United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-86/043
September 1986

EPA

Superfund
Record of Decision:

Lake Sandy Jo, IN

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/ROD/R05-86/043	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE SUPERFUND RECORD OF DECISION Lake Sandy Jo, IN		5. REPORT DATE September 26, 1986 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Final ROD Report 14. SPONSORING AGENCY CODE 800/00

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Lake Sandy Jo site is located on the southeast side of the City of Gary in Lake County, Indiana. The site was a former 40-acre water-filled borrow pit that was used as a landfill between 1971 and 1980. Various wastes including construction and demolition debris, garage and industrial wastes, and drums are believed to be in the site. The area surrounding the site is primarily low density residential property. The borrow pit on the site was originally dug to support construction of I-90/84, which is adjacent to the site. In 1971 the pit was filled with ground water and was used for a short time as a recreational lake. Between 1971 and 1975 the pit was filled with various debris. Complaints were filed by local residents about odors emanating from the site, and in 1976 the owners were ordered to drain the lake and restrict fill to demolition debris only. Later in 1976 the site was sold to Glen and Gordon Martin, who continued filling operations without a permit until the site was closed in 1980. The primary contaminants of concern are PAHs, phthalates and heavy metals, found mainly in soils.

The selected remedial action for this site includes: installation of a soil cover over the landfill with a drainage blanket to control surface seeps; extension of water mains to affected residents in Gary; onsite consolidation of contaminated sediments; ground water and surface water/sediment monitoring; and deed restrictions on landfill property and institutional controls on aquifer use. The estimated capital cost of the remedy is $4,747,000 with annual O&M costs of $63,000.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Lake Sandy Jo, IN Contaminated Media: soil, gw, sediments Key contaminants: heavy metals, PAHs, phthalates.		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)* None	21. NO. OF PAGES 66
	20. SECURITY CLASS *(This page)* None	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

RECORD OF DECISION

SITE Lake Sandy Jo/M&M Landfill
Lake County, Indiana

DOCUMENTS REVIEWED

The following documents describing the analysis of the cost effectiveness of the remedial action for the Lake Sandy Jo site, Gary, Indiana have been reviewed.

- Lake Sandy Jo Phase I and II Remedial Investigation Report, July 1986;
- Lake Sandy Jo Feasibility Study, July 1986;
- Lake Sandy Jo Responsiveness Summary, September 1986; and,
- Summary of Remedial Alternative Selection Lake Sandy Jo, September 1986.

DESCRIPTION OF SELECTED REMEDY

- Installation of a soil cover over the landfill with a drainage blanket to control surface seeps.
- Extension of water mains from the Gary-Hobart water distribution system into the community north of 29th Avenue, south of 25th Avenue between Morton and Chase streets in Gary.
- Onsite consolidation of contaminated sediments.
- Ground water monitoring on a quarterly basis and surface water/sediment and supplemental ground water monitoring on a semi-annually basis.
- Deed restrictions on landfill property and institutional controls on aquifer use in the affected areas.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), it has been determined that taking source control action by installing a soil cover over the landfill, consolidating sediment under the cover, and placing the surrounding community on a water distribution system is a cost-effective remedy that provides adequate protection of public health, welfare, and the environment. The State of Indiana has been consulted and agrees with the approved remedy. In addition, the action will require further operation and maintenance activities to ensure the continued effectiveness of the remedy. The U.S. EPA will fund 90% of the operation and maintenance for the first year. It has also been determined that the action being taken is appropiate when balanced against the availability of Trust Fund monies for use at other sites.

September 26th, 1986.
Date

Valdas V. Adamkus
Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V

Summary of Remedial Alternative Selection

Lake Sandy Jo/M&M Landfill

SITE LOCATION AND DESCRIPTION

The Lake Sandy Jo Landfill site is located on the southeast side of the City of Gary, Lake County, Indiana (Figure 1-1). The Lake Sandy Jo Landfill was a former 40-acre water-filled borrow pit that was gradually displaced by landfill operations between 1971 and 1980. Various wastes including construction and demolition debris, municipal garage, industrial wastes, and possible drummed wastes are believed to be in the site.

Land use around the Lake Sandy Jo Landfill, is primarily low density residential, except for the traverse of I-90/84, which lies along the southern boundary of the site. The three closest residences have backyards that abut the northern boundary of the landfill. Up until April 1986, there was no restricted site access.

The Lake Sandy Jo Landfill consists of an approximately 50-acre tract of land surrounding the former borrow pit. Wastes are partially exposed over much of the disposal area. Where wastes are not exposed, the surface of the site is a fine sand with substantial vegetation cover, mainly weeds and shrubs. Thick stands of cattails and several leachate seeps are evident along the southern edge of the landfill. Near the southeast corner of the landfill, there is a pond and a wetland which contain accumulated surface water discharges. At the south edge of the landfill, the ground water level is very close to the surface. Most of the ground water in the shallow aquifer passing through the landfill is collected as surface water recharge by two west/east drainage ditches that parallel I-80/94 or by a drainage ditch which flows from the southwest corner of the landfill southeast toward the Little Calumet River. The Little Calumet River lies approximately one mile south of Lake Sandy Jo at its closest point (Figure 1-2).

SITE HISTORY

The Lake Sandy Jo Landfill was originally a sand and gravel borrow pit dug to support construction of the adjacent expressway in the 1960's. The exact dimensions of the pit are not known, but the maximum depth of the pit is thought to be 40 feet deep. The borrow pit gradually filled with ground water and for a short time was used by the surrounding community as a recreational lake. In 1971, Robert Breski and Robert Nelson of the Gemin Corporation obtained rights to start filling the lake. Between 1971 and 1975 the lake was half filled and during these years there were numerous complaints about odors at the site. Legal proceedings were initiated by the State of Indiana in 1975 against the owners for operating without a permit, mismanagement of the landfill, and for "contaminating and polluting the waters of Lake Sandy Jo." In 1976, the charges were sustained, the owners fined $20,000 and ordered to pump the lake dry and restrict future fill to demolition debris only.

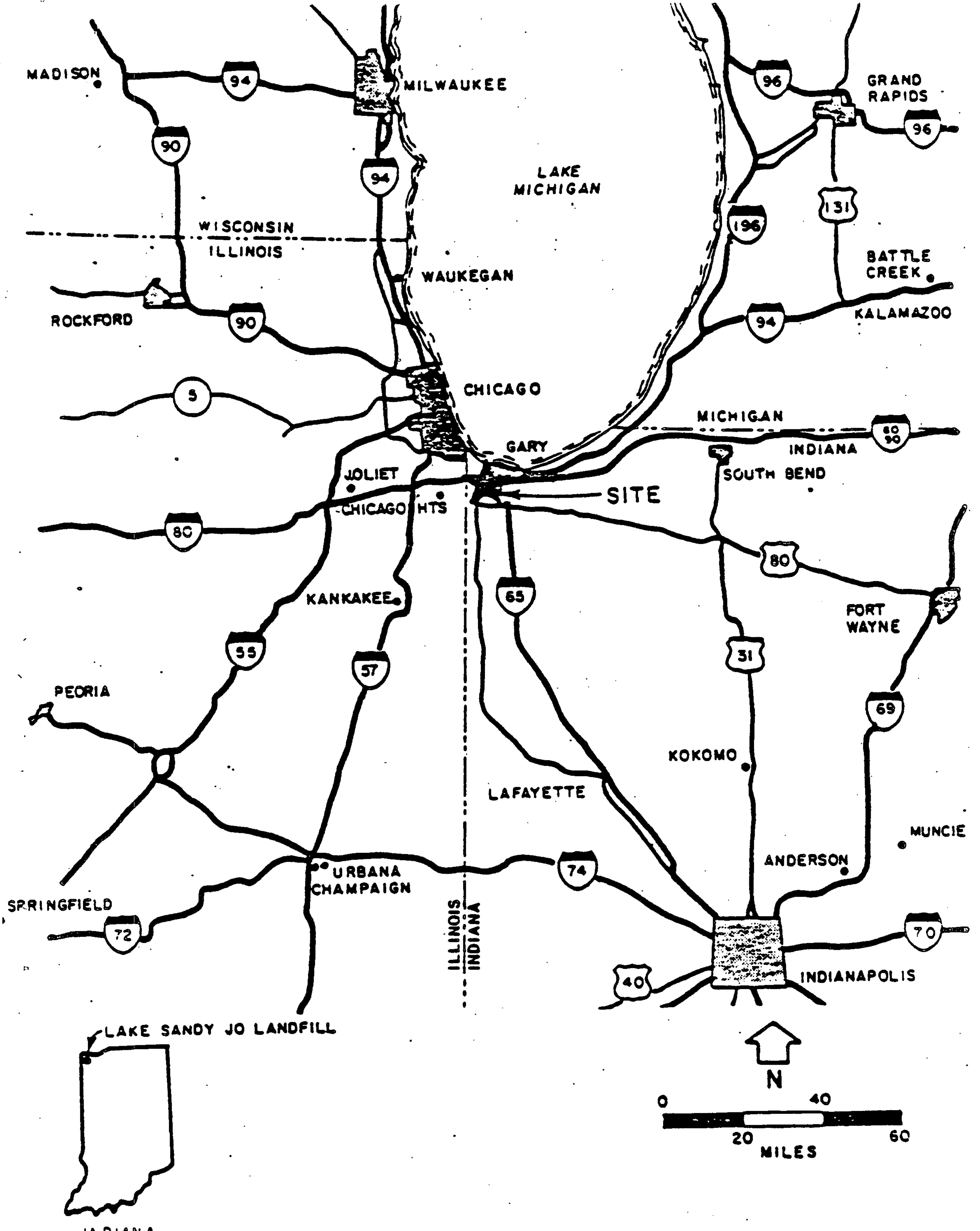
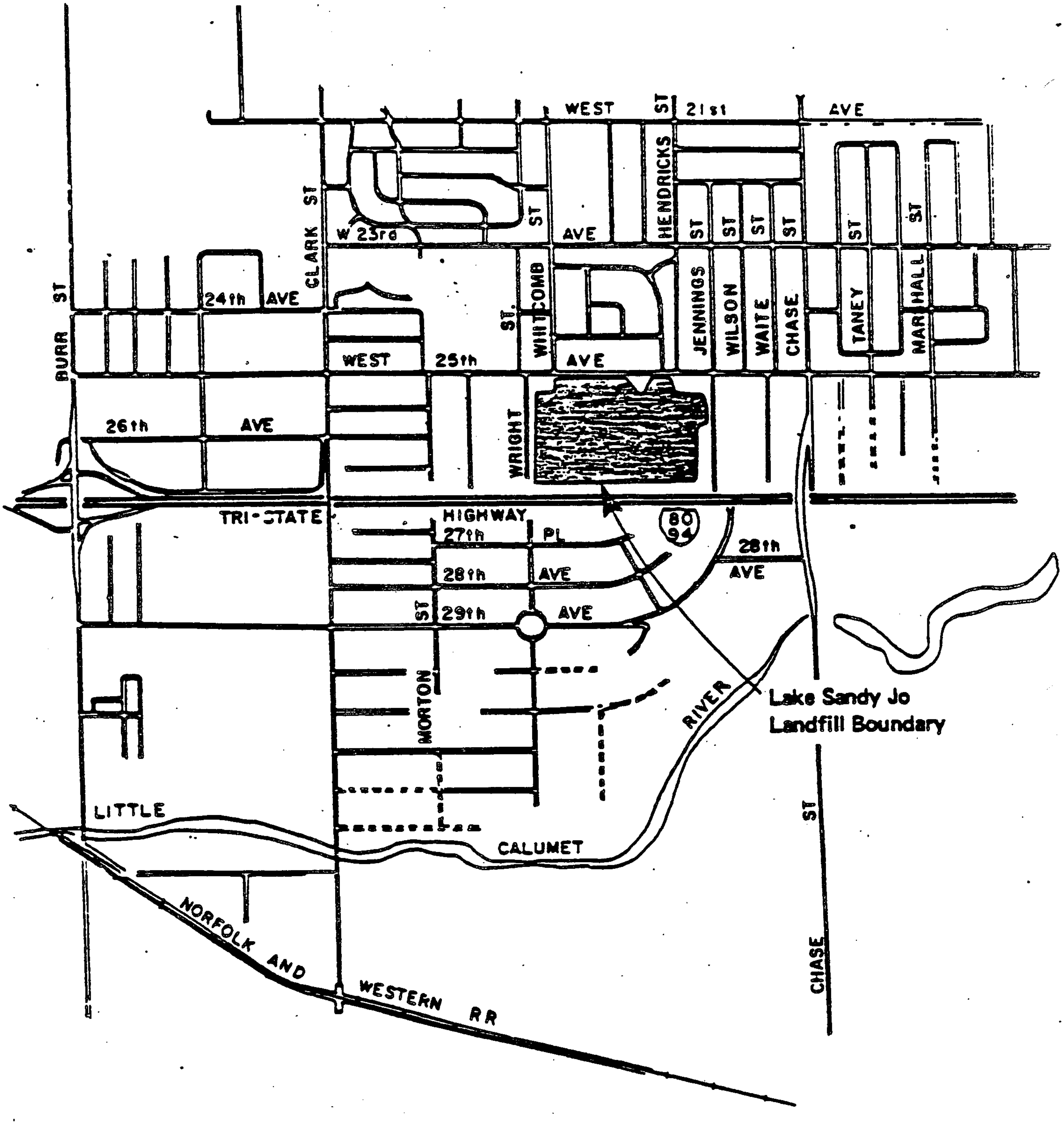


FIGURE 1
LOCATION MAP
LAKE SANDY JO LANDFILL



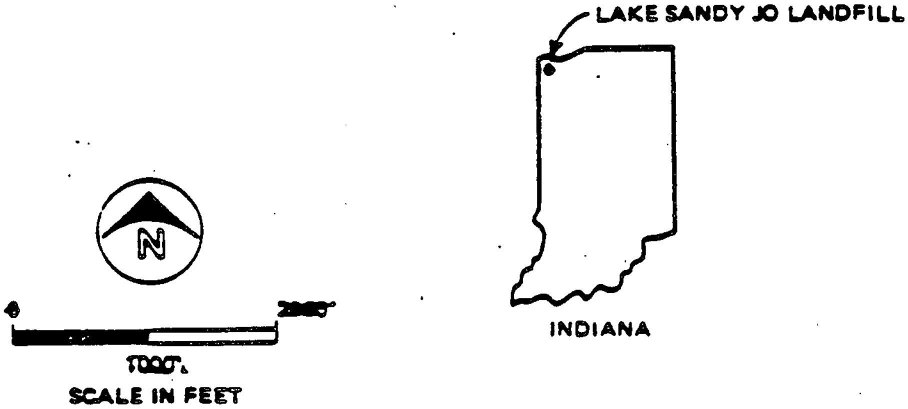


FIGURE 2
VICINITY MAP
LAKE SANDY JO FS

Instead, Gemin Corporation sold Lake Sandy Jo to Glen and Gordon Martin, and from 1976 to 1980 Lake Sandy Jo was known as the M&M Landfill. Although the landfill was never permitted, it was granted an operating variance without a permit by the state. The operating variance restricted fill materials to wood, stone, concrete, brick and other similar types of demolition debris. Industrial wastes, municipal wastes, and garbage were not to be accepted. However, throughout M&M Landfill's operating period the operating variance was revoked and reinstated several times for violations including inadequate site grading, failure to cover wastes, open dumping, and failure to meet the required fill and cover objectives within the allotted time frame. Reports by the Gary Fire Department indicate a number of fires occurred on the landfill property that burned both above and below ground. The site has remained inactive since May 1980. Because of the potential for the site to contaminate a drinking water aquifer, Lake Sandy Jo was placed on the National Priorities List (NPL) in 1982.

CURRENT SITE STATUS

There are no records on Lake Sandy Jo that describe quantity, types, and concentrations of hazardous substances present in the landfill. Data collected during the Remedial Investigation (RI) conducted from November 1984 to January 1986 are summarized below, and in Table 1.

SURFACE SOILS

There is areawide contamination of the landfill surface with polyaromatic hydrocarbons (PAHs), phthalate acid esters (phthalates), and metals. Cadmium, copper, lead, nickel, chromium and zinc were among the metals that exceeded background levels in surface soils. Concentrations of lead up to 2,788 ppm were considered an acutely toxic threat from direct exposure. Benzo(a)pyrene, the most significant PAH, was detected in 23 out of 33 samples at concentrations up to 78 parts per million (ppm). Immediate action was deemed necessary to prevent direct contact with surface soils. Emergency action was taken in April 1986 to erect a security fence around the site. Direct contact is temporarily prevented, but exposure and ingestion of soils is possible as long as the contaminated soils remain exposed.

