared cancer statistics and found that there was not a higher incidence of cancer in the vicinity of the site, as compared to the rest of Upper Merion Township. The EPA responded to initial concerns by monitoring ground, air and water within the nearby Valley Brook Development and by informing residents that there was no contamination to their immediate environment. Residents and local developers were also concerned with property values in the developments close to Tyson's.

Immediate removal actions were underway in April of 1983. At that time, an extent of contamination survey was conducted, former lagoon areas were regraded with clean fill, and temporary caps were placed on the lagoons. A security fence was constructed around the entire site, a leachate collection and treatment system was installed, along with a storm water management system for the site. Vegetation was planted for erosion control purposes. During the Immediate Removal activities, the citizen's concerns continued to center on the frequency of cancer deaths. They were also concerned with the time frame for total cleanup of the site, and removing all of the contaminated soil and disposing of it off site. At the public meeting to discuss the emergency actions, EPA officials told the residents that permanent cleanup alternatives will be addressed in the Remedial Investigation and the Feasibility Study.

During and after the emergency work, federally elected officials toured the site, and State, local and federal officials from the area urged that EPA and the State propose Tyson's for the Superfund National Priorities List. The site was put on the proposed list in September of 1983. In October of 1983, a public meeting was held to discuss the workplan. Approximately fifty people attended the meeting. The citizens continued to voice their concerns, the high cancer death rate in the area being their primary concern. The people understood EPA's purpose for doing the study, however, they pushed heavily for a quick cleanup. They continued to urge total excavation and off site disposal of contaminated soil. The Upper Merion Township Board of Supervisors also urged EPA to implement off site disposal of contaminated soils from the site. EPA officials moved quickly in the remedial planning activities. There was quick turn around time between the site making the National Priorities List and the completion of the draft workplan one month later.

A public meeting to discuss the Draft Remedial Investigation (RI) Report and Draft Feasibility Study (FS) was held on October 10, 1984, at the Upper Merion Township Building. About sixty-five concerned residents attended the meeting. Prior to the meeting, the Draft Remedial Investigation Report and the Draft FEasibility Study were placed in a repository at the township building and the local library, for three weeks, for public review. At that time, the citizens had the opportunity to review the documents and comment at the public meeting. A pre meeting was held earlier on October 10, 1984, to discuss the EPA's finding with the Upper Merion Township Manager, and his Environmental Advisory Council. The council is made up of a group of five residents of Upper Merion Township, who have background in engineering or environmental sciences. They strongly backed the township's position for excavation of soil and off site disposal. In reading the RI Report, the Township environmental council disagreed with the low to moderate water risk assessment of contaminated surface water migrating from the site. They feel that the water risk is too low and unrealistic because the flow from the site is toward the Schuylkill Rver, which runs along the site. The concern with that is, the local high school crew team uses the river adjacent to the floodplain, downgrade from the former lagoons. Because of this, they believe that off-site removal is appropriate.

The four cancer deaths were mentioned during the pre-meeting. The township Environmental Council was emphatic about eliminating any potential cause of cancer in the area. Despite CDS statistics, the council was highly concerned about the four youths who died of cancer.

Another major concern of the Upper Merion Township Manager, is a proposed four lane highway, which is still in the planning phase. This highway is intended to alleviate heavy traffic through the community. This proposed road would run tight through the area of the site, as a bypass to the heavily travelled main taoa through town. Local officials believe there is a strong need for the highway. According to township officials, not constructing the highway would be detrimental to community growth, would maintain a high level of air pollution and would have a negative impact on local business. Construction of the road will be impossible, however, if the contaminated soils remain of the site. This issue was previously discussed earlier, in September of 1984, between the Township Manager and EPA officials. That meeting took place one month before our Otober RI/FS meeting, speciically to discuss the plans for the new highway. During the October pre-meeting, the township Manager repeatedly stated that he feels the proposed highway is an essential means of dealing with the increased traffic throughout the township.