GROUND WATER

Figure 3 demonstrates the direction of ground water flow through the site. The landfill area, having been a recreational lake, is highly saturated. The significant source of leachate generation is the aquifer water which flows through the fill area. Percolation from rain is a minor contributor to leachate generation.

The shallow aquifer has poor drinking water quality independent of the Lake Sandy Jo Landfill. Upgradient and background samples show detectable levels of heavy metals, none above primary drinking water standards (MCL's set by the Safe Drinking Water Act). Iron and manganese, which affect color, odor, and/or taste, are above their secondary drinking water standards. Sulfide also contributes to poor taste and odor.

Some of the shallow ground water monitoring wells downgradient of the site contained low levels of benzene, butyl benzyl phthalate, and trace levels of styrene. Benzene, the key toxic organic constituent, has been detected in low levels at the facility boundary wells. Most monitoring wells also contained the following inorganic contaminants in low concentrations: arsenic, cyanide, lead, chromium, copper, cadmium, and nickel. None of these concentrations exceed primary drinking water standards, or health advisories.

Twenty-nine residential well samples were collected during Phase I and Phase II of the RI. All data were reviewed by Region V's Drinking Water Section and the Agency for Toxic Substances and Disease Registry (ATSDR). Residential wells located southeast and along the drainage ditch leading south from the Lake Sandy Jo Landfill have severely degraded ground water quality due to high levels of iron, manganese, sodium, magnesium, and potassium. None of these contaminants have primary drinking water standards. However, iron and manganese exceed secondary drinking water standards and there is an advisory for drinking water containing greater than 20 ppm sodium for individuals on sodium restricted diets. Low levels of heavy metals, arsenic, cadmium, cyanide, lead, and copper have also been detected at levels below primary drinking water standards. These low level inorganic contaminants in conjunction with high dissolved solids are a direct result of the landfill leachate and constitute a non-toxic ground-water plume. Figure 4 shows the extent of ground water contamination from Lake Sandy Jo.

Organic contaminants have not been detected in residential wells. However, through the inorganic data, the ground-water pathway is clear. Therefore, the potential exists for exposure to ground-water users of yet undetected contaminants or increased levels of inorganic contaminants.

SURFACE WATER/SEDIMENTS

The observed surface waters are the discharge points for the shallow aquifer ground water. The surface waters consist of landfill leachate mixed with large volumes of uncontaminated ground water. No organics were detected in these samples. Elevated levels of heavy metals were detected in upstream and downstream samples. Samples from the leachate seep or pond contained concentrations of barium, chromium, mercury, nickel and cyanide. None of the concentrations exceeded Freshwater Ambient Water Quality Criteria.

Sediments collected in the drainage ditches southeast and south of the Lake Sandy Jo Landfill are contaminated with heavy metals and PAH compounds similar to the surface soil samples from the site. The PAH concentrations are significantly above the highway background contributions. As with the surface water samples, elevated levels of heavy metals were found in upstream and downstream samples.

EXPOSURE ASSESSMENT

The public health risk assessment developed using the RI data shows the following risks exist under the "no action" alternative at the Lake Sandy Jo Landfill under present conditions:

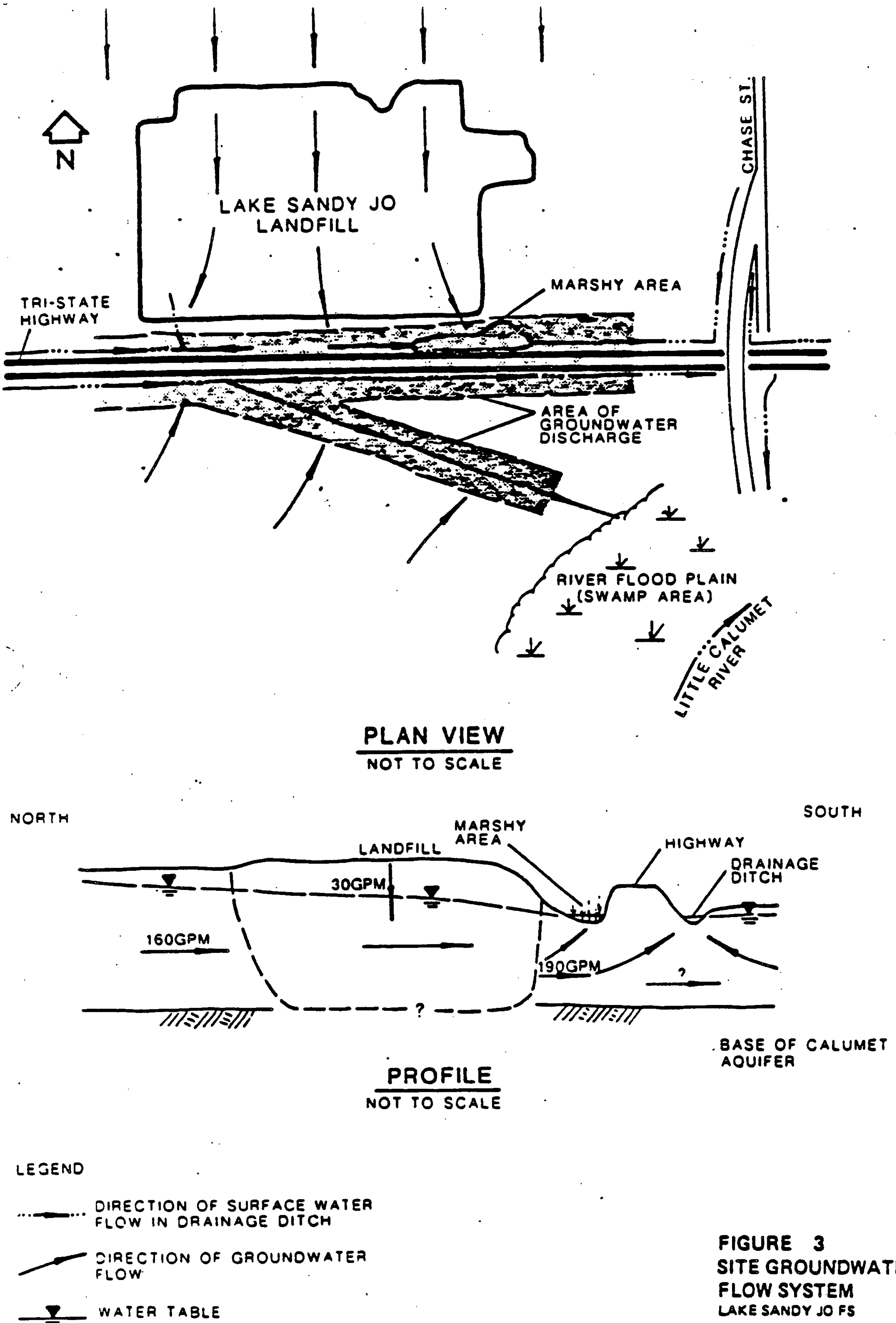
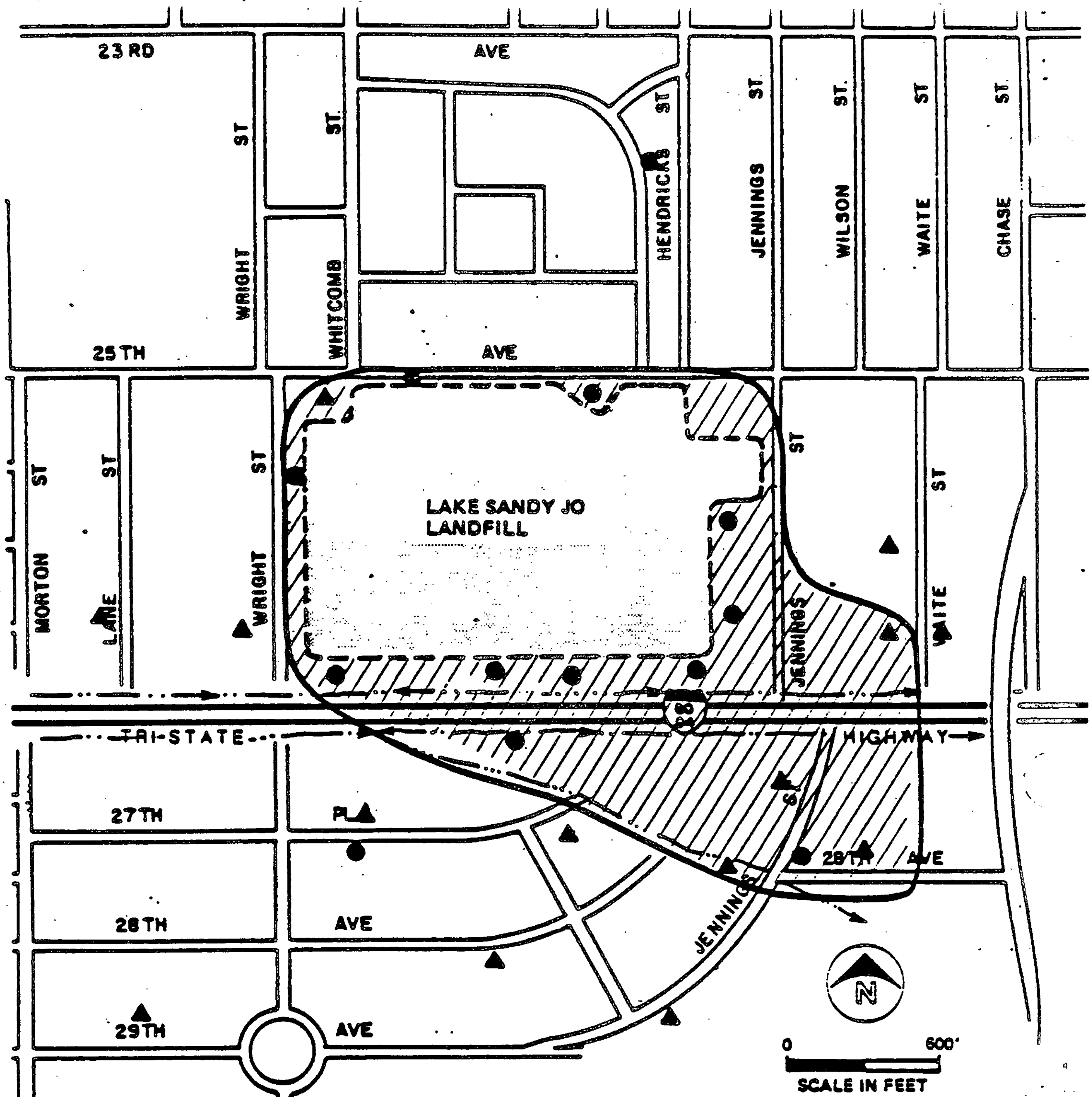


FIGURE 3
SITE GROUNDWATER
FLOW SYSTEM
LAKE SANDY JO FS



LEGEND

● APPROXIMATE LOCATION OF MONITORING WELL OR WELL PAIR IN CALUMET AQUIFER

▲ APPROXIMATE LOCATION OF SAMPLED RESIDENTIAL WELL IN CALUMET AQUIFER

— — APPROXIMATE LOCATION OF DRAINAGE DITCHES

////// AREA OF CALUMET AQUIFERS PRESENTLY AFFECTED BY CONTAMINANTS FROM LANDFILL. THE BOUNDARY ENCOMPASSES WELLS FROM WHICH SAMPLES WITH CONCENTRATIONS GREATER THAN BACKGROUND WERE OBTAINED.

FIGURE 4
EXTENT OF CONTAMINATION
GROUNDWATER
LAKE SANDY JO FS

SUMMARY OF SURFACE SOIL SAMPLING RESULTS
LAKE SANDY JO LANDFILL RI/FS

CONSTITUENT	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/kg)	RANGE OF VALUES DETECTED IN BACKGROUND SAMPLES (SS0034-035)
VOLATILE ORGANICS:			
1,1,2,2-tetrachloroethane	5/33	14 - 19	ND*
1,1-dichloroethene	3/33	ND - 31	ND
tetrachloroethene	5/33	9 - 24	ND
SEMI-VOLATILE ORGANICS:			
bis(2-ethylhexyl)phthalate	26/33	160 - 180,000	ND
butyl benzyl phthalate	18/33	220 - 180,000	ND
di-n-butyl phthalate	16/33	200 - 23,000	ND
di-n-octyl phthalate	7/33	240 - 47,000	ND
diethyl phthalate	3/33	10,000 - 72,000	ND
acenaphthene	6/33	64 - 13,000	ND
fluoranthene	23/33	260 - 160,000	ND - 18
naphthalene	2/33	36 - 97	ND
benzo(a)anthracene	23/33	140 - 89,000	ND
benzo(a)pyrene	22/33	140 - 78,000	ND
benzo(b)fluoranthene	25/33	130 - 140,000	ND
benzo(k)fluoranthene	19/33	120 - 120,000	ND
chrysene	20/33	120 - 83,000	ND
acenaphthene	6/33	180 - 1,300	ND
anthracene	12/33	34 - 12,000	ND
benzo(ghi)perylene	18/33	240 - 44,000	ND
fluorene	7/33	118 - 16,000	ND
phenanthrene	22/33	180 - 67,000	ND
dibenzo(ah)anthracene	9/33	88 - 20,000	ND
indeno(1,2,3-cd)perylene	16/33	200 - 37,000	ND
pyrene	23/33	280 - 170,000	ND
4-4'DDT	4/33	120 - 1,500	ND
4-4'DDE	6/33	40 - 440	ND
PCB-1254	12/33	210 - 4,600	ND
PCB-1260	2/33	6,100 - 9,700	ND
HEAVY METALS			
arsenic	19/28	2,700 - 83,000	ND
cadmium	23/25	2,800 - 74,000	ND
copper	34/35	7,900 - 5,420,000	4,100 - 4,800
chromium	22/25	2,600 - 362,000	3,000 - 3,300
lead	22/24	22,000 - 3,670,000	3,900 - 4,400
nickel	23/31	ND - 1,399,000	ND
zinc	31/31	16,000 - 20,352,000	16,000 - 25,000

*ND - Not Detected

Table 1 (page 2 of 4)
SUMMARY OF GROUNDWATER SAMPLING RESULTS
(CALUMET AQUIFER)
LAKE SANDY JO LANDFILL RI/FS

CONSTITUENT	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)	SAMPLES FROM WELLS NOT AFFECTED BY LANDFILL[a]: NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	SAMPLES FROM WELLS NOT AFFECTED BY LANDFILL[a]: RANGE OF DETECTIONS (ug/l)
Aluminum	17/56	[26] - 917	1/11	[52]
Arsenic	19/56	2 - 26	2/11	2 - 2.7
Barium	54/56	[17] - 557	11/11	33 - 276
Cadmium	3/56	2.4 - 5.1	0/11	-
Calcium	56/56	22,700 - 286,000	11/11	22,700 - 186,000
Chromium	6/56	10 - 14.6	0/11	-
Cobalt	2/44	[9.6] - 24	0/9	-
Copper	20/56	6.1 - 48.5	2/11	6.1 - 7.4
Iron	53/56	[77] - 24,800	11/11	323 - 12,400
Lead	10/56	1 - 12	2/11	1.8 - 2.3
Lithium	25/27	10 - 47	10/10	10 - 21.6
Magnesium	56/56	5,620 - 506,000	11/11	5,620 - 41,500
Manganese	55/56	38 - 1,704	11/11	95 - 651
Mercury	3/27	0.1 - 0.35	1/9	0.2
Nickel	12/56	[10] - 123	1/11	123
Potassium	38/56	2,370 - 75,700	5/11	2,570 - 8,600
Silver	1/44	8	0/9	-
Sodium	55/56	30,000 - 220,000	10/11	30,000 - 142,000
Strontium	27/27	109 - 866	10/10	181 - 597
Titanium	1/12	50.5	0/2	-
Vanadium	16/56	[5] - 44	0/11	-
Zinc	31/56	13 - 2,990	9/11	107 - 954
Cyanide	10/56	2.9 - 52	1/11	2.9
Benzene	6/56	2.5K - 23.5	0/11	-
Bromodichloromethane	1/56	5.4	0/11	-
2-Butanone	2/56	3K - 8.1K	0/11	-
Chlorodibromoethane	1/56	2.3	0/11	-
Chloroethane	1/56	8.3	0/11	-
Chloroform	1/56	6.4	0/11	-
2-Hexanone	1/56	3.8K	0/11	-
Styrene	1/56	1.0K	0/11	-
Toluene	2/56	1.3 - 3.0	1/11	3.0
Total Xylene	1/56	1K - 3.1K	0/11	-
Phenol	1/56	7.01	1/11	7.01
Benzyl Phthalate	10/56	4K - 16.7	0/11	-
Di-N-Butyl Phthalate	2/56	4.8K - 10	0/11	-
Di-N-Octyl Phthalate	5/56	6.4K - 6.7K	0/11	-
Isophorone	1/56	23	0/11	-
[illegible]	0/56	[illegible]	0/11	-

a - Wells MW021, MW003, MW017, MW022, MW023, MW024, MW025, MW027.

J - Indicates an estimated value.

SUMMARY OF SEDIMENT SAMPLING
LAKE SANDY JO LANDFILL RI/FS

CONSTITUENT	NO. OF POSITIVES/ NO. OF VALID DETECTIONS	RANGE OF DETECTIONS ug/kg	RANGE OF VALUES DETECTED IN BACKGROUND SAMPLES INFLUENCED BY THE HIGHWAY ug/kg	VALUES DETECTED IN BACKGROUND SAMPLES NOT INFLUENCED BY THE HIGHWAY ug/kg
VOLATILES				
1,1,1-trichloroethane	1/15	ND*-13	ND	Not Tested
ACID COMPOUNDS				
pentachlorophenol	1/15	ND-1600	ND	ND
BASE/NEUTRAL COMPOUNDS				
bis(2-ethylhexyl)phthalate	7/8	440 - 33,000	ND	ND
di-n-octyl phthalate	2/8	330 - 5,500	ND	ND
anthracene	10/15	68 - 2,600	ND	ND
pyrene	14/15	150 - 6,200	280 - 430	200
benzo(ghi)perylene	12/15	280 - 2,400	ND - 330	ND
indeno(1,2,3-cd)pyrene	11/15	240 - 2,500	ND	ND
benzo(b)fluoranthene	13/15	150 - 530	150 - 550	130
fluoranthene	9/15	210 - 8,700	260 - 530	210
benzo(k)fluoranthene	12/15	140 - 3,000	140 - 550	110
acenaphthylene	4/15	220 - 1,400	ND	ND
chrysene	14/15	140 - 5,800	200 - 360	140
benzo(a)pyrene	12/15	120 - 1,700	ND - 450	120
dibenzo(a,h)anthracene	4/15	330 - 1,200	ND	ND
benzo(a)anthracene	13/15	110 - 6,800	140 - 410	110
acenaphthene	4/15	220 - 2,100	ND	ND
diethyl phthalate	1/15	ND - 430	ND	ND
di-n-butyl phthalate	7/8	330 - 720	ND	ND
phenanthrene	11/15	270 - 3,400	ND - 400	ND
benzyl butyl phthalate	5/15	140 - 9,800	ND	ND
fluorene	4/15	260 - 3,600	ND	ND
naphthalene	7/15	56 - 1,200	ND - 400	ND
PESTICIDES				
PCB-1254	1/15	ND - 2,000	ND	ND
4,4'-DDT	1/15	ND - 1,100	ND	ND
4,4'-DDD	1/15	ND - 40	ND	ND
Endosulfan	1/15	ND - 10	ND	ND
ELEMENTS				
Aluminum	15/15	288,000 - 12,300,000	3,460,000 - 3,850,000	4,940,000
Barium	15/15	12,000 - 1,540,000	41,000 - 92,000	93,000
Beryllium	5/15	640 - 6,200	ND - 990	850
Cadmium	9/15	2,300 - 14,000	ND	ND
Chromium	15/15	8,200 - 81,000	8,600 - 25,000	20,000
Copper	15/15	17,000 - 187,000	21,000 - 59,000	50,000
Mercury	7/15	40 - 900	ND - 400	ND
Manganese	15/15	13,000 - 2,710,000	219,000 - 472,000	225,000
Nickel	15/15	5,500 - 42,000	5,500 - 12,000	23,000
Lead	14/15	48,000 - 526,000	120,000 - 526,000	162,000
Zinc	15/15	62,000 - 1,920,000	117,000 - 327,000	573,000
Arsenic[(a)]	4/7	14,000 - 102,000[(b)]	14,000	35,000

*ND = Not detected.
(a) Only analyzed for in Phase II.
(b) 102,000 mg/kg of arsenic was detected in one sample, but its field replicate was non-detectable for arsenic. The next highest arsenic detected was 69,000.

SUMMARY OF SURFACE WATER SAMPLING RESULTS
LAKE SANDY JO LANDFILL RI/FS

			BACKGROUND SAMPLES UPSTREAM OF LANDFILL			
			ADJACENT TO HIGHWAY (SW002 AND SW008)		AWAY FROM HIGHWAY (SW010)	
CONSTITUENT	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)
Aluminum	3/8	1,730 - 63,200	1/1	63,200	1/1	242
Antimony	1/8	ND* - 69	1/1	69	0/1	ND
Arsenic	3/8	11 - 378	1/1	378	0/1	ND
Barium	11/15	[60] - 1,860	1/2	1,860	1/1	[60]
Beryllium	2/8	[0.4] - 15	1/1	15	0/1	ND
Cadmium	2/8	[4.3] - 51	1/1	51	0/1	ND
Calcium	15/15	96,000 - 272,000	2/2	123,000 - 231,000	1/1	114,000
Chromium	7/8	[5.5] - 271	1/1	271	1/1	[5.8]
Cobalt	2/8	[10] - 122	1/1	122	0/1	ND
Copper	3/15	20 - 940	1/2	940	0/1	ND
Iron	15/15	120 - 366,000	2/2	170 - 366,000	1/1	23,000
Lead	7/8	12 - 9,980	1/1	9,980	1/1	13
Magnesium	15/15	30,000 - 451,000	2/2	34,000 - 70,800	1/1	33,800
Manganese	14/15	40 - 12,500	2/2	570 - 12,500	1/1	697
Mercury	3/8	[0.11] - 0.72	1/1	0.72	0/1	ND
Nickel	5/8	[10] - 176	1/1	176	0/1	ND
Potassium	15/15	5,840 - 74,300	2/2	8,000 - 9,080	1/1	5,840
Silver	1/8	ND - 25	1/1	25	0/1	ND
Sodium	15/15	19,400 - 230,000	2/2	19,400 - 66,000	1/1	32,600
Tin	1/15	ND - 60	0/2	ND	0/1	ND
Vanadium	7/8	4.5 - 350	1/1	350	1/1	[4.5]
Zinc	10/15	72 - 5,860	1/2	5,860	1/1	114
Cyanide	7/15	10 - 20	1/2	18	0/1	ND
Acetone	4/7	10J - 200	1/1	10J	0/0	Not Tested
Chloromethane	1/7	ND - 11	1/1	11	0/0	Not Tested

NOTE: [ ] Indicates an estimated value below contract required detection limits.
J Indicates that the compound was detected at levels too low to be quantified. The number is the quantification limit.
*ND = Not Detected.

- Surface Soil: Because of PAH's, the inhalation and ingestion risks exceed the 1×10^{-6} cancer risk level (one in a million) for onsite exposure. The inhalation risks due to PAH's for offsite exposure are less than 1×10^{-6}.

- Sediment: The ingestion risks, because of PAH's, exceed 1×10^{-6}.

- Groundwater: None of the residential wells sampled contained benzene; however, benzene was found in some of the monitoring wells exceeding 1×10^{-6}. Therefore, shallow aquifer groundwater may pose a cancer risk due to the presence of benzene in the future.

ENFORCEMENT (See Attachment 1)

ALTERNATIVES EVALUATION

Applicable general response actions and technologies addressing problems at the Lake Sandy Jo Landfill site were identified. Public health and environmental objectives include:

- Prevention of inhalation, absorption or ingestion of surface soils and sediments.

- Prevention of ingestion of contaminated drinking water from existing and future releases to the Calumet aquifer.

- Prevention of future releases of sediments to the east-west and southeast drainage ditches from onsite surface soil erosion.

Remedial technologies were screened according to applicability to site conditions and the contaminants of concern at the site and the ability of the technology to adequately protect human health and the environment. The technologies were assessed on the basis of technical feasibility, including an assessment of performance, reliability, implementabililty, and safety with respect to site-specific physical and waste characteristics. Both source control and offsite (management of migration) technologies were considered. The following technologies are considered applicable to site conditions and problems:

- Soil/Sediment

  Soil Cover

  Multimedia Cap

  Landfill

  Incineration

- Ground Water/Surface Water

  Vertical barrier

  Treatment (onsite)

  - Precipitation
  - Air stripping
  - Filtration
  - Granular activated carbon
  - Biological

  Treatment (off-site)

  - POTW
  - RCRA facility

  Collection

  - Extraction wells
  - Subsurface drains

  Alternate Water Supply

  - Water distribution system
  - Deeper bedrock wells

Onsite landfilling and incineration were eliminated because of excessive cost, $460 million and $2 billion plus dollars respectively. Pipe and media drains were eliminated because they were significantly more difficult and costly to install than the extraction wells. Biological treatment was eliminated because of the low biological oxygen demand (BOD) values currently in the groundwater. Bedrock wells were eliminated because of difficulties in drilling productive wells.

Remedial action alternatives were developed from the technologies which survived the screening process taking into consideration the magnitude and extent of contamination, the waste characteristics, and the physical conditions of the site. The technical feasibility of each alternative was evaluated based upon performance, reliability, implementability and safety. The capital costs, annual operation and maintenance (O&M) costs, and present worth costs were estimated for each of the alternatives. The expected accuracies for cost estimates are within +50 and -30 percent of the actual cost. The individual alternatives were then evaluated for compliance with federal and state environmental laws and regulations, protection of human health and effects on institutional parameters. This detailed analysis of a limited number of alternatives is consistent with Section 300.68 (i) of the NCP.

DETAILED DESCRIPTION/EVALUATION OF ALTERNATIVES

A comparative evaluation and description of the alternatives is presented below and summarized in Table 2.

ALTERNATIVE 1--NO ACTION

The No Action alternative is required by the NCP to be carried forward. It provides a baseline for comparison of other alternatives.

ALTERNATIVE 2--ACCESS RESTRICTIONS--WITH SOIL COVER

Alternatives 2 includes deed restrictions, ground water and surface water monitoring, a soil cover over the landfill, and onsite sediment disposal.

All operable unit goals are addressed in this alternative. It is intended to be representative of a low-cost alternative that offers a minimally acceptable level of protection to public health and environment from known existing site hazards. Under this alternative, future remedial actions would likely be necessary if monitoring detected future offsite migration of hazardous levels of contaminants into the environment.

ALTERNATIVE 3--ALTERNATE WATER SUPPLY--WITH SOIL COVER AND ACCESS RESTRICTIONS

Alternative 3 adds a municipal water supply for area residents to the components of Alternative 2. The existing public water system would be extended to include residences potentially affected by ground water contaminant migration in the future. This provides additional protection of public health from ingestion, inhalation, or absorption of possible future ground water contaminants relative to Alternative 2. Ground water monitoring would be essential to detect offsite contaminant migration. A drainage blanket would be placed along the southern boundary of the site beneath the soil cover to control surface seeps and protect the integrity of the soil cover. Treatment of the seeps will not be necessary because the seeps are not presently contaminated. The drainage blanket would be approximately 2 feet thick and would consist of clean stone or gravel similar to a french tile drain. Perforated drainage pipes would extend along the periphery of the blanket and would be sloped to allow drainage to the east-west and southeast drainage ditches. The drainage would be enveloped in filter fabric to minimize the movement of soil patches into the stone and drainage pipes.

OVERVIEW OF ALTERNATIVES 4A, 4B, 5A, 5B, and 6

Ground water collection is a component of Alternatives 4A, 4B, 5A, 5B, and 6. Three ground water treatment technologies survived screening and could be incorporated into these alternatives. They are:

- o Onsite treatment consisting of precipitation, filtration, and activated carbon adsorption
- o Offsite treatment at the Gary Publicly Owned Treatment Work (POTW)
- o Offsite treatment at a Resource Conservation and Recovery Act (RCRA) facility

ALTERNATIVE 4A--GRADIENT CONTROL/TREATMENT--WITH SOIL COVER

Instead of the water supply provision in Alternative 3, this alternative prevents future offsite migration of ground water through ground water collection with extraction wells and ground water treatment (onsite treatment or treatment at a POTW). This alternative addresses the sediment and ground water operable unit goals of providing adequate protection of the public health and environment by eliminating offsite migration of ground water contaminants, and by consolidating contaminanted sediments onsite. Contaminated soil and ground water beneath the site, however, would remain, thus requiring enforcement of deed restrictions for an indefinite period (the period of natural attenuation of contaminants). As with previous alternatives, the soil cover as well as deed restrictions address the soil operable unit goals.

ALTERNATIVE 4B--GRADIENT CONTROL/TREATMENT--WITH MULTILAYER CAP

Alternative 4B is identical to Alternative 4A with the exception of the multilayer cap replacing the soil cover. This alternative is intended to provide a greater level of protection by reducing contaminant migration to the ground water through reductions in percolation through the surface while also meeting technical requirements of landfill capping for hazardous site closure under RCRA.

ALTERNATIVE 5A--GROUND WATER EXCLUSION/TREATMENT--WITH SOIL COVER AND SLURRY WALL

Alternative 5A increases the reliability of preventing offsite ground water contaminant migration through use of a slurry wall in conjuncton with extraction wells. Other than this, the level of protection of the public health and environment in all operable units intended for this alternative is similar to Alternative 4A. Some ground water collection within the slurry wall is necessary and would be treated either onsite, offsite at the Gary POTW, or offsite at a RCRA facility. Alternative 5A will result in a much lower treatment flowrate with resulting lower operating and capital cost than Alternative 4A. However, this alternative will incur greater capital cost as the result of the slurry wall.

ALTERNATIVE 5B--GROUND WATER EXCLUSION/TREATMENT--WITH MULTILAYER CAP AND SLURRY WALL

Alternative 5B is identical to Alternative 5A with the exception of the multilayer cap replacing the soil cover. This alternative provides a greater level of protection than 5A by reducing contaminant migration to the ground water through reduction in surface water infiltration while also meeting technical requirements of landfill capping for hazardous site closure under RCRA.

ALTERNATIVE 6--LANDFILL DEWATERING--WITH MULTILAYER CAP AND SLURRY WALL

Alternative 6 is intended to provide a similar level of protection of public health and the environment as Alternatives 4 and 5. In this alternative the landfill is dewatered by perimeter wells. When the landfill is dewatered, the ground water pumpage from within the slurry wall containment would not require treatment. During dewatering, ground water would be treated either in an onsite treatment system or offsite at the Gary POTW. The dewatering would result in lower annual operational costs, although in the long term the lack of contaminant purging (as occurs in Alternative 4 and 5) from the landfill contents will require the system to be in place for a longer period. Because the wastes are isolated from ground water there is only very gradual attenuation of contaminants out of the landfill.

ASSESSMENT OF ALTERNATIVES

ALTERNATIVE 1--NO ACTION

The no action alternative is ineffective for preventing further contaminant migration, does not mitigate the existing contamination at the site, and does not reduce current or future public health risks. The risk assessment concludes that there is a potential for exposure of the public to contaminants at the site at levels that may adversely affect health and welfare. If no action is taken, ground water will continue to enter the site and be discharged as contaminated surface water and ground water. Contaminated soil and sediments will remain as a threat to direct exposure. Remedial action is therefore required to reduce or minimize this exposure. The no action assembled alternative is not appropriate and is eliminated for further consideration.