On the evening of October 10, 1984, the public meeting was held, with approximately sixty-five citizens in attendance. About half of those residents asked EPA officials questions about the work at the site over the past year. The cancer concern was raised at the meeting. Residents said that the cases were too similar to not count the site as a possible cause or aggravation of the condition. All the residents who spoke were strongly opposed to any on-site facility being built for cleanup of the site. They also were in favor of Alternative #1, Total Excavation and off-site disposal. The coincidence that the cancer victims frequented the area in the past was a major issue with the residents.

The citizens also were concerned with how quickly EPA would decide on alternative. They want the project to be cleaned up as effectively and rapidly as possible.

The residents were asked to send their written comments to EPA, Region III. The comment period lasted from October 11, through November 7th. During that time, we received seven individual letters from residents who live in the developments borderng the site. Included in the correspondence was a letter from the parents of two of the young men who died of cancer. All of the comments favored total excavation and off site disposal. They received written comments from two of the potentially responsible parties. One of those parties sent a letter indicating that they are in favor of Alternative #2, Site Capping and Groundwater Division. The other party indicated, in a written report, that they find a modificationof Alternative #3, Groundwater/Leachate Collection and Treatment and Surface Cover, acceptable. These suggestions were addressed in the Record of Decision.

We also received a written comment for total excavation/off site removal from a State Senator. We received a letter indicating that the Upper Merion Township Republican Committee strongly supports the township's position for total excavation and off site disposal. A letter was received from the township manager repeating the issues and concerns discussed at the pre-meeting on October 10, 1984. We also received a petition containing 1,000 citizen signatures, requesting total excavation and off site disposal of contaminated soil.

Throughout the comment period, the citizens were told that they could contact Region III at any time to discuss any concerns regarding Tyson's site. However, most of the residents chose to correspond through mail, or through the petition that we received.

Once the alternative is approved, before we begin the design/construction stage, a public meeting will be held to discuss the work. EPA Region III will continue to provide community contracts for the residents, should anyone have questions or concerns during the design/construction phase.

PRELIMINARY REVIEW OF TYSON'S DUMP SITE FEASIBILITY STUDY ON-SITE LANDFILL ALTERNATIVE

EXECUTIVE SUMMARY

The RCRA Permits Section (3HW33) was requested to review the feasibility of the on-site landfill alternative as presented in the Draft Feasibility Study (FS) for the Tyson's Dump Site located near Norristown. PA. Specifically to be addressed was whether the proposed alternative would meet current RCRA technical requirements and guidance.

The review concentrated upon three (3) areas limiting site locational criteria. design/construction feasibility and impact of recently enacted RCRA amendments. The findings of the review conclude that no clear-cut constraints were found which would prohibit the siting or construction of the on-site landfill. However. several deficiencies and significant constraints were found which, in the final analysis. makes this alternative an unfavorable one. A summary of the significant constraints and deficiencies are presented below.

1. Foundation stability. This is considered not to be a problem except for the waste pile location proposed over the abandoned lagoons where expected significant differential settlements would crack or rupture a liner. Also, shallow groundwater levels will require construction of select fill to raise the liner system of the landfill.

2. Slope stability. Long-term stability of the quarry high wall against which the landfill will be constructed may be a problem. "Slab" or "block" slippage may occur due to the frequent vertical jointing and weakly cemented structure of the rock along with anticipated seepage pressures on the quarry face.

3. Protected lands. RCRA requires compliance with Presidential Executive Order 11990 and Section 404 of the CWA under 40CFR 270.3. The landfill is above the 100-year floodplain of the Schuylkill River. however. impacts due to leachate. erosion and contaminated groundwater emanating in the discharge zone of the river may occur. Concern was also raised regarding the siting of the existing leachate collection/air stripper system within the 100-year floodplain and its ability to withstand washout should this event occur. This system should not be located in the floodplain.

4. Groundwater monitorability. Background groundwater quality wells were not proposed which is required by 40 CFR Part 264. Subpart F of RCRA. Furthermore the problem of accessibility of installing these wells is cited. The area between the quarry high wall and adjacent property owners located south and upgradient of the landfill is limited. Background wells need to be located sufficiently upgradient from the landfill boundary so as not to be affected by contaminants migrating from the landfill along the prominent secondary bedrock structure (joints). The limited area may preclude locating on-site background wells which would then require obtaining permission to install them on the adjacent properties.