ALTERNATIVE 2--ACCESS RESTRICTIONS--WITH SOIL COVER

This alternative includes: deed restrictions; soil cover; ground water, surface water, and sediment monitoring; and onsite sediment disposal. Alternative 2 would eliminate exposure to surface soil and sediments and prevents the generation of contaminated surface runoff. This alternative relies on monitoring to detect increases in contaminant levels or types is

SUMMARY OF DETAILED ANALYSIS OF ALTERNATIVES

Technical Evaluation Criteria	Alternative 1 No Action	Alternative 2 Access Restrictions-With Soil Cover	Alternative 3 Alternate Water Supply-With Soil Cover and Access Restrictions	Alternative 4A Gradient Control--With Soil Cover
TECHNICAL EVALUATION	Potential health risks exist for lifetime exposures to onsite contaminated soil, offsite sediment, and onsite groundwater. Potential also exists for increasing contaminant levels in groundwater that would migrate to surface waters or residential well users. This could result in public health and environmental risks in excess of those calculated based on existing contaminant levels. Potential risks from lifetime exposure to sediment is unmitigated.	Given proper implementation and maintenance activities, is effective in preventing potential risks to public health or the environment if contaminant levels do not increase in the groundwater. Reliability of deed restrictions to prevent exposure to onsite subsurface soil or groundwater over indefinite period of natural contaminant degradation of alternative is not known. Potential exists for development of site by future generations with resulting exposures. Reliance on surface water, sediment, and groundwater monitoring to detect increases in contaminant levels or types potentially posing risks to public health is not considered reliable because of relatively short pathways to receptors. Sufficient time to implement mitigative measures, such as an alternate water supply, may not be available, once action is required.	Given proper implementation and maintenance activities, is effective in preventing potential risks to public health or the environment if contaminant levels do not increase in the groundwater. If groundwater contaminant types or levels increase in future, the public health remains protected because of the elimination of the groundwater exposure route. Reliability of deed restrictions to prevent exposure to onsite subsurface soil or groundwater over indefinite period of natural contaminant degradation or alternative is not known. Potential exists for development of site by future generations with resulting exposures. Surface water and groundwater monitoring remains important to detect increases in contaminant types or levels potentially posing a hazard to the environment. Since large increases in contaminated levels would be necessary before aquatic life was harmed in the Little Calumet River, the reliability of monitoring is considered good. Mitigative measures, such as onsite treatment, could be implemented before impacts occur.	Given proper implementation, operation and maintenance activities, are effective in preventing potential risks to public health or the environment. Reliability of deed restrictions to prevent exposure to onsite subsurface soil or groundwater over indefinite period of natural contaminant degradation of alternative is not known. Potential exists for development of site by future generations with resulting exposures. Reliability of gradient control system is good. It is a proven system with flexibility to adjust flowrates or add additional wells. Monitoring is critical to proper operation of system, although failure of gradient control system would likely be detected before significant risks to public health or environment occur. Lax monitoring over the indefinite operational period could result in risks to public health or environment from the groundwater migration pathways. Regular maintenance and replacement is also required to ensure alternative reliability.
PUBLIC HEALTH, WELFARE, AND ENVIRONMENTAL EVALUATION	Does not reduce public health or environmental risks from the site. Potential health risks could result from exposure to contaminated onsite soil (PAH's and metals), exposure to contaminated offsite sediments (PAH's), and potential release of contaminants in the fill to the groundwater and migration to points of groundwater use. Potential loss of groundwater natural resource. Future releases could impact wetlands.	Sediment consolidation and soil cover eliminates risks from soil and sediment. Does not prevent release and migration of contaminants through groundwater and potential exposure of receptors. Potential environmental exposures not mitigated.	Sediment consolidation and soil cover eliminates risks from soil and sediment. Alternative water supply prevents potential exposure to contaminants in groundwater. Potential environmental exposures not mitigated.	Sediment consolidation and soil cover eliminates risks from soil and sediment. Groundwater management reduces contact of groundwater with fill. Contaminated groundwater would be captured, preventing release and offsite exposures of human and environmental receptors. Minor short-term construction impacts.

Technical Evaluation Criteria	Alternative 4B Gradient Control-With Multilayer Cap	Alternative 5A Groundwater Exclusion-With Soil Cover and Slurry Wall	Alternative 5B Groundwater Exclusion-With Multilayer Cap and Slurry Wall	Alternative 6 Landfill Dewatering-With Multilayer Cap and Slurry Wall
TECHNICAL EVALUATION	Given proper implementation, operation, and maintenance activities, is effective in preventing potential risks to public health or the environment. Reliability of deed restrictions to prevent exposure to onsite subsurface soil or groundwater over indefinite period of natural contaminant degradation or alternative is not known. Potential exists for development of site by future generations with resulting exposures. Reliability of gradient control system is good. It is a proven system with flexibility to adjust flowrates or add additional wells. Monitoring is critical to proper operation of system, although failure of gradient control system would likely be detected before significant risks to public health or environment occur. Lax operational period could result in risks to public health or environment from the groundwater migration pathways. Multilayer cap does not add appreciably to protection of public health or environment relative to soil cover because leachate generation in unsaturated zone would contribute a minor proportion of contaminated groundwater. Reliability of cap is affected by potential landfill settlement.	Given proper implementation, operation, and maintenance activities, is effective in preventing potential risks to public health or the environment. Reliability of deed restrictions to prevent exposure to onsite subsurface soil or groundwater over indefinite period of natural contaminant degradation or alternative is not known. Potential exists for development of site by future generations with resulting exposures. Reliability of this alternative in preventing offsite groundwater migration is greater than Alternatives 4A and 4B because of the presence of the slurry wall. Monitoring is not as critical because longer travel times for contaminants to migrate through slurry wall preclude sudden failure. Regular maintenance and replacement schedule must be adhered to in order to assure reliable operation. Failure of any component would not likely result in endangerment to public health or environment because sufficient time for corrections would be available following failure detection.	Given proper implementation, operation, and maintenance activities, is effective in preventing potential risks to public health or the environment. Reliability of deed restrictions to prevent exposure to onsite subsurface soil or groundwater over indefinite period of natural contaminant degradation or alternative is not known. Potential exists for development of site by future generations with resulting exposures. Reliability of this alternative in preventing offsite groundwater migration is greater than Alternatives 4A and 4B because of the presence of the slurry wall. Monitoring is not as critical because longer travel times for contaminants to migrate through slurry wall preclude sudden failure. Regular maintenance and replacement schedule must be adhered to in order to assure reliable operation. Failure of any component would not likely result in endangerment to public health or environment because sufficient time for corrections would be available following failure detection. Multilayer cap does not add appreciably to protection of public health or environment relative to soil cover because leachate generation in unsaturated zone would contribute a minor proportion of contaminated groundwater. Reliability of cap is affected by potential landfill settlement.	Given proper implementation, operation, and maintenance activities, is effective in preventing potential risks to public health or the environment. Reliability of deed restrictions to prevent exposure to onsite subsurface soil or groundwater over indefinite period of natural contaminant degradation or alternative is not known. Potential exists for development of site by future generations with resulting exposures. Alternative 6 has the greatest reliability in preventing offsite groundwater migration, because this alternative would produce a clean discharge after dewatering of the landfill. Migration of contaminated groundwater could occur only if system components failed and the failure went undetected for a long time period. Discharge of untreated groundwater during Phase 2 (after dewatering) requires close monitoring. Regular maintenance and replacement schedule must be adhered to in order to assure reliable operation.
PUBLIC HEALTH, WELFARE, AND ENVIRONMENTAL EVALUATION	Sediment consolidation and cap eliminates risks from soil and sediment. Groundwater management reduces contact of groundwater with fill. Contaminated groundwater would be captured, preventing release and offsite exposure of human and environmental receptors. Minor short-term construction impacts.	Sediment consolidation and soil cover eliminates risks from soil and sediment. Groundwater management reduces contact of groundwater with fill. Contaminated groundwater would be captured, preventing release and offsite exposure of human and environmental receptors. Minor short-term construction impacts.	Sediment consolidation and cap eliminates risk from soil and sediment. Groundwater management eliminates contact of groundwater with fill. Contaminated groundwater would be captured, preventing release and offsite exposure of human and environmental receptors. Minor short-term construction impacts.	Sediment consolidation and cap eliminates risk from soil and sediment. Groundwater management eliminates contact of groundwater with fill. Contaminated groundwater would be captured, preventing release and offsite exposure of human and environmental receptors. Minor short-term construction impacts.

Technical Evaluation Criteria	Alternative 1 No Action	Alternative 2 Access Restrictions-With Soil Cover	Alternative 3 Alternate Water Supply-With Soil Cover and Access Restrictions	Alternative 4A Gradient Control--With Soil Cover
INSTITUTIONAL EVALUATION	Does not meet EPA's groundwater protection policy goals. Does not achieve goal of CERCLA to protect human health, welfare, and the environment.	Does not comply with RCRA closure requirements. Institutional controls may require zoning and deed changes. May be difficult to achieve. Does not meet groundwater protection goals.	Does not comply with RCRA closure requirements. Institutional controls may require zoning and deed changes. May be difficult to achieve. Does not meet groundwater protection goals. Meets CERCLA goals.	Does not comply with RCRA closure requirements. Institutional controls may require zoning and deed changes. May be difficult to achieve. Meets EPA groundwater protection policy and CERCLA goals.
COST EVALUATION				
Capital		$2,600,000	$4,200,000	$3,200,000
Operation and Maintenance Present Worth		$ 800,000	$ 800,000	$ 700,000
Total Present Worth		$3,400,000	$5,000,000	$3,900,000
COSTS INCLUDING GROUNDWATER TREATMENT				
Onsite Treatment				
Capital		N/A	N/A	$4,500,000
Operation and Maintenance Present Worth				$4,400,000
Total Present Worth				$8,900,000
POTW Treatment				
Capital		N/A	N/A	$3,400,000
Operation and Maintenance Present Worth				$3,200,000
Total Present Worth				$6,600,000

Technical Evaluation Criteria	Alternative 4B Gradient Control-With Multilayer Cap	Alternative 5A Groundwater Exclusion-With Soil Cover and Slurry Wall	Alternative 5B Groundwater Exclusion-With Multilayer Cap and Slurry Wall	Alternative 6 Landfill Dewatering-With Multilayer Cap and Slurry Wall
INSTITUTIONAL EVALUATION	Meets EPA groundwater protection policy and CERCLA goals. Institutional controls may require zoning and deed changes. May be difficult to achieve.	Does not comply with RCRA closure requirements. Meets EPA groundwater protection policy and CERCLA goals. Institutional controls may require zoning and deed changes. May be difficult to achieve.	Meets EPA groundwater protection policy and CERCLA goals. Institutional controls may require zoning and deed changes. May be difficult to achieve.	Meets EPA groundwater protection policy and CERCLA goals. Institutional controls may require zoning and deed changes. May be difficult to achieve.
COST EVALUATION				
Capital	$11,000,000	$7,500,000	$15,500,000	$15,700,000
Operation and Maintenance Present Worth	$ 800,000	$ 600,000	$ 700,000	$ 700,000
Total Present Worth	$11,800,000	$8,100,000	$16,200,000	$16,400,000
COSTS INCLUDING GROUNDWATER TREATMENT				
Onsite Treatment				
Capital	$12,300,000	$7,900,000	$15,700,000	$16,400,000
Operation and Maintenance Present Worth	$ 4,500,000	$1,300,000	$ 1,100,000	$ 1,900,000
Total Present Worth	$16,800,000	$9,200,000	$16,800,000	$18,300,000
POTW Treatment				
Capital	$11,200,000	$7,600,000	$15,600,000	$15,900,000
Operation and Maintenance Present Worth	$ 3,300,000	$ 800,000	$ 700,000	$ 1,200,000
Total Present Worth	$14,500,000	$8,400,000	$16,300,000	$17,100,000
RCRA Treatment				
Capital	N/A	$ 7,700,000	$15,700,000	N/A
Operation and Maintenance Present Worth		$27,800,000	$ 1,900,000	
Total Present Worth		$35,500,000	$17,600,000	

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not considered reliable because of the short travel time between the site and residential wells. The present worth of Alternative 2 is $4,130,000. Because it does nothing to mitigate the risks associated with ground water, this alternative was also eliminated.

ALTERNATIVE 3--ALTERNATE WATER SUPPLY--WITH SOIL COVER AND ACCESS RESTRICTIONS

Alternative 3 includes the same components as Alternative 2. In addition, the Gary Hobart water distribution system would be extended to provide residents with potentially affected wells in the Lake Sandy Jo area with an alternate water supply. Therefore, in addition to eliminating exposure to surface soil and sediments, and to preventing the generation of contaminated surface runoff, Alternative 3 would eliminate the risks associated with the future ingestion of or residential contact with contaminated ground water. Thus, all public health threats would be addressed. Periodic monitoring would detect off-site contaminant migration and would trigger remedial actions as needed. However, with respect to the environment, the upper aquifer and surface water receptors could possibly receive some future migrating contaminants before any remedial action could be implemented. Alternative 3 has a present worth of $5,690,000 and it would not require ground water treatment and its associated additional costs. Alternative 3 addressed all public health concerns and thus will be carried forward.

ALTERNATIVE 4A--GRADIENT CONTROL WITH SOIL COVER, AND 4B GRADIENT CONTROL WITH MULTILAYER CAP

Alternative 4A and 4B each contain the deed restictions, monitoring, and sediment disposal components described for Alternative 2. In addition, both have a ground water gradient control component consisting of 10 ground water extraction wells installed around the site perimeter. They differ only in cap type. Alternative 4A has a soil cover while Alternative 4B has a multilayer (impermeable) cap. Both alternatives would address the exposure risks to public health and the environment. Because of the gradient control component, all offsite migration is eliminated and the upper aquifer and surface water receptors are protected from future releases. The multilayer cap in Alternative 4B will reduce the amount of infiltration through the top of the landfill but it will not reduce the amount of water to be collected by the extraction wells. Alternative 4B does not offer any additional environmental protection over Alternative 4A, yet it has substantially higher costs. Alternative 4B has a present worth of $12,530,000 while 4A would cost $4,670,000.

The cost for ground water treatment would be added to each alternative ($2,580,000 for POTW treatment or $4,900,000 for onsite treatment). Alternative 4B will not be carried forward because it has a higher present worth but does not offer additional environment protection.

ALTERNATIVE 5A--GROUND WATER EXCLUSION WITH SOIL COVER AND SLURRY WALL--AND 5B--GROUND WATER EXCLUSION WITH MULTI-LAYER CAP AND SLURRY WALL

Alternative 5A and 5B each contain deed restrictions, monitoring, and sediment disposal components as described for Alternative 2. In addition, both have a ground water exclusion component consisting of a slurry wall around the entire site perimeter and two ground water extraction wells inside of the slurry wall. As with Alternative 4, these alternatives differ only in the cap type, with a soil cover and a multi-layer cap being used by Alternative 5A and 5B, respectively. The slurry wall minimizes ground water infiltration and the extraction wells collect the small amount of water that does infiltrate. Both alternatives address all of the public health and environmental exposure risks. Without ground water treatment, the present worth of each is $9,430,000 and $17,520,000 for Alternatives 5A and 5B, respectively. Alternative 5B significantly reduces the total infiltration because of the impermeable cap. This does not result in any additional environmental protection but has a much higher cost. Both Alternatives 5A and 5B are not carried forward because both are substantially more costly than Alternative 4A with no additional reduction in risk to public health or the environment.

ALTERNATIVE 6--LANDFILL DEWATERING WITH MULTI-LAYER CAP AND SLURRY WALL

Alternative 6 has the same components as Alternative 5B with the exception that the ground water extraction system consists of 60 ejector wells installed within the slurry wall around the perimeter instead of two collection wells. This ground water collection system is intended to dewater the landfill in 2 to 3 years. After this point, the collected ground water should not require treatment. Alternative 6 addresses all identified exposure risks to public health and the environment. In addition, it requires a much shorter period of time for ground water treatment. However, its cost of $17,780,000 (present worth) excluding ground water treatment is substantially higher than Alternative 4A, which offers the same environmental protection. Accordingly, Alternative 6 will not be carried forward.

PREFERRED ALTERNATIVES

The two alternatives that remain for final comparison are:

- Alternative 3--Alternative Water Supply with Soil Cover and Access Restrictions. This alternative has deed restrictions and institutional controls, ground water, surface water, and sediment monitoring; onsite sediment disposal; and an alternate water supply or residences with potentially affected wells. Present worth: $5,690,000, Annual O&M: $63,000/yr.

- Alternative 4A--Gradient Control with Soil Cover. This alternative has deed restrictions, surface water and groundwater monitoring, onsite sediment disposal, and a groundwater gradient control system. Without groundwater treatment, this alternative has a present worth of $4,670,000 and an annual O&M of $73,000/yr. Groundwater treatment would increase the cost to a present worth of $7,210,000 and annual O&M to $339,000/yr.

Both alternatives offer the same protection for the identified public health risks of ingestion and inhalation of contaminated surface soils and sediments; and possible ingestion of contaminated drinking water. Alternative 4A offers greater protection from the future environmental risks because it prevents migration of leachate into the upper aquifer and surface water. However, based on contaminant levels found at the site and background contaminant levels of the ground water and surface water, Lake Sandy Jo has only a minor impact on the environment. The major site contaminants, PAH's and heavy metals, are relatively immobile in water and will be prevented from recontaminating the sediments by the soil cover.