The number and location of compliance point wells proposed is not sufficient either. The complexity of the groundwater flow and potential contaminant plume direction in the jointed, sandstone bedrock, which is located within 15 feet of the surface, was raised.

5. Groundwater vulnerability. The site is located over a Class II aquifer. Depending upon in-situ bedrock permeabilities, the site may be classified as a vulnerable setting based upon unofficial Phase II draft location guidance criteria.6

However, of more concern is the high permeabilities of the colluvial/alluvial soils located downgradient of the proposed landfill and within the floodplain, which is a groundwater discharge zone. Should contaminants leak from the landfill, they may impact the wetlands ecosystem and the Schuylkill River before appropriate corrective action could take place. Under 40CFR 264.100(c) of RCRA, corrective action must begin within a reasonable time period after the migration of hazardous constituents has been detected by the compliance monitoring system.

6. Liner system design/construction feasibility. The construction of the liner system against the steep quarry high wall is not possible, as proposed. Site development to flatten slopes is required resulting in less disposal capacity. A chimney drain against the quarry wall appears to be needed to relieve any groundwater seepage pressure on the quarry face and maintain the integrity of the liner system.

7. Run-off Management. Collection of run-off from the landfill during its active life (6 months) and its management as a hazardous waste will be required. Sedimentation control to collect suspended hazardous waste (soil, colloids, etc.) will be needed. The run-off which will mix with leachate during the active landfill life will also need to be managed as a hazardous waste.

8. Site accessibility & working area. Significant site constraints for delivery of materials, personnel and equipment and construction activities exist. Only one entrance to the site exists and is the only one feasible. The railroad right-of-way to the north and the quarry high wall to the south of the site presents limited working space to efficiently expedite the work.

9. Waste management scheme. The alternative requires handling wastes twice in level B personnel protection, excavating then transporting the wastes to a temporary storage waste pile and subsequently placing them in the prepared landfill area. Volatile organics and the possibility of evacuating people in the nearby City of Norristown also exists. All of these are unfavorable aspects of the landfill alternative.

10. Impacts of the new RCRA amendments. The proposed landfill includes a leachate detection system between the liners. However, §202 of the amendments requires that a leachate collection system be placed between the liners. In conclusion, the viability of the proposed landfill alternative is very questionable.

The amendments under §201 include restrictions, including bans, on the disposal of certain hazardous wastes and liquid hazardous wastes contained in a solid or sludge. These restrictions are applicable to soil or debris contaminated by these wastes and disposed after November 8, 1988 for 104 or 106 CERCLA actions.

Some of these wastes are metals and organic HSL compounds that have been identified during the RI either in soil or water. Should the time frame for the design and construction of the landfill be such that disposal of these wastes would take place after the above effective date, then the restrictions would apply. Off-site disposal would not be impacted by these restrictions due to the shorter time frame in which this could be accomplished.

Although the guidance for groundwater vulnerability site locational criteria (see item 5. above) has no present regulatory basis, §202 requires publication of this criteria by May 8, 1986. This is well within the time frame that it will take to implement and complete the activities for construction of the landfill. Secondly, the amendments require promulgation of regulations which will specify acceptable site location criteria thus reinforcing the present Phase I guidance.5

TYSON'S DUMP SITE
DRAFT FEASIBILITY STUDY
RCRA EVALUATION OF THE ON-SITE
LANDFILL ALTERNATIVE

A. INTRODUCTION

Due to the inherent complexities involved with any land disposal design, the preliminary evaluation of the on-site landfill alternative as presented in the Draft Feasibility Study (FS) had to be approached on three (3) levels. First, the alternative was studied on the basis of whether its feasibility would be precluded on the basis of clear evidence that the site was unsuitable due to limiting site locational criteria (high hazard/unstable terrain, groundwater monitorability/vulnerability, protected lands, etc.). The second level of evaluation looked at the site from the viewpoint of whether the alternative proposed could be feasibly built from an engineering design/construction standpoint. Lastly, the impact of "The Hazardous and Solid Waste Amendments of 1984" enacted November 8, 1984 was evaluated.

Although the first two of these approaches could be used as a basis leading to denial of a land disposal RCRA permit, the second one is more subtle in its determination in that the alternative is presented, at best, on a conceptual basis and the detailed study associated with final design may resolve or clarify any shortcomings.

The above evaluative approach was not only used to determine the feasibility of the proposed landfill itself but also that of the temporary waste pile storage areas which are an integral part of the landfill alternative. And as will be pointed out later, there are regulatory requirements for waste piles, which, at first, will seem superfluous because of the time frame (6 months) for the specific activities involved or scope, but will have a significant impact on selecting the best alternative.

B. LOCATIONAL CRITERIA

Although the Phase I5 locational guidance criteria are in final draft form, existing regulations do allow their implementation. Phase II6 which addresses groundwater vulnerability is in draft form and has not been officially released to date. This criteria is tied into the Groundwater Protection Strategy (GWPS) and at the present time has no regulatory basis (See Section D). Only those locational criteria which are believed to be applicable to the proposed landfill alternative are addressed herein.

1. High hazard/unstable terrain

a. Foundation stability

The FS proposes that the landfill will be constructed in the western lagoon area requiring removal of the lagoon contents and contaminated soils where it is to be sited. Conclusions reached in the Remedial Investigation (RI), indicates that up to 20 feet of wastes have been buried and placed directly

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1. High hazard/unstable terrain

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The FS proposes that the landfill will be constructed in the western lagoon area requiring removal of the lagoon contents and contaminated soils where it is to be sited. Conclusions reached in the Remedial Investigation (RI), indicate: that up to 20 feet of wastes have been buried and placed directly upon the underlying bedrock and, that groundwater, apparently based on levels measured in January and February of 1984, occurs within the buried waste zones. (The FS also states that these high levels may be due to mounding within the lagoons).

Since excavation of the wastes to bedrock will be necessary to remove all wastes, landfill liner instability due to foundation failure or settlement would be highly unlikely. However, since the liner and associated leachate collection/leak detection systems would have to be constructed above seasonal high groundwater levels (which would be above those reported during the winter months) backfill of up to 10 to 15 feet of costly select material for structural fill can be expected. PA DER further requires the liner to be 4 feet above seasonal high groundwater and 8 feet above "normal" or average groundwater levels. The use of select material will be required in order to provide the relatively incompressible, stable foundation for the landfill and associated liners and leachate collection/leak detection systems. The use of select materials is also necessitated by the "wet" conditions (created by the shallow groundwater) into which the fill will be placed in the excavation.

On the other hand, the stability of the foundation of the temporary waste pile storage area is questionable and could limit the feasibility of temporarily storing these materials on-site. The FS proposes two (2) alternative waste pile locations: one with and the other without a liner. The regulations for waste piles require use of a liner and leachate collection system unless the design will prevent migration of any hazardous constituents into the groundwater or surface water at any future time.

It can be assumed that a liner would be required; therefore, it appears that placement of the temporary waste pile at the first location over the eastern lagoon area is not suitable. Differential settlement due to the varied location and depth of the lagoon wastes beneath the pile would no doubt be too excessive for any liner material or leachate collection system. This could be minimized by removing the weak, compressible filled wastes and contaminated soils. But this would obviate the need to site the pile at this location when the second alternative location exists.

The second or far eastern location proposed for the temporary waste pile where lagoons or wastes were not placed is believed to be suitable. Compressibilities of the alluvial/colluvial soils that exist would be limited and can be minimized through appropriate site preparation (excavation and backfill of weak soils, deep compaction via heavy rollers, or site preparation techniques similar to that required for the landfill).

b. Slope Stability

The long-term stability of the steep slopes (averaging between 20 and 100 percent and vertical in some areas) along the southern perimeter of the site need to be closely examined. The site history indicating that it was used as a quarry would suggest that groundwater seeps discharging on the quarry high wall would occur. Published geologic literature[1,2] places the site in the lower member of the Stockton Formation. The ridges typical of this member are mainly comprised of coarse to very coarse grained arkosic sandstones and conglomerate "poorly sorted and weakly cemented" with occassional interfingering of shale and siltstone. These ridges approximately parallel the strike (roughly SW-NE) of the beds. Weathering processes of these weakly cemented sandstones and shales are the forces which deposit the colluvial materials which can typically be found at the bottom of steep slopes.