Any off-site contaminant migration would be detected by the monitoring system and addressed through subsequent remedial action if needed under Alternative 3. Alternative 4A requires ground water collection and treatment for operational periods in excess of 100 years. Accordingly, it has a substantially higher annual O&M cost and total present worth. Since Alternative 3 offers equal protection of public health and adequate protection of the environment at a significantly lower cost, it is selected as the preferred alternative.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

The Lake Sandy Jo Landfill has as its regulatory focus the Resource Conservation and Recovery Act (RCRA). RCRA has very stringent standards for closure of a hazardous waste landfill under Subtitle C, and considerably more flexibility for closure as a Solid Waste facility under Subtitle D. The Feasibility Study reviewed a range of alternatives which were less than, equal to and more compliant with both Subtitle sections of RCRA.

The results of the Remedial Investigation support that Lake Sandy Jo was used primarily for construction and demolition debris. This Record of Decision, therefore, recommends closure of Lake Sandy Jo under Subtitle D of RCRA, which covers solid waste management. The closure plans would meet the technical standards set by the State of Indiana.

The proposed clean-up standards under the new CERCLA require that all sites with remedial actions leaving contamination in place be re-evaluated every five years. However, should a release occur at LSJ within this 5-year period, CERCLA emergency actions would be instituted. The responsibility for determining whether a release poses a substantial threat to the environment would rest with the State of Indiana. Should ground water collection and treatment become warranted for Lake Sandy Jo, then Alternative 4A will be re-evaluated.

DETAILED DESCRIPTION OF SELECTED ALTERNATIVE

The major components of Alternative 3 are:

- o Deed Restrictions/Institutional Controls
- o Soil Cover With Drainage Blanket
- o Ground Water and Surface Water/Sediment Monitoring
- o Onsite Sediment Disposal
- o Municipal Water Supply

DEED RESTRICTIONS

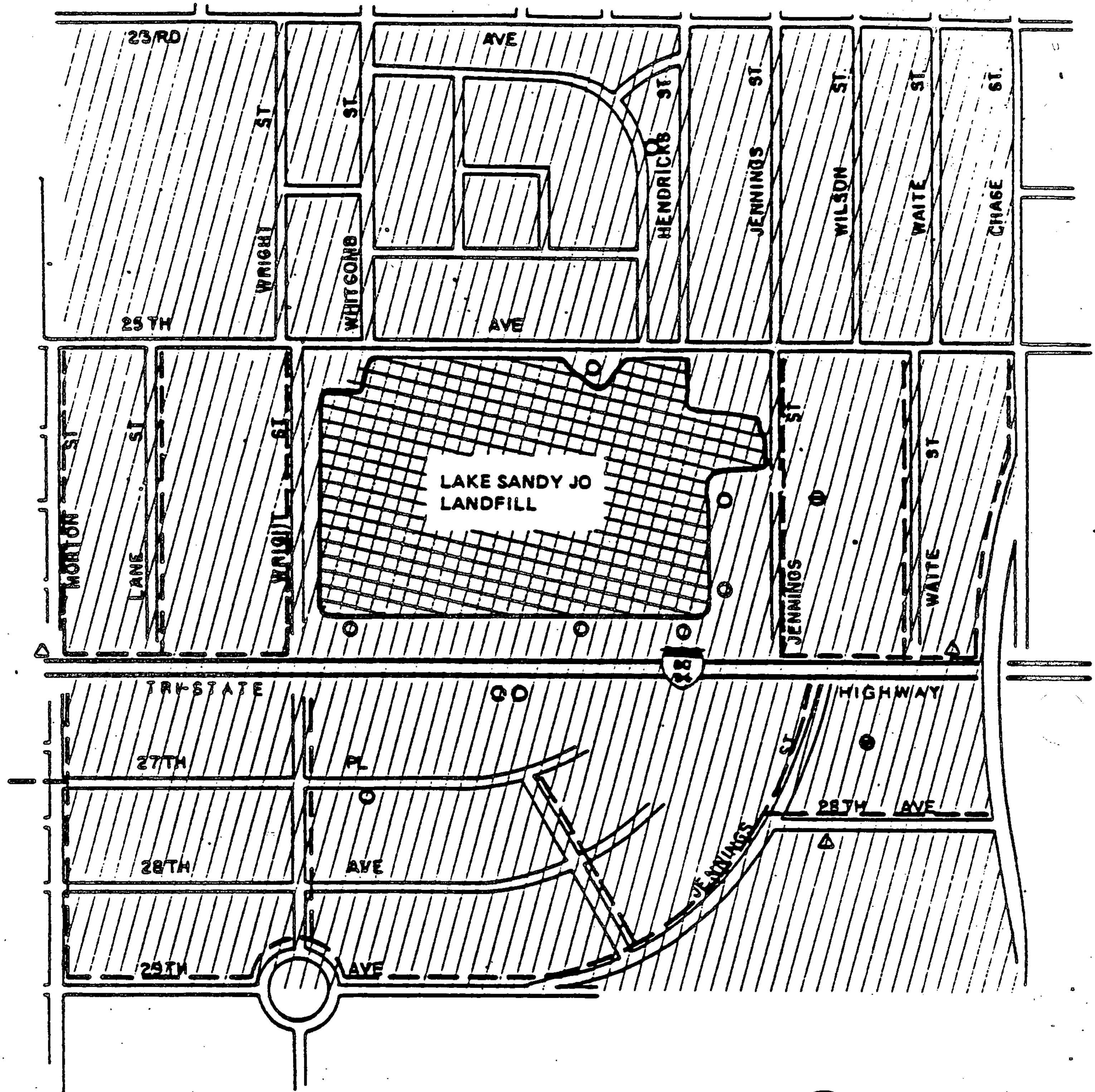
Deed restrictions would be placed on the landfill property. The restrictions would attempt to prevent future development of the land to protect against direct contact with contaminants or further migration of contaminants that would result from site excavation. Institutional controls would prohibit use of ground water or installation of shallow wells onsite and in the area provided municipal water and an area north of the landfill (Figure 5). Access to the landfill site would be controlled by fencing around the site perimeter.

SOIL COVER

A soil cover would be installed over the landfill to prevent direct contact with surface contaminants and prevent their erosion to the ditches offsite. The cover would increase evapotranspiration and prevent water ponding onsite. Prior to placing the cover, the site would be graded to fill existing depressions, eliminate sharp grade changes, and provide for site drainage. A 2-foot soil cover consisting of locally available loam would be placed over the site. The site would be seeded with grass to prevent erosion and increase evapotranspiration. As described on page 4, a drainage blanket would be placed along the southern boundary of the site beneath the soil cover to control surface seeps and protect the integrity of the soil cover.

GROUND WATER AND SURFACE WATER/SEDIMENT MONITORING

Contaminant migration would be assessed through a regular ground water and surface water/sediment monitoring program. The ground water monitoring program would consist of quarterly samplings of six existing monitoring wells (including one upgradient location) and semiannual sampling of two



LEGEND

WATER MAIN

APPROXIMATE AREA OF DEED RESTRICTIONS

MONITORING WELL SAMPLING LOCATION

MONITORING WELL SAMPLING LOCATION, NEW WELL INSTALLED

SURFACE WATER AND SEDIMENT SAMPLING LOCATION

AREA OF SOIL COVER

N

0 600

SCALE IN FEET

FIGURE 5
ALTERNATIVE 3
WATER SUPPLY – WITH SOIL COVER AND ACCESS RESTRICTIONS
LAKE SANDY JO FS

new monitoring wells to be installed east and southeast of the site. Samples would be analyzed for VOC's, base/neutrals, and inorganics. Water levels of monitoring wells would be taken at the time of sampling and gradients would be calculated and compared to existing data. Surface water and sediment would be sampled at four locations (including one background location) on a semi-annual basis. Samples would be analyzed for base/neutral organics and inorganics.

ONSITE SEDIMENT DISPOSAL

Sediment with contaminants above the 10^{-6} cancer risk level would be excavated, dewatered and disposed of onsite beneath the soil cover. The total estimated volume of contaminated sediment in the east-west ditch, the southeast ditch, and the marshy area near the southeast site corner is 2,500 cubic yards. Ditch excavation volumes were estimated based on an excavation cross section of 1 foot in depth and 3 to 4 feet in width. Marsh areas were assumed to require excavation to 1 foot in depth.

Prior to excavation, additional sediment samples should be taken to fully delineate the area of excavation. Samples will be analyzed for PAH's and inorganics. Before excavation the areas would be dewatered by rerouting ditch flows or by pumping, with discharged to uncontaminated ditch reaches. It is not expected that dewatering liquid will require treatment. If analysis of samples shows hazardous contaminant levels, treatment using one of the groundwater treatment systems could be implemented.

The excavated sediment may require dewatering prior to disposal onsite in the central area of the landfill. Dewatering with a filter press was assumed to be necessary. The sediment would be spread onsite to conform to the drainage contours required for the soil cover. The excavated marshy area would be backfilled with locally obtained soil and revegetated.

ALTERNATIVE WATER SUPPLY

The Gary-Hobart water distribution system would be extended from the existing mains along West 25th Avenue (north of the site) and along Clark Street (south and west of the site). Connections to the existing water main on West 25th Avenue could be at Morton and Jennings Streets. New water mains would be extended across West 25th Avenue to serve the area north of the Tri-State Highway between Morton and Chase Street. Another connection to the Gary-Hobart water system would be made at Clark Street and 29th Avenue. New water mains would be extended to serve the area north of 29th Avenue between Morton Street and Chase Street on the south side of the Tri-State Highway.

Approximately 22,400 ft of 6-inch and 8-inch-diameter wate mains would be required. Approximately 75 residences would be given the opportunity to connect to the water distribution system. The existing wells would be disconnected and properly abandoned. Figure 4 shows the area around Lake Sandy Jo which would require connection to municipal water.

Operation and maintenance of the distribution system would be performed by the Gary-Hobart water system and is reflected in the unit cost for water usage.

OPERATION AND MAINTENANCE

Each alternative was evaluated for present worth and O&M costs as shown in Table 3. The O&M costs were estimated on an annual basis over 30 years. The O&M for the recommended alternative will require a vigorous ground water, surface water and sediment monitoring program for an indefinite period of time. The cost of O&M is estimated to be $63,000 annually for the monitoring and associated activities.

Maintenance would be required for the soil cover. Maintenance of the soil cap would be required because of landfill settling. It is estimated that every 10 years the site would require regrading, replacement of 30 percent of the original soil cover volume, and reseeding of the entire soil cover. The perforated pipes in the drainage blanket would be flushed of accumulated sediment at the time of regrading.

STATE ASSURANCE/CONCURRENCE

The State of Indiana concurs with the recommended alternative and will assume responsibility for long term O&M. The U.S. EPA will enter into a State Superfund Contract (SSC) to formalize the 10% match before the start of construction. A Cooperative Agreement (CA) for O&M will be formalized before completion of construction.

COMMUNITY RELATIONS

There have been three public meetings during the RI/FS at Lake Sandy Jo. The first meeting was an RI/FS kick-off with approximately 20 people in attendance. The second meeting was held to announce the results of Phase I and plans for the Phase II RI. This meeting was well attended by 40 people. Additionally, results of residential well samples were discussed individually with residents by technical and community relations staff of Region V. During these visits we learned that the shallow well water quality was perceived by the residents as being poor. One resident stated the water has been poor for over 30 years. Most residents did not use the water for drinking, but used bottled water instead. There was favorable reaction from the community when the security fence was erected around Lake Sandy Jo in April 1986.

The public meeting held August 30, 1986 was to discuss the alternatives for Lake Sandy Jo and to receive public comments on the recommended alternative. There were over 50 people in attendance. No interest was expressed for Alternatives 4, 5 and 6. Instead, the main concern of the community was where water mains would be placed, and which homes could be hooked up under Alternative 3. Most of the community south of Lake Sandy Jo has never contained water mains. People outside of the designated affected area and buffer zone also wanted to be hooked up because their well water was of poor quality.

SCHEDULE (dependent upon reauthorization)

MILESTONES	DATE
- Approve Remedial Action (ROD)	September 1986
- Award IAG for Design	October 1986
- Begin Design	January 1987
- Complete Design	June 1987
- Sign State Superfund Contract	June 1987
- Award IAG for Construction	June 1987
- Begin Construction	October 1987
- End Construction	October 1988

TABLE 3 (Page 1 of 11)

COST ESTIMATE SUMMARY
ALTERNATIVE 2
ACCESS RESTRICTIONS, SOIL COVER

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
LANDFILL SOIL COVER (a)		$592,000	$350,000
Soil cover	$1,040,000		
Compaction	$259,000		
Grading	$136,000		
Revegetation	$69,000		
Toe Drain	$354,000		
Lawn Maintenance (b)		$7,000	$66,000
MONITORING (b)	$1,400	$56,000	$528,000
ACCESS RESTRICTION			
Signs	$1,000		
Construction Fence	$14,000		
SEDIMENT MANAGEMENT			
Remove sediments	$25,000		
Backfill marsh	$18,000		
Dewatering	$64,000		
Haul & spread sediments on landfill	$19,000		
Grade and reseed	$29,000		
Testing	$21,000		
CONSTRUCTION SUBTOTAL	$2,050,000		
Health & Safety (10%)	$205,000		
Bid Contingency (15%)	$338,000		
Scope Contingency (20%)	$519,000		
CONSTRUCTION TOTAL	$3,112,000		
Permitting & Legal (5%)	$156,000		
Services During Construction	$100,000		
TOTAL IMPLEMENTATION COST	$3,368,000		
Engineering & Design	$100,000		
TOTAL CAPITAL COSTS	$3,468,000		
TOTAL O & M AND REPLACEMENT PRESENT WORTH	$944,000		
TOTAL PRESENT WORTH (b)	$4,412,000		$944,000

(a) O&M costs assume replacing 30% of the topsoil, regrading, and revegetating the entire landfill every 10 years.
(b) Present worth cost based on a 10% discount rate over a period of 30 years.

COST ESTIMATE SUMMARY
ALTERNATIVE 3
ALTERNATE WATER SUPPLY, SOIL COVER, ACCESS RESTRICTIONS

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
LANDFILL SOIL COVER (a)		$592,000	$350,000
Soil cover	$1,040,000		
Compaction	$259,000		
Grading	$136,000		
Revegetation	$69,000		
Toe Drain	$334,000		
Lawn Maintentance (b)		$7,000	$66,000
MONITORING (b)	$1,400	$56,000	$528,200
MUNICIPAL WATER SUPPLY			
Water Mains	$443,300		
Hydrants & Valves	$62,200		
Residential Connections	$168,800		
Private well abandonment	$15,000		
Road crossings	$50,000		
ACCESS RESTRICTION			
Signs	$1,000		
Construction Fence	$14,000		
SEDIMENT MANAGEMENT			
Remove sediments	$25,000		
Backfill marsh	$18,000		
Dewatering	$64,000		
Haul & spread sediments on landfill	$19,000		
Grade and reseed	$29,000		
Testing	$21,000		
CONSTRUCTION SUBTOTAL	$2,790,000		$944,000
Health & Safety (10%)	$279,000		
Bid Contingency (15%)	$460,000		
Scope Contingency (20%)	$706,000		
CONSTRUCTION TOTAL	$4,235,000		
Permitting & Legal (5%)	$212,000		
Services During Construction	$150,000		
TOTAL IMPLEMENTATION COST	$4,597,000		
Engineering & Design	$150,000		
TOTAL CAPITAL COSTS	$4,747,000		
TOTAL O & M AND REPLACEMENT PRESENT WORTH	$944,000		
TOTAL PRESENT WORTH (b)	$5,691,000		

(a) O&M costs assume replacing 30% of the topsoil, regrading, and revegetating the entire landfill every 10 years.
(b) Present worth cost based on a 10% discount rate over a period of 30 years.