The lower member is further characterized by appreciable secondary structure consisting of vertical jointing which roughly parallel the strike and consequently the ridge and quarry high wall. Freezing water and frost heave within these joints and along the interfingered shale bed contacts would occur. Combined with gravitational forces possible "slab" or "block" movement or slippage towards the face of the quarry high wall could be initiated.

These above-noted climatic and geologic conditions will, to varying degrees, affect the stability of the quarry high wall and to a degree the liner and leachate collection/leak detection systems constructed against it. In the final analysis, it is recognized that the landfill will be constructed over a short period of time (six (6) months) and a significant portion of the landfill will be constructed against the high wall minimizing slope failure. The issue is raised, however, since exposure of the quarry high wall will still exist and this site feature will also impact the design/construction feasibility of the landfill as discussed later under "Section C."

The site also exhibits a similar steep slope between the proposed landfill and railroad right-of-way. The FS shows, however, that the slope is developed primarily upon the natural colluvial/alluvial soils. Although these soils will, in small part, form the foundation for the landfill and stability of the slope and these soils will need to be examined, their existence would not preclude the landfill construction on the basis of limiting site locational criteria. Conventional foundation preparation and slope stabilization techniques, such as benching, compaction, etc., are available.

2. Protected lands

The landfill is not proposed within the floodplain zone defined by the 100-year flood elevation of +80 and is, therefore, not situated within the wetlands adjacent to the Schuylkill River. The operational definition and identification of wetlands has been recognized not to be an exact science. The U.S. Fish and Wildlife Service can provide a wetlands summary of the site and coordination with the Corps of Engineers is also advised.

Discharge of sediments which will have an adverse impact on municipal water supplies, fishery areas, recreational areas and shellfish beds are prohibited. The alternative which requires excavation and handling of contaminated soils and wastes to temporarily store and subsequently dispose of them in the new landfill provides the likelihood that such impacts could occur.

This waste management scheme coupled with the occurrence of stormwater run-off and groundwater seeps south of the dumpsite which could mobilize the contaminated sediments and wastes create a negative side to this alternative. It is true that these affects can be mitigated by run-on diversion structures, erosion control structures, etc., as the FS states. However, the available working area is extremely limited by existing site conditions (quarry high wall, steep slope on nothern perimeter, existing drainage-ways, springs and leachate collection ditches, railroad right-of-way, etc.) which add significantly to the complexities of implementing these safe-guards (also refer to Section C.2.).

Lastly, the location of the existing leachate collection and treatment system within the 100-year floodplain (and in some areas within the 50-year floodplain) met with concern. Inundation of these facilities would be severely detrimental to their operation, require more maintenance and significantly shorten their life span. During the required 30-year post-closure care period, the chances are as much as 60% (30-year care period/50-year flood frequency) that floods would impact these facilities. Therefore, any alternative which intends to upgrade this treatment facility should consider relocation outside the 100-year floodplain.

3. Groundwater monitorability

The 40 CFR 264 Subpart F, "Groundwater Protection", regulations require that a groundwater monitoring system be installed, maintained and sampled during a landfill's active life and closure and postclosure periods. A review of the proposed and existing monitoring systems identified in the FS reveals immediatel that no background groundwater quality system has been installed or even proposed.

Based upon inferred groundwater flow directions it would appear that a system of upgradient wells would be required to monitor background groundwater quality; be installed along the ridge south of the dump site; and, be screened throughout the saturated zone to a depth sufficiently below the bottom of the landfill. Total well depths would exceed 100 feet. The limitation that is recognized, however, is site accessibility for the background monitoring system. The system would need to be sufficiently far enough from the landfill as to not be impacted by any liner leaks which may develop along the quarry high wall. Heavy immiscible contaminants, such as the 1,2,3-trichloropropane and other Appendix VIII constituents required to be analyzed under RCRA could affect samples from "upgradient" wells located near the landfill. These heavy contaminants tend to be affected more by gravitational effects than by the groundwater flow field. As such, they will flow through the secondary structure of vertical joints and not necessarily along the flow paths of an isotropic formation.