COST ESTIMATE SUMMARY
ALTERNATIVE 4A
GRADIENT CONTROL, SOIL COVER

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
LANDFILL SOIL COVER (a)		$592,000	$350,000
Soil cover	$1,040,000		
Compaction	$259,000		
Grading	$136,000		
Revegetation	$69,000		
Toe Drain	$354,000		
Lawn Maintenance (b)		$7,000	$66,000
MONITORING (b)		$38,000	$358,000
ACCESS RESTRICTION			
Signs	$1,000		
Construction Fence	$14,000		
SEDIMENT MANAGEMENT			
Remove sediments	$25,000		
Backfill marsh	$18,000		
Dewatering	$64,000		
Haul & spread sediments on landfill	$19,000		
Grade and reseed	$29,000		
Testing	$21,000		
EXTRACTION WELLS			
Well installation (c)	$15,000	$15,000	$2,000
Well pumps (d)	$9,000	$9,000	$5,000
Electrical (b)	$40,000	$4,000	$38,000
Header piping and connections	$112,000		
CONSTRUCTION SUBTOTAL	$2,225,000		$819,000
Health & Safety (10%)	$223,000		
Bid Contingency (15%)	$367,000		
Scope Contingency (20%)	$563,000		
CONSTRUCTION TOTAL	$3,378,000		
Permitting & Legal (5%)	$169,000		
Services During Construction	$150,000		
TOTAL IMPLEMENTATION COST	$3,697,000		
Engineering & Design	$150,000		
TOTAL CAPITAL COSTS	$3,847,000		
TOTAL O & M AND REPLACEMENT COSTS	$819,000		
TOTAL PRESENT WORTH (b)	$4,666,000		

(a) O&M costs assume replacing 30% of the topsoil, regrading, and revegetating the entire landfill every 10 years.
(b) Present worth cost based on a 10% discount rate over a period of 30 years.
(c) Present worth cost based on a 10% discount rate and replacement at 20 year intervals.
(d) Present worth cost based on a 10% discount rate and replacement at 10 year intervals.

COST ESTIMATE SUMMARY
ALTERNATIVE 4B
GRADIENT CONTROL, MULTILAYER CAP

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
MULTI-LAYER CAP (a)		$592,000	$329,000
Loam cover (e)	$520,000	$520,000	$30,000
Gravel cover (e)	$858,000	$858,000	$49,000
Impermeable liner (e)	$1,050,000	$1,050,000	$60,000
Clay cover (e)	$1,290,000		
Gas collection system	$600,000		
Grading, compaction, revegetation	$1,950,000		
Toe Drain	$354,000		
Lawn Maintenance (b)		$7,000	$65,000
MONITORING		$38,000	$358,000
ACCESS RESTRICTION			
Signs	$1,000		
Construction Fence	$14,000		
SEDIMENT MANAGEMENT			
Remove sediments	$25,000		
Backfill marsh	$18,000		
Dewatering	$64,000		
Haul & spread sediments on landfill	$19,000		
Grade and reseed	$29,000		
Testing	$21,000		
EXTRACTION WELLS			
Well installation (c)	$15,000	$15,000	$2,000
Well pumps (d)	$9,000	$9,000	$5,000
Electrical (b)	$40,000	$4,000	$38,000
Header piping and connections	$112,000		
CONSTRUCTION SUBTOTAL	$6,989,000		$936,000
Health & Safety (10%)	$699,000		
Bid Contingency (15%)	$1,153,000		
Scope Contingency (20%)	$1,768,000		
CONSTRUCTION TOTAL	$10,609,000		
Permitting & Legal (5%)	$530,000		
Services During Construction	$250,000		
TOTAL IMPLEMENTATION COST	$11,389,000		
Engineering & Design	$200,000		
TOTAL CAPITAL COSTS	$11,589,000		
TOTAL O & M AND REPLACEMENT COSTS	$936,000		
TOTAL PRESENT WORTH (b)	$12,525,000		

(a) O&M costs assume replacing 30% of the topsoil, regrading, and revegetating the entire landfill every 10 years
(b) Present worth cost is based on a 10% discount rate over a period of 30 years.
(c) Present worth cost based on a 10% discount rate and replacement at 20 year intervals.
(d) Present worth cost based on a 10% discount rate and replacement at 10 year intervals.
(e) Present worth cost based on a 10% discount rate and replacement at 30 years.

COST ESTIMATE SUMMARY
ALTERNATIVE 5A
GROUNDWATER EXCLUSION, SOIL COVER, SLURRY WALL

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
LANDFILL SOIL COVER (a)		$592,000	$350,000
Soil cover	$1,040,000		
Compaction	$259,000		
Grading	$136,000		
Revegetation	$69,000		
Toe Drain	$354,000		
Lawn Maintenance (b)		$7,000	$66,000
MONITORING (b)		$38,000	$358,000
ACCESS RESTRICTION			
Signs	$1,000		
Construction Fence	$14,000		
SLURRY WALL			
Installation	$2,581,000		
Soils testing	$120,000		
Regrade & Revegetate	$198,000		
Dewatering wastewater disposal to POTW	$14,000		
EXTRACTION WELLS			
Well installation (c)	$3,000	$3,000	$400
Well pumps (d)	$1,800	$1,800	$1,000
Electrical (b)	$24,000	$300	$2,800
Header piping and connections	$31,000		
SEDIMENT MANAGEMENT			
Remove sediments	$25,000		
Backfill marsh	$18,000		
Dewatering	$64,000		
Haul & spread sediments on landfill	$19,000		
Grade and reseed	$29,000		
Testing	$21,000		
CONSTRUCTION SUBTOTAL-	$5,021,800		$778,200
Health & Safety (10%)	$502,000		
Bid Contingency (15%)	$829,000		
Scope Contingency (20%)	$1,271,000		
CONSTRUCTION TOTAL	$7,624,000		
Permitting & Legal (5%)	$381,000		
Services During Construction	$330,000		
TOTAL IMPLEMENTATION COST	$8,335,000		
Engineering & Design	$300,000		
TOTAL CAPITAL COSTS	$8,655,000		
TOTAL O & M AND REPALCEMENT COSTS	$778,000		
TOTAL PRESENT WORTH (b)	$9,433,000		

(a) O&M costs assume replacing 30% of the topsoil, regrading, and revegetating the entire landfill every 10 years.
(b) Present worth cost is based on a 10% discount rate over a period of 30 years.
(c) Present worth cost based on a 10% discount rate and replacement at 20 year intervals.
(d) Present worth cost based on a 10% discount rate and replacement at 10 year intervals.

COST ESTIMATE SUMMARY
ALTERNATIVE 5B
GROUNDWATER EXCLUSION, MULTILAYER CAP, SLURRY WALL

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
MULTI-LAYER CAP (a)		$592,000	$328,000
Loam cover (e)	$520,000	$520,000	$30,000
Gravel cover (e)	$858,000	$858,000	$49,000
Impermeable liner (e)	$1,050,000	$1,050,000	$60,000
Clay cover (e)	$1,290,000		
Gas collection system	$600,000		
Grading, compaction, revegetation	$1,950,000		
Toe Drain	$354,000		
Lawn Maintenance (b)		$7,000	$66,000
MONITORING (b)		$38,000	$358,000
ACCESS RESTRICTION			
Signs	$1,000		
Construction Fence	$14,000		
SLURRY WALL			
Installation	$2,581,000		
Soils testing	$120,000		
Regrade & Revegetate	$198,000		
Dewatering wastewater disposal to POTW	$14,000		
EXTRACTION WELLS			
Well installation (c)	$3,000	$3,000	$400
Well pumps (d)	$1,800	$1,800	$1,000
Electrical (b)	$24,000	$300	$2,600
Header piping and connections	$31,000		
SEDIMENT MANAGEMENT			
Remove sediments	$25,000		
Backfill marsh	$18,000		
Solidification	$175,000		
Haul & spread sediments on landfill	$19,000		
Grade and reseed	$29,000		
Testing	$21,000		
	===========		===========
CONSTRUCTION SUBTOTAL	$9,897,000		$895,000
Health & Safety (10%)	$990,000		
Bid Contingency (15%)	$1,633,000		
Scope Contingency (20%)	$2,504,000		
CONSTRUCTION TOTAL	$15,024,000		
Permitting & Legal (5%)	$751,000		
Services During Construction	$500,000		
TOTAL IMPLEMENTATION COST	$16,275,000		
Engineering & Design	$350,000		
TOTAL CAPITAL COSTS	$16,625,000		
TOTAL O & M AND REPLACEMENT COSTS	$895,000		
	===========		
TOTAL PRESENT WORTH (b)	$17,520,000		

(a) O&M costs assume replacing 30% of the topsoil, regrading, and revegetating the entire landfill every 10 years.
(b) Present worth cost is based on a 10% discount rate over a period of 30 years.
(c) Present worth cost based on a 10% discount rate and replacement at 20 year intervals.
(d) Present worth cost based on a 10% discount rate and replacement at 10 year intervals.
(e) Present worth cost based on a 10% discount rate and replacement at 30 years.

COST ESTIMATE SUMMARY
ALTERNATIVE 6
LANDFILL DEWATERING, MULTILAYER CAP, SLURRY WALL

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
MULTI-LAYER CAP (a)		$592,000	$326,000
Loam cover (e)	$520,000	$520,000	$30,000
Gravel cover (e)	$858,000	$858,000	$49,000
Impermeable liner (e)	$1,050,000	$1,050,000	$60,000
Clay cover	$1,290,000		
Gas collection system	$600,000		
Grading, compaction, revegetation	$1,950,000		
Toe Drain	$354,000		
Lawn Maintenance (b)		$7,000	$66,000
MONITORING (b)		$38,000	$358,000
ACCESS RESTRICTION			
Signs	$1,000		
Construction Fence	$14,000		
SEDIMENT MANAGEMENT			
Remove sediments	$25,000		
Backfill marsh	$18,000		
Dewatering	$64,000		
Haul & spread sediments on landfill	$19,000		
Grade and reseed	$29,000		
Testing	$21,000		
SLURRY WALL			
Installation	$2,581,000		
Soils testing	$120,000		
Regrade & Revegetate	$198,000		
Dewatering wastewater disposal to POTW	$14,000		
EXTRACTION WELLS			
Well installation (c)	$126,000	$126,000	$19,000
Well ejectors (d)	$30,000	$30,000	$18,000
Well pumps (f)	$6,000	$1,200	$7,100
Header piping and connections	$85,000		
Electrical (b)	$50,000	$2,000	$19,000
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CONSTRUCTION SUBTOTAL	$10,023,000		$954,000
Health & Safety (10%)	$1,002,000		
Bid Contingency (15%)	$1,654,000		
Scope Contingency (20%)	$2,536,000		
CONSTRUCTION TOTAL	$15,215,000		
Permitting & Legal (5%)	$761,000		
Services During Construction	$500,000		
TOTAL IMPLEMENTATION COST	$16,476,000		
Engineering & Design	$350,000		
TOTAL CAPITAL COSTS	$16,826,000		
TOTAL O & M AND REPLACEMENT COSTS	$954,000		
	============		
TOTAL PRESENT WORTH (b)	$17,780,000		

(a) O&M costs assume replacing 30% of the topsoil, regrading, and revegetating the entire landfill every 10 years.
(b) Present worth cost is based on a 10% discount rate over a period of 30 years.
(c) Present worth cost based on a 10% discount rate and replacement at 20 year intervals.
(d) Present worth cost based on a 10% discount rate and replacement at 10 year intervals.
(e) Present worth cost based on a 10% discount rate and replacement at 30 years.
(f) Present worth Cost based on replacement of 150 gpm pump with 30 gpm pump at 10 year intervals.

COST ESTIMATE SUMMARY
ONSITE TREATMENT

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
30 gpm flowrate: (Alternative 5)			
Package treatment plant (b)	$94,000	$94,000	$14,000
Backwash tanks (b)	$20,000	$20,000	$3,000
carbon treatment system (b)	$38,000	$38,000	$6,000
Building	$25,000		
Electrical	$20,000		
Temporary sludge lagoon	$6,000		
Dispose sludge in RCRA landfill (a)		$8,000	$75,500
Chemicals (a)		$2,500	$23,500
Carbon (a)		$8,800	$83,000
Labor (a)		$44,000	$415,000
Maintenance (a)		$6,000	$56,000
Heat & electrical (a)		$2,000	$19,000
Subtotals	$203,000		$695,000
Allowances and Contingencies	$152,000		
Total	$355,000		
Present worth (a)	$1,050,000		

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
1 gpm flowrate: (Alternative 5B)			
Package treatment plant (b)	$20,000	$20,000	$3,000
Backwash tanks (b)	$2,000	$2,000	$300
carbon treatment system (b)	$9,000		
Building	$5,000		
Electrical	$5,000		
Temporary sludge lagoon		$500	$4,700
Dispose sludge in RCRA landfill (a)		$100	$1,100
Chemicals (a)		$400	$3,800
Carbon (a)		$44,000	$415,000
Labor (a)		$500	$4,700
Maintenance (a)		$1,000	$9,400
Heat & electrical (a)			
Subtotals	$41,000		$442,000
Allowances and Contingencies	$31,000		
Total	$72,000		
Present worth (a)	$514,000		

(a) Present worth based on a period of 30 yrs., at a discount rate of 10%.
(b) Present worth based on equipment replacement at 20 years and a 10% discount rate.
(c) Present worth based on treating 150 gpm for 5 yrs. and 30 gpm for 25 yrs. Discount rate = 10%.
(d) Allowances and Contingencies include health and safety, bid contingency, scope contingency, permitting and legal, services during construction, and engineering and design.

TABLE 3 (Page 9 of 11)

COST ESTIMATE SUMMARY
ONSITE TREATMENT

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
400 gpm flowrate: (Alternative 4 & 4B)			
Package treatment plant (b)	$243,000	$243,000	$36,000
Backwash tanks (b)	$30,000	$30,000	$4,100
carbon treatment system (b)	$126,000	$126,000	$19,000
Building	$144,000		
Electrical	$30,000		
Temporary sludge lagoon	$109,000		
Dispose sludge in RCRA landfill (a)		$138,000	$1,301,000
Chemicals (a)		$47,000	$439,000
Carbon (a)		$138,000	$1,301,000
Labor (a)		$44,000	$415,000
Maintenance (a)		$15,000	$141,500
Heat & electrical (a)		$8,000	$75,500
Subtotals	$682,000		$3,732,000
Allowances and Contingencies (d)	$512,000		
Total	$1,194,000		
Present worth	$4,926,000		
150 gpm -30 gpm flowrate: (Alternative 6)			
Package treatment plant (b)	$162,000	$162,000	$24,000
Backwash tanks (b)	$20,000	$20,000	$3,000
carbon treatment system (b)	$58,000	$58,000	$9,000
Building	$80,000		
Electrical	$20,000		
Temporary sludge lagoon	$41,000		
	150 gpm O&M	30 gpm O&M	150 gpm & 30 gpm Present Worth
Dispose sludge in RCRA landfill (a)	$52,000	$10,000	$253,483
Chemicals (a)	$17,500	$3,500	$86,065
Carbon (a)	$60,000	$12,000	$295,081
Labor (a)	$44,000	$44,000	$414,784
Maintenance (a)	$10,000	$10,000	$94,269
Heat & electrical (a)	$3,500	$2,300	$26,231
Subtotals	$381,000		$1,206,000
Allowances and Contingencies (d)	$286,000		
Total	$667,000		
Present worth (c)	$1,873,000		

(a) Present worth based on a period of 30 yrs., at a discount rate of 10%.
(b) Present worth based on equipment replacement at 20 years and a 10% discount rate.
(c) Present worth based on treating 150 gpm for 5 yrs. and 30 gpm for 25 yrs. Discount rate = 10%.
(d) Allowances and Contingencies include health and safety, bid contingency, scope contingency, permitting and legal, services during construction, and engineering and design.

COST ESTIMATE SUMMARY
POTW TREAMENT

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
400 gpm flowrate: (Alternative 4 & 4B)			
Sewer discharge pipe	$20,000		
Connection to sewer	$5,000		
User charge (a)		$263,000	$2,479,000
Monitoring fee (a)		$3,000	$31,000
Subtotals	$25,000		$2,510,000
Allowances and Contingencies (c)	$19,000		
Total	$44,000		
Present worth (a)	$2,554,000		
150 gpm - 30 gpm flowrate: (Alternative 6)			
Sewer discharge pipe	$12,000		
Connection to sewer	$5,000		
User charge (150 gpm) (a)		$99,000	$374,000
User charge (30 gpm) (a)		$20,000	$112,000
Monitoring fee (150 gpm) (a)		$3,000	$11,000
Monitoring fee (30 gpm) (a)		$1,000	$6,000
Subtotals	$17,000		$503,000
Allowances and Contingencies (c)	$13,000		
Total	$30,000		
Present worth (b)	$533,000		
22 gpm flowrate: (Alternative 5A)			
Sewer discharge pipe	$7,000		
Connection to sewer	$5,000		
User charge (a)		$20,000	$189,000
Monitoring fee (a)		$3,000	$31,000
Subtotals	$12,000		$220,000
Allowances and Contingencies (c)	$9,000		
Total	$21,000		
Present worth (a)	$241,000		
1 gpm flowrate: (Alternative 5B)			
Sewer discharge pipe	$7,000		
Connection to sewer	$5,000		
User charge (a)		$500	$4,000
Subtotals	$12,000		$4,000
Allowances and Contingencies (c)	$9,000		
Total	$21,000		
Present worth (a)	$25,000		

(a) Present worth based on a period of 30 yrs., at a discount rate of 10%.
(b) Present worth based on treating 150 gpm for 5 yrs. and 30 gpm for 25 yrs. Discount rate = 10%.
(c) Allowances and Contingencies include health and safety, bid contingency, scope contingency, permitting and legal, services during construction, and engineering and design.