The solution which involves locating the background quality wells sufficiently far from the facility is hampered should permission of adjacent land-owners south of the site be required to install these wells. Use of those residential wells located south of the site and sampled during the RI could not meet the regulatory requirements for a background groundwater quality system due to their locations, probable limited depths, questionable ability to obtain representative samples, construction, if known, and limited zones that are screened, if they exist.

The other regulatory requirement associated with the groundwater monitoring system involves installing a sufficient number of wells which will yield samples that are representative of the groundwater flowing under the landfill and passing the compliance point (refer to 40 CFR §264.95). The compliance point wells must be located at the downgradient limit of the waste management area, i.e., just beyond the landfill limits. Here again the existing or proposed wells would not satisfy the compliance point monitoring system. These wells would have to be located just south of the railroad right-of-way.

Only two (2) existing wells, ERT-1 and 2, penetrate the lower member of the Stockton formation, the aquifer of concern. However, neither one of these are located along the compliance point based on inferred groundwater flow directions. Secondly the RI/FS noted that well ERT-1, which consists of a bedrock and an unconsolidated screened well cluster revealed "a slight artesion condition." This conclusion is questioned and it is believed that the "artesion condition" may have been mistaken for one typical of discharge zones. The bedrock well is only ten (10) feet deeper than the unconsolidated zoned well and may be measuring "elevated" piezometric heads due to a shallow upward flow path (i.e. shallow discharge zone in the floodplain of the Schuylkill River).

The four (4) proposed wells sited as two (2) clusters and located north of the railroad right-of-way would not be adequate or meet the intent of the compliance point groundwater monitoring system. First, they are located too far apart (about 600 feet) with only one (1) cluster north of the proposed landfill location. Second, the compliance point, as defined by their locations, is 250 to 400 feet beyond the limit of the waste management area or landfill. And lastly, they are located within the 100-year floodplain and, in fact, near the 50-year flood elevation of +77.

The purpose of locating the compliance point groundwater monitoring system at the limits of the waste management area is to provide early detection of contaminant release so that timely corrective action can be taken before receptors are impacted. Bail tests performed in two (2) wells (NUS-4 and NUS-5) revealed permeabilities in the 10-5 ft/sec. range. However, greater permeabilities in the floodplain were evidenced by the RI study which noted rapid recharge in well NUS-7. Based on this, permeabilities in the range of 10-4 ft/sec. may be conservatively presumed. Using this permeability value and the values of gradient and assumed effective porosity reported in the FS the contaminant plume (ignoring attenuative effects and dispersivity) would impact the Schuylkill River within one (1) year after reaching the proposed compliance point wells. This is far too short of a time to develop and implement appropriate corrective action as required under 40 CFR §270.100(c). Furthermore, impact to wetland soils would have already occurred once the contaminants were detected and shortly thereafter possibly to Norristown's surface water supply intake downstream.

To summarize the above points, based on 1) the potential limitations of accessibility for background groundwater monitoring wells; and 2) possible difficulty in locating a compliance point groundwater monitoring system that would allow timely corrective action: the site may not meet the RCRA groundwater monitoring requirements and would be unsuitable for a landfill.

4. Groundwater vulnerability

Although presently not having any present regulatory basis, site locational criteria is presently under development limiting siting of land based HWM facilities in vulnerable settings. Essentially, a vulnerable setting is one where the natural terrain or subsurface stratigraphy would not provide containment of contaminants should the engineered containment structures (liner and cover) fail; and the facility is above Class I or II groundwater as defined in the Groundwater Protection Strategy (GWPS) (based on present draft guidance).