COST ESTIMATE SUMMARY
RCRA FACILITY TREATMENT

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M & REPLACEMENT COSTS	PRESENT WORTH O&M/REPLACEMENT COSTS
22 gpm flowrate: (Alternative 5A)			
Storage tank & access road	$110,000		
trucking & disposal costs (a)		$2,891,000	$27,253,000
Subtotals	$110,000		$27,253,000
Allowances and Contingencies (b)	$83,000		
Total	$193,000		
Present worth (a)	$27,446,000		
1 gpm flowrate: (Alternative 5B)			
Storage tank & access road	$110,000		
trucking & disposal costs (a)		$131,000	$1,239,000
Subtotals	$110,000		$1,239,000
Allowances and Contingencies (b)	$83,000		
Total	$193,000		
Present worth (a)	$1,432,000		

(a) Present worth cost is based on a 10% discount rate over a period of 30 years.
(b) Allowances and Contingencies include health and safety, bid contingency, scope contingency, permitting and legal, services during construction, and engineering and design.

ADDENDUM
RESPONSIVENESS SUMMARY

A public meeting was held on August 20, 1986, at the PAC office in Gary, Indiana, to discuss the findings and recommendations of the Feasibility Study for the Lake Sandy Jo site.

Public comments on the feasibility study report for the Lake Sandy Jo site were received by the U.S. EPA on August 20, 1986, and through written documents received by U.S. EPA through September 5, 1986. These comments fell into the following major categories:

- o Groundwater quality
- o Soil and sediment quality
- o Extent of the investigations
- o Alternate water supply
- o Residential cost for alternate water supply
- o Deed restrictions

- o Drainage ditch remediation

Public comments and U.S. EPA's responses are summarized in this chapter. Comments in this chapter are edited and sometimes paraphrased to combine similar comments under common topics. The intent has been to present the full range of topics and details of the overall comment set without lengthy repetition. A transcript of the public meeting and written comments are included in Appendix A and B, respectively.

GROUNDWATER QUALITY

Public comments:

1. What are the main organic contaminants in the groundwater?

2. What are the risks posed by each?

3. What are the main inorganic contaminants in the groundwater?

4. Which ones pose a risk and what are those risks?

5. Will these chemical contaminants dissipate with distance?

6. What will be their effect on health?

Agency response:

1. The primary organic contaminant of concern in the groundwater is benzene. Data for groundwater analysis is summarized in Table 1-8 of the FS report for the Calumet aquifer.

2. The benzene is present in the monitoring wells at a concentration posing a 2×10^{-5} to 2×10^{-6} cancer risk over a lifetime exposure.

3. There are no inorganic contaminants found to have significant risk in the groundwater. Some lead, arsenic, and cyanide were found in monitoring wells around the site which do constitute a plume from the site and could pose a risk if found in sufficient concentrations in the groundwater. A summary of inorganic contaminants can be found in Appendix C, FS Table 1-8.

4. No cancer risk levels were generated for inorganic contaminants at the site as only secondary drinking water standards were violated (those standards set for aesthetic quality rather than health reasons).

5. In general, all constituents found in the groundwater will decrease in concentration with distance from the site. Actions responsible for this phenomenon include dilution with other unaffected groundwater, degradation due to biological activity from soil microbes, and adsorption onto soil particles. A certain amount of volatilization may also occur in more surficial groundwater layers.

6. As previously mentioned, only secondary water quality standards have been exceeded by the groundwater found in residential wells around the site. That is, no health effects should occur but taste, odor, and color may appear as problems with use of the water. Benzene, found in monitoring wells adjacent to the site, does carry a cancer risk if a lifetime exposure were to occur. However, there was no benzene found in the 24 residential wells sampled.

SOIL AND SEDIMENT QUALITY

Public comments:

1. What are the main contaminants of concern?

2. What are the risks posed?

Agency response:

1. The primary organic contaminant of concern in the surface soil and sediment at the site is benzo(a)pyrene. Inorganics of concern include chromium, copper and lead. A more comprehensive summary of compounds found in the surface soil and sediment can be found in Appendix C, FS Tables 1-5, 1-6, and 1-7.

2. Ingestion of surface soils through a trespass setting could lead to a 2×10^{-2} to 2×10^{-5} cancer risk due to polyaromatic hydrocarbons (including benzo(a)pyrene). Ingestion of ditch sediments could lead to a 1×10^{-4} to 2×10^{-6} cancer risk due to (PAH's). Inhalation of contaminants bound to dusts in the surface soils could lead to a 2×10^{-5} to 2×10^{-6} cancer risk due to PAH's.

EXTENT OF THE INVESTIGATIONS

Public comments:

1. Explain the extent of groundwater investigations.

2. How deep did you drill?

3. How many aquifers were looked at?

4. Are the upper and lower aquifers separated?

5. Explain the extent of the surface water/sediment investigations.

6. What areas were covered and what was the rationale?

7. Why were the areas just north of the public well and just north of the Little Calumet River (wetland areas) not studied?

8. Where does the surface water leaving the site via the southeast ditch go?

9. Can the groundwater under the wetland area be contaminated by Lake Sandy Jo?

10. How were dioxins looked for and what laboratories did these analyses?

Agency response:

1. In Phase I of the remedial investigations, 15 shallow and one deep bedrock monitoring well were installed and sampled and 14 residential wells were sampled to

characterize the groundwater and determine if hazardous materials were being released. In Phase II of the remedial investigation, five additional shallow monitoring wells and one additional bedrock well were installed and 10 residential wells were sampled to determine the extent of contamination at the site and determine groundwater flowrate characteristics.

2. Drilling extended to the bottom of the Calumet aquifer, and ranged from 20 to 30 feet below ground surface. In addition, drilling extended into the top of the underlying bedrock aquifer, approximately 117 feet below ground surface.

3. Two aquifers were investigated, the Calumet and deeper bedrock aquifer.

4. The upper Calumet aquifer and lower bedrock aquifer are not hydraulically connected. They are separated by approximately 100 feet of glacial till. This till was tested and found to have a very low conductivity (10^{-8} cm/sec). This precludes any significant downward flow of contaminants. In addition, pumping tests also showed that each aquifer was not influenced when the other was pumped. This also indicates the two aquifers are not connected.

5. During Phase I, seven surface water and sediment samples were collected; and in Phase II, eight surface water and sediment samples were collected.

6. The areas covered in surface water and sediment sampling are shown in Appendix C, Figure 1-4. These areas were chosen originally because of obvious site drainage patterns and the need to verify the migration of surface contaminants from onsite.

7. The wetland area north of the public well was not studied because it lies in a different groundwater flow basin than the site and, as such, is not influenced by the site. Groundwater beneath the wetland or flood plain area just north of the Little Calumet River was not studied because groundwater was not moving from the site to this area. Rather, groundwater travels from the site, recharges the intercepting drainage ditches, and becomes surface water. Surface water then moves to the flood plain area. The quality of this surface water was studied.

8. Drainage from the southeast ditch travels to a wetland which drains into the Little Calumet River.

9. No, the groundwater beneath the wetland cannot be contaminated by Lake Sandy Jo groundwater. Surface

water contaminants from Lake Sandy Jo could influence the surface water in the wetland.

10. Dioxins and other chemicals were analyzed by the U.S. EPA Contract Laboratory Program as referenced in the Lake Sandy Jo Remedial Investigation Report.

ALTERNATE WATER SUPPLY

1. What residences will be hooked up to the alternate supply?

2. What was the rationale for selection?

3. What water system will the residences be hooked up to?

4. Within the area selected for alternative water, will the availability to a given residence be dependent on the level of participation of local neighbors?

5. How much time will eligible residences have to decide if they want the alternative water supply?

6. Why can't people just outside of the selected area to be given the alternate water supply also be included if they have poor water quality (taste, odor, color)?

7. Are residences on the west side of Morton Street included?

8. One resident who resides just outside the designated area stated that when Lake Sandy Jo was filled in, her upper aquifer well dried up. On that basis, is the residence eligible for the alternate water supply?

Agency response:

1. At this time, exact addresses have not been selected, however, those residences lying withing the area shown in Appendix C, FS Figure 2-3 will be served by the alternate water supply. This area lies south of 25th Avenue, north of 29th Avenue, and between Morton and Chase Streets.

2. The selection was based on location of the current groundwater plume influenced by the site and the assumption that potential hazardous releases from the site will follow the same pattern upon release and migration from the site. To account for any uncertainty in identification of the limits of the plume, a "buffer zone" was added to the limits of the affected area to ensure that any borderline residences were not excluded from service. The area selected was

also based on where the groundwater from Lake Sandy Jo travels.

3. Residences will be serviced by the Gary-Hobart Water Distribution System as this system currently serves the area north of 25th Avenue and has existing mains up to this street.

4. The option to be hooked up to the new water distribution system lies with each eligible resident. Availability will not be affected by the level of participation of the local neighbors.

5. Eligible residents will have several months to decide whether or not to accept the alternate water supply. The actual schedule is dictated by the reauthorization date of the Superfund bill, however public announcements will be made at the start of implementation of the alternative and input will be accepted throughout the design period.

6. The primary purpose of the Superfund Bill is to protect public health and the environment. Water supplies that are considered unpalatable due to secondary water quality standards are not necessarily due action under the bill. In the case of Lake Sandy Jo, background water quality often exceeds these water quality

standards and the basis for extending the alternate water supply is the potential for migration of hazardous contaminants from the landfill, not the current state of water quality.

7. Residences west of Morton Street are not included in the area designated for the alternate water supply.

8. The presence of a dry well indicates that there can be no influence to it by Lake Sandy Jo and the purpose of this remedy is to limit or prevent exposure to people and the environment as the situation exists now. If a well was rendered dry due to previous activities at the site, it does not warrant attention based on the goals of the remedial action.

RESIDENTIAL COSTS FOR ALTERNATE WATER SUPPLY

Public comments:

1. Within the designated area, how much will it cost to hook up to an individual residence (connect the home's internal water supply line to the main in the street, install a valve, install a meter, and abandon the old well)?

2. Just outside the designated area, how much would it cost a resident to get water (run a main down the street and connect to the home in the same fashion as in #1)?

3. If a resident selecting the alternative water supply is not connected to the public sewer line but instead has a septic tank system, the monthly water use fee should not include any sewer use fees. Will this be the case?

Agency response:

1. It will cost approximately $1,500-$2,200 per connection, in general. The actual cost depends on the proximity of the residence to the main, size of line selected, the materials of construction deemed necessary at the time of design, and the actual costs/ or the value, meter, and fittings needed at each installation.

2. The cost for Gary-Hobart to hook up a resident outside the designated area to their water system cannot be quantified for a specific residence. The hookup charge includes the cost of running a water main down the street and then the cost of connecting the residence to the water main. The Gary-Hobart Water Co. does not have a final estimate for residential hookups because

the cost for a specific residence depends on its location, the need to install or replace a water main for the area, the number of residences that will tap into the installed water main, the home's proximity to the water main, and the overall economic base of the area.

3. The monthly water use fee paid by the consumer should not include sewer use unless the home is connected to the sewer collection system. If the residence uses a septic tank; no sewer charges should be accrued.

DEED RESTRICTIONS

Public Comments:

1. How will deed restrictions work?

2. Who (what area) will be restricted?

3. When will deed restrictions begin?

4. How long will deed restrictions be in effect?

5. Why is the area north of 25th Avenue included?

Agency Reply:

1. Deed restrictions are designed to limit access to the hazardous constituents at the site and to limit their migration from the site. For instance, excavation onsite will be prohibited to prevent breach of the soil and vegetative cover, and installation of a well in the area of influence of the site to prevent access to potentially contaminated groundwater and/or prevent the diversion of groundwater to a previously unaffected area.

2. Activities that will be restricted include construction or excavation onsite, onsite access to the public, and installation of wells near the groundwater plume.

3. The schedule for initiation of deed restrictions is dependent upon the date of reauthorization of the Superfund monies to be used in administering this alternative.

4. Deed restrictions will be considered permanent, that is, the restrictions will apply indefinitely.

5. Areas subject to deed restrictions are shown on Figure 5-3 of the FS Report. Excavation and/or construction will be prohibited on the landfill site,

proper, and well installation will be prohibited in the area bounded by 23rd Avenue, 29th Avenue, Morton Street, and Chase Street. The area north of 25th Avenue is being included because installation of a well in this area may change groundwater gradients and draw contaminants to the north of the site.

DRAINAGE DITCH RECOMMENDATIONS

Public Comments:

1. If the recommended alternative is followed, will the drainage ditches still be contaminated in the future?

Agency Response:

1. The drainageways will be dredged and existing contamination removed. As for future contamination, with a vegetated soil cover on the site, rainfall runoff will no longer contain surface soil contamination and the sediments will not be contaminated.

GLT620/9

Table 1-5
SUMMARY OF SUBSURFACE SOIL SAMPLING
LAKE SANDY JO LANDFILL RI/FS

CONSTITUENT	FREQUENCY	RANGE OF DETECTION	BACKGROUND (SB021)
Toluene	1/12	ND* - 3	Not Tested
Chloroform	1/12	ND - 6	Not Tested
Chloromethane	1/12	ND - 13	Not Tested
1,1,2,2-tetrachloroethane	1/12	ND - 3	Not Tested
1,1,1-trichloroethane	1/12	ND - 6	Not Tested
bis(2-ethylhexyl)phthalate	1/12	ND - 220	Not Tested
Aluminum	19/19	683,000 - 3,320,000	1,470,000
Arsenic	1/7	ND - 6,800	ND
Barium	7/7	50,000 - 371,000	65,000
Calcium	19/19	130,000 - 45,100,000	130,000
Chromium	8/19	11,000 - 98,100	14,000
Copper	5/19	5,000 - 31,000	ND
Iron	19/19	390,000 - 21,200,000	1,710,000
Lead	11/19	3,400 - 13,000	ND
Manganese	19/19	13,000 - 395,000	13,000
Zinc	18/19	7,900 - 62,000	15,000

*ND = Not Detected

Table 1-6
SUMMARY OF SEDIMENT SAMPLING
LAKE SANDY JO LANDFILL RI/FS

CONSTITUENT	NO. OF POSITIVES/ NO. OF VALID DETECTIONS	RANGE OF DETECTIONS ug/kg	RANGE OF VALUES DETECTED IN BACKGROUND SAMPLES INFLUENCED BY THE HIGHWAY ug/kg	VALUES DETECTED IN BACKGROUND SAMPLES NOT INFLUENCED BY THE HIGHWAY ug/kg
VOLATILES				
1,1,1-trichloroethane	1/15	ND*-13	ND	Not Tested
ACID COMPOUNDS				
pentachlorophenol	1/15	ND-1600	ND	ND
BASE/NEUTRAL COMPOUNDS				
bis(2-ethylhexyl)phthalate	7/8	440 - 33,000	ND	ND
di-n-octyl phthalate	2/8	330 - 5,500	ND	ND
anthracene	10/15	68 - 2,600	ND	ND
pyrene	14/15	150 - 6,200	280 - 430	200
benzo(ghi)perylene	12/15	280 - 2,400	ND - 330	ND
indeno(1,2,3-cd)pyrene	11/15	240 - 2,500	ND	ND
benzo(b)fluoranthene	13/15	150 - 530	150 - 550	130
fluoranthene	9/15	210 - 8,700	260 - 530	210
benzo(k)fluoranthene	12/15	140 - 3,000	140 - 550	110
acenaphthylene	4/15	220 - 1,400	ND	ND
chrysene	14/15	140 - 5,800	200 - 360	140
benzo(a)pyrene	12/15	120 - 1,700	ND - 450	120
dibenzo(a,h)anthracene	4/15	330 - 1,200	ND	ND
benzo(a)anthracene	13/15	110 - 6,800	180 - 410	110
acenaphthene	4/15	220 - 2,100	ND	ND
diethyl phthalate	1/15	ND - 430	ND	ND
di-n-butyl phthalate	7/8	330 - 720	ND	ND
phenanthrene	11/15	270 - 3,400	ND - 400	ND
benzyl butyl phthalate	5/15	140 - 9,800	ND	ND
fluorene	4/15	260 - 3,600	ND	ND
naphthalene	7/15	56 - 1,200	ND - 400	ND
PESTICIDES				
PCB-1254	1/15	ND - 2,000	ND	ND
4,4'-DDT	1/15	ND - 1,100	ND	ND
4,4'-DDD	1/15	ND - 40	ND	ND
Endosulfan	1/15	ND - 10	ND	ND
ELEMENTS				
Aluminum	15/15	288,000 - 12,300,000	3,460,000 - 3,850,000	4,940,000
Barium	15/15	12,000 - 1,540,000	41,000 - 92,000	93,000
Beryllium	5/15	640 - 6,200	ND - 990	850
Cadmium	9/15	2,300 - 14,000	ND	ND
Chromium	15/15	8,200 - 81,000	8,600 - 25,000	20,000
Copper	15/15	17,000 - 187,000	21,000 - 59,000	50,000
Mercury	7/15	40 - 900	ND - 400	ND
Manganese	15/15	13,000 - 2,710,000	219,000 - 472,000	225,000
Nickel	15/15	5,500 - 42,000	5,500 - 12,000	23,000
Lead	14/15	48,000 - 526,000	120,000 - 526,000	162,000
Zinc	15/15	62,000 - 1,920,000	117,000 - 327,000	573,000
Arsenic[a]	4/7	14,000 - 102,000[b]	14,000	35,000

*ND = Not detected.
[a] Only analyzed for in Phase II.
[b] 102,000 mg/kg of arsenic was detected in one sample, but its field replicate was non-detectable for arsenic. The next highest arsenic detected was 69,000.