The site is located over a Class II aquifer which under the GWPS is one that is currently used or potentially available for use. The vulnerability of the setting above the Class II aquifer does not consider whether it is presently used or the proximity of present users (i.e. wells) to the site. Based on unofficial draft guidance, a vulnerable setting is based on time of travel (TOT) of groundwater flow ignoring attenuation, immiscibility of contaminants and non-saturated flow zones. Furthermore, the affect of engineered containment structures are not considered. At the present time, draft guidance defines a vulnerable setting for a landfill to be one where the TOT per 100 feet is less than 100 years.

The reason that engineered containment structures (i.e., caps and liners) whether constructed of clay or a flexible membrane liner (FML) are ignored is that it is recognized that eventually these structures will leak.3 Therefore, EPA is developing this vulnerability criteria to protect important aquifers and groundwater resources should the engineered containment fail.

Groundwater flow parameters for the unconsolidated materials noted in the FS indicate flow rates of about 2 inches per day. Although the path of least resistance may be through the overlying unconsolidated materials as stated in the FS, interconnection and appreciable downward flow into the lower member Stockton Formation aquifer is considered highly likely. As discussed earlier, secondary vertical joints occur in the formation and the landfill will be situated directly on the bedrock in those areas where the liner is located the minimum distance above normal and seasonal groundwater levels (see Section B, para. 1a).

An indication of the site's potential vulnerability can be evaluated on a preliminary basis. Using those parameters established for the unconsolidated zones, a TOT per 100 feet of 1.4 to 1.9 years results. Permeabilities in the bedrock can be expected to be lower than those determined in the unconsolidated soils. Published laboratory analyses of rock core samples from the lower member of the Stockton Formation found horizontal permeabilities of 0.003 to 0.03 gpd/ft2 (4.7x10-9 to 4.7x10-8 ft/sec.) and vertical permeabilities of 0.0003 to 0.04 gpd/ft2 (4.7x10-10 to 6.2x10-8 ft/sec).1 However, laboratory permeabilities are not indicative of in-situ conditions especially where secondary structure is prevalent and has a significant impact on groundwater flow rates and direction as discussed earlier. Groundwater flow conditions in such bedrock is very difficult to determine even in the field. Rima, et. al.1, address this in attempting to characterize the Stockton Formation via pumping tests. The conclusion's from these tests were:

"... the Stockton formation does not respond to pumping as an ideal aquifer would. Two (2) reasons for this are that the formation is not isotropic, and it is not infinite in areal extent. It contains an alternating sequence of materials of grossly different hydraulic properties that are intermingled... Even those individual beds that appear to have a uniform permeability throughout their extent do not conform to the ideal-aquifer concept, owing to their lenticular shape and differences in thickness from place to place."1

C. ENGINEERING DESIGN/CONSTRUCTION FEASIBILITY

1. Landfill liner system

The proposed landfill design incorporates a double liner system of synthetic over clay with a leak detection system between the liners and a leachate collection system on top of the synthetic liner. This meets the intent of the 40 CFR §264.301 design requirements for new landfills and present design guidance. However, the feasibility of constructing this system along the steep face of the quarry high wall is questionable. Certainly the liner system cannot be installed prior to placement of the wastes unless slopes are significantly flattened on the order of 3h:1v or preferably flatter. Synthetic liner materials can be "draped" or installed vertically as long as the thickness is increased to account for the additional stress (30 mil is recommended minimum thickness for "conventional" sloped surfaces) and proper anchoring is provided. The slope recommended, however, is more from the standpoint of constructability of the various compacted soil layers: i.e., drainage layers and clay liner.4 The trade-off to providing flatter slopes is, of course, less disposal capacity. The alternative to flattening the slope along the quarry face is installing the system as waste disposal progresses. However, here the significant construction and QA/QC complexities involved would negate the landfill as a viable alternative.

The other consideration which needs to be addressed is in the design of the system. As discussed earlier in the report, slope stability and groundwater seeps on the face will place forces on the liner system which it may not be able to handle. If it can be assumed that the weight of the landfill zone will resist the slab or block slippage on the quarry face then this concern is minimized. However, seepage pressures against the quarry face will need to be relieved via a "chimney drain" type structure so as to preclude infiltration of groundwater through the clay liner and into the leak detection system which would give a false indication that a leak in the synthetic liner had occurred.

2. Management of Run-off

Under 40 CFR §264.3(c)(2), precipitation run-off is excluded as a hazardous waste. However, during the active life of the landfill (6 months duration) this run-off will pick up suspended hazardous waste and mix with the leachate. RCRA guidance7, therefore, states that run-off from active portions will generally be a hazardous waste. As such, the run-off needs to be collected and treated on-site or disposed off-site as a hazardous waste. Sedimentation control procedures will also be necessary so that they do not impact the wetlands and discharge into the Schuylkill River. The collected sediment will have to be

removed from the sedimentation control structure and managed as a hazardous wast
The regulations under 40 CFR §264.301(d) require that the run-off system be designed for a 25-year, 24-hour storm.

The alternative to the above management procedures is to perform waste analysis of the run-off on a periodic basis to demonstrate that it is not a hazardous waste. However, the practicality of such a burden may not outweight the management procedures discussed above.

3. Limited site access and working area

Located at the west end, only one entry onto the site is available to deliver needed construction materials, equipment, and personnel and emergency vehicles and equipment, if necessary. Combined with the limited space between the quarry wall and steep slope along the southern perimeter of the railroad right-of-way, significant constraints are placed upon construction efficiency and planning. Movement of construction equipment and personnel access to transport the lagooned wastes twice, construct the leachate collection and leak detection systems, surface run-off diversion and erosion control structures and providing an area for decontamination are all hampered. This can only add to the time frame for construction, increase costs and affect the overall quality of the project.

4. Waste management scheme

In terms of the overall management of wastes on-site during constructi of the landfill (the handling of wastes twice, temporarily storing them in a waste pile and achieving the level of environmental control and personnel site safety required) the landfill alternative is viewed skeptically.

Based upon the waste characterized, preliminarily there appears to be no compatibility problem. However, during excavation an appropriate waste sampling plan is required to: confirm waste compatibility, determine level of personnel protection and appropriate management in the temporary waste storage pile(s). Aside from the site constraints, significant time delay is to be expected to handle the wastes twice in Level B site personnel protection. Volatiles will be expected and proposing a winter construction period for the landfill in order to minimize their release is offset in part by typical winter construction difficulties.

The FS discusses the possibility of degradation of local air quality and the evacuation of local residents in this event. Although a wind rose was not provided to show prevailing winds, evacuation of residents and workers in the City of Norristown less than 3000 feet away to the north across the Schuylkill River is not viewed as a viable approach.

D. IMPACT OF RCRA AMENDMENTS

The proposed landfill includes a leachate detection system between the liners. However, §202 of the amendments requires that a leachate collection system be placed between the liners.

The amendments under §201 include restrictions, including bans, on the disposal of certain hazardous wastes and liquid hazardous wastes contained in a solid or sludge. These restrictions are applicable to soil or debris contaminated by these wastes and disposed after November 8, 1988 for 104 or 106 CERCLA actions. Some of these wastes are the metals and organic HSL compounds that have been identified during the RI either in soil or water. Should the time frame for the design and construction of the landfill be such that disposal of these wastes would take place after the above effective date, then the restrictions would apply. Off-site disposal would not be impacted by these restrictions due to the shorter time frame in which this could be accomplished.

Although the guidance for ground water vulnerability site locational criteria (see item 5. above) has no present regulatory basis, §202 requires publication of this criteria by May 8, 1986. This is well within the time frame that it will take to implement and complete the activities for construction of the landfill. Secondly, the amendments require promulgation of regulations which will specify acceptable site location criteria thus reinforcing the present Phase I guidance.5

E. CONCLUSIONS

The on-site landfill alternative for the Tyson's Dump Site was reviewed and as a final analysis is a questionable one. Although there were no clear-cut site locational constraints that would prohibit the siting of the landfill as proposed under RCRA (at least on a conceptual basis as presented in the FS), there are significant ones that are noted. Costs were not addressed herein since they have no impact on RCRA technical requirements; however, costs will be higher than estimated due to these constraints and the deficiencies (site characterization, groundwater monitoring, and liner design, for example) discussed.