Table 1-7
SUMMARY OF SURFACE WATER SAMPLING RESULTS
LAKE SANDY JO LANDFILL RI/FS

			BACKGROUND SAMPLES UPSTREAM OF LANDFILL			
			ADJACENT TO HIGHWAY (SW002 AND SW008)		AWAY FROM HIGHWAY (SW010)	
CONSTITUENT	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)
Aluminum	3/8	1,730 - 63,200	1/1	63,200	1/1	242
Antimony	1/8	ND* - 69	1/1	69	0/1	ND
Arsenic	3/8	11 - 378	1/1	378	0/1	ND
Barium	11/15	[60] - 1,860	1/2	1,860	1/1	[60]
Beryllium	2/8	[0.4] - 15	1/1	15	0/1	ND
Cadmium	2/8	[4.3] - 51	1/1	51	0/1	ND
Calcium	15/15	96,000 - 272,000	2/2	123,000 - 231,000	1/1	114,000
Chromium	7/8	[5.5] - 271	1/1	271	1/1	[5.8]
Cobalt	2/8	[10] - 122	1/1	122	0/1	ND
Copper	3/15	20 - 940	1/2	940	0/1	ND
Iron	15/15	120 - 366,000	2/2	170 - 366,000	1/1	23,000
Lead	7/8	12 - 9,980	1/1	9,980	1/1	13
Magnesium	15/15	30,000 - 451,000	2/2	34,000 - 70,800	1/1	33,800
Manganese	14/15	40 - 12,500	2/2	570 - 12,500	1/1	697
Mercury	3/8	[0.11] - 0.72	1/1	0.72	0/1	ND
Nickel	5/8	[10] - 176	1/1	176	0/1	ND
Potassium	15/15	5,840 - 74,300	2/2	8,000 - 9,080	1/1	5,840
Silver	1/8	ND - 25	1/1	25	0/1	ND
Sodium	15/15	19,400 - 230,000	2/2	19,400 - 66,000	1/1	32,600
Tin	1/15	ND - 60	0/2	ND	0/1	ND
Vanadium	7/8	4.5 - 350	1/1	350	1/1	[4.5]
Zinc	10/15	72 - 5,860	1/2	5,860	1/1	114
Cyanide	7/15	10 - 20	1/2	18	0/1	ND
Acetone	4/7	10J - 200	1/1	10J	0/0	Not Tested
Chloromethane	1/7	ND - 11	1/1	11	0/0	Not Tested

NOTE: [ ] Indicates an estimated value below contract required detection limits.
J Indicates that the compound was detected at levels too low to be quantified. The number is the quantification limit.
*ND = Not Detected.

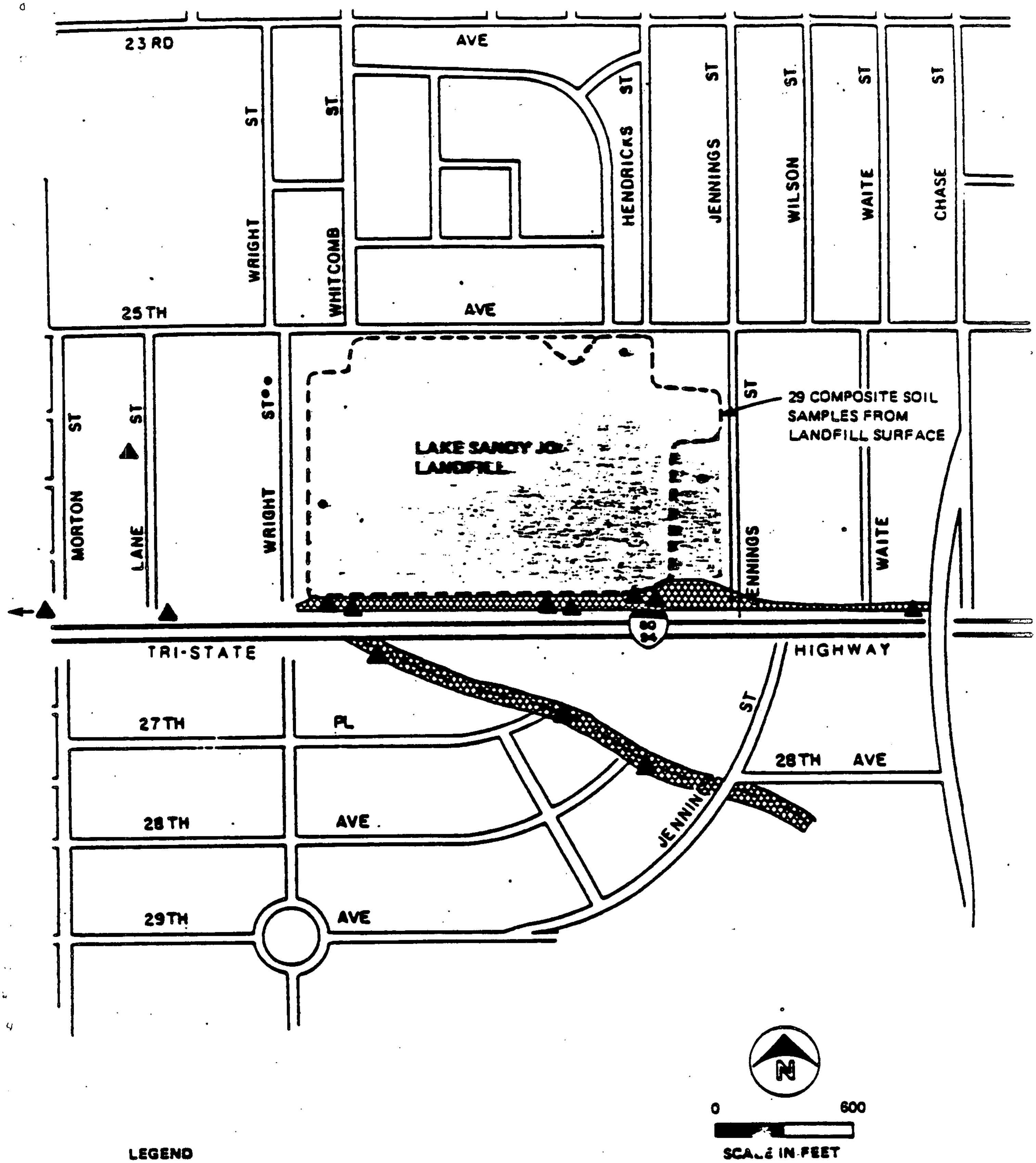
Table 1-8
SUMMARY OF GROUNDWATER SAMPLING RESULTS
(CALUMET AQUIFER)
LAKE SANDY JO LANDFILL RI/FS
PAGE 1 OF 2

CONSTITUENT	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)	SAMPLES FROM WELLS NOT AFFECTED BY LANDFILL* NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	SAMPLES FROM WELLS NOT AFFECTED BY LANDFILL* RANGE OF DETECTIONS (ug/l)
Aluminum	17/56	[26] - 917	1/11	[52]
Arsenic	19/56	2 - 26	2/11	2 - 2.7
Barium	54/56	[17] - 557	11/11	33 - 276
Cadmium	3/56	2.4 - 5.1	0/11	-
Calcium	56/56	22,700 - 286,000	11/11	22,700 - 186,000
Chromium	6/56	10 - 14.6	0/11	-
Cobalt	2/44	[9.6] - 24	0/9	-
Copper	20/56	6.1 - 48.5	2/11	6.1 - 7.4
Iron	53/56	[77] - 24,800	11/11	323 - 12,400
Lead	10/56	1 - 12	2/11	1.8 - 2.3
Lithium	25/27	10 - 47	10/10	10 - 21.6
Magnesium	56/56	5,620 - 506,000	11/11	5,620 - 41,500
Manganese	55/56	38 - 1,704	11/11	95 - 651
Mercury	3/27	0.1 - 0.35	1/9	0.2
Nickel	12/56	[10] - 123	1/11	123
Potassium	38/56	2,370 - 75,700	5/11	2,570 - 8,600
Silver	1/44	8	0/9	-
Sodium	55/56	30,000 - 220,000	10/11	30,000 - 142,000
Strontium	27/27	109 - 866	10/10	181 - 597
Titanium	1/12	50.5	0/2	-
Vanadium	16/56	[5] - 44	0/11	-
Zinc	31/56	13 - 2,990	9/11	107 - 954
Cyanide	10/56	2.9 - 52	1/11	2.9

Table 1-8
SUMMARY OF GROUNDWATER SAMPLING RESULTS
(CALUMET AQUIFER)
LAKE SANDY JO LANDFILL RI/FS

CONSTITUENT	NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	RANGE OF DETECTIONS (ug/l)	SAMPLES FROM WELLS NOT AFFECTED BY LANDFILL* NO. OF POSITIVE DETECTIONS/ NO. OF VALID OBSERVATIONS	SAMPLES FROM WELLS NOT AFFECTED BY LANDFILL* RANGE OF DETECTIONS (ug/l)
Benzene	6/56	2.5K - 23.5	0/11	-
Bromodichloromethane	1/56	5.4	0/11	-
2-Butanone	2/56	3K - 8.1K	0/11	-
Chlorodibromomethane	1/56	2.3	0/11	-
Chloroethane	1/56	8.3	0/11	-
Chloroform	1/56	6.4	0/11	-
2-Hexanone	1/56	3.8K	0/11	-
Styrene	1/56	1K	0/11	-
Toluene	2/56	1.3 - 3	0/11	-
Total Xylenes	1/56	1K - 3.1K	0/11	-
Phenol	1/56	7J	1/11	7J
Butyl Benzyl Phthalate	10/56	4K - 16.7	0/11	-
Di-N-Butyl Phthalate	2/56	4.8K - 103	0/11	-
Di-N-Octyl Phthalate	5/56	6.4K - 6.7K	0/11	-
Isophorone	1/56	2J	1/11	2J
Gamma-BHC	1/56	0.015J	1/11	0.015J

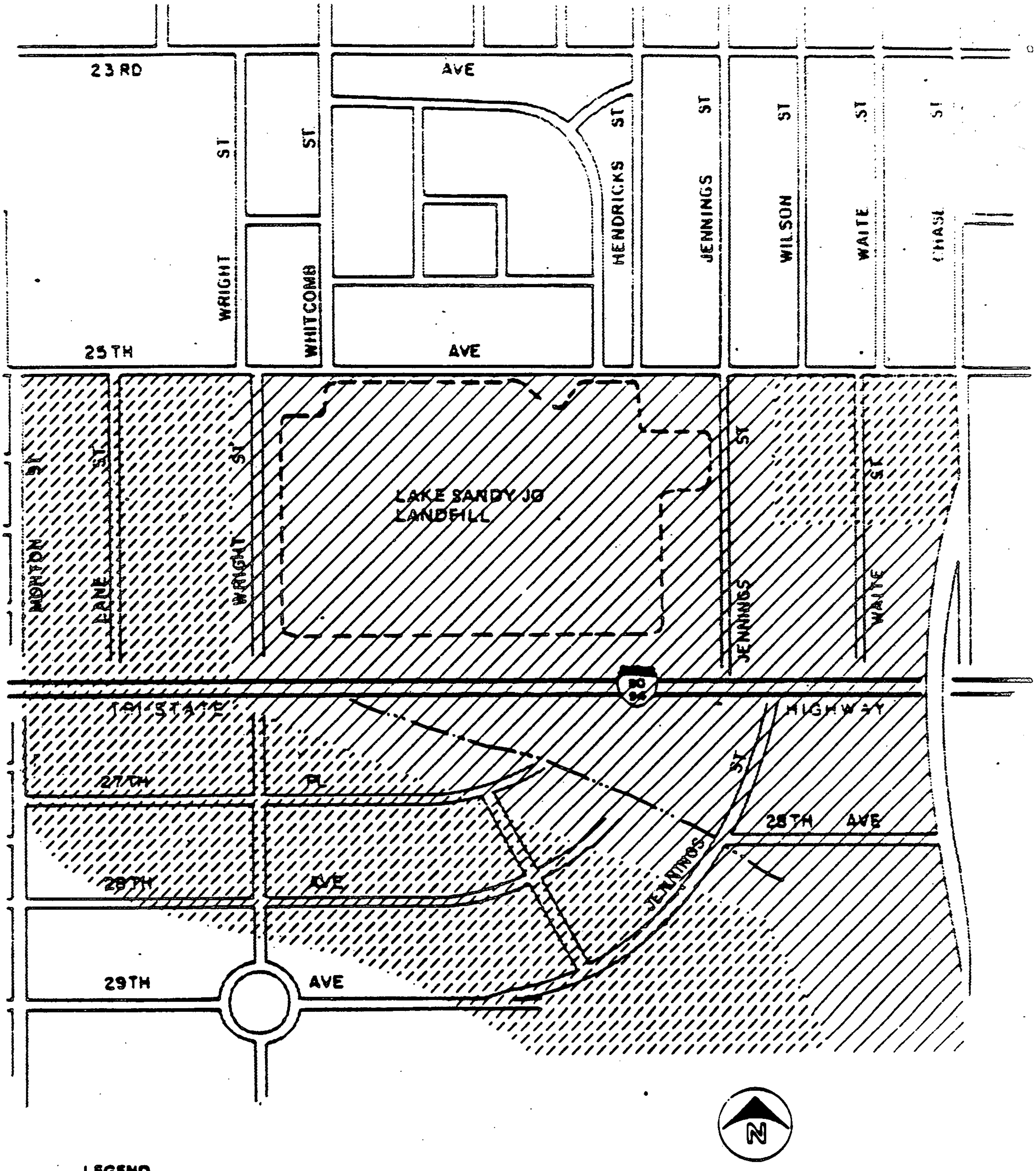
NOTES:
* - Wells MW021, DW003, DW017, DW022, DW023, DW024, DW025, DW027.
[ ] - Indicates an estimated value below contract required detection limits.
J - Indicates an estimated value.
K - Indicates that the compound was detected at a level lower than the required detection limit.



LEGEND

- ● DISCRETE SOIL SAMPLING LOCATION
- ▲ SEDIMENT SAMPLING LOCATION
- AREA OF KNOWN OR SUSPECTED SURFACE SOIL CONTAMINATION
- AREA OF KNOWN OR SUSPECTED SEDIMENT CONTAMINATION

FIGURE 1-4
EXTENT OF CONTAMINATION: SOIL AND SEDIMENT
LAKE SANDY JO FS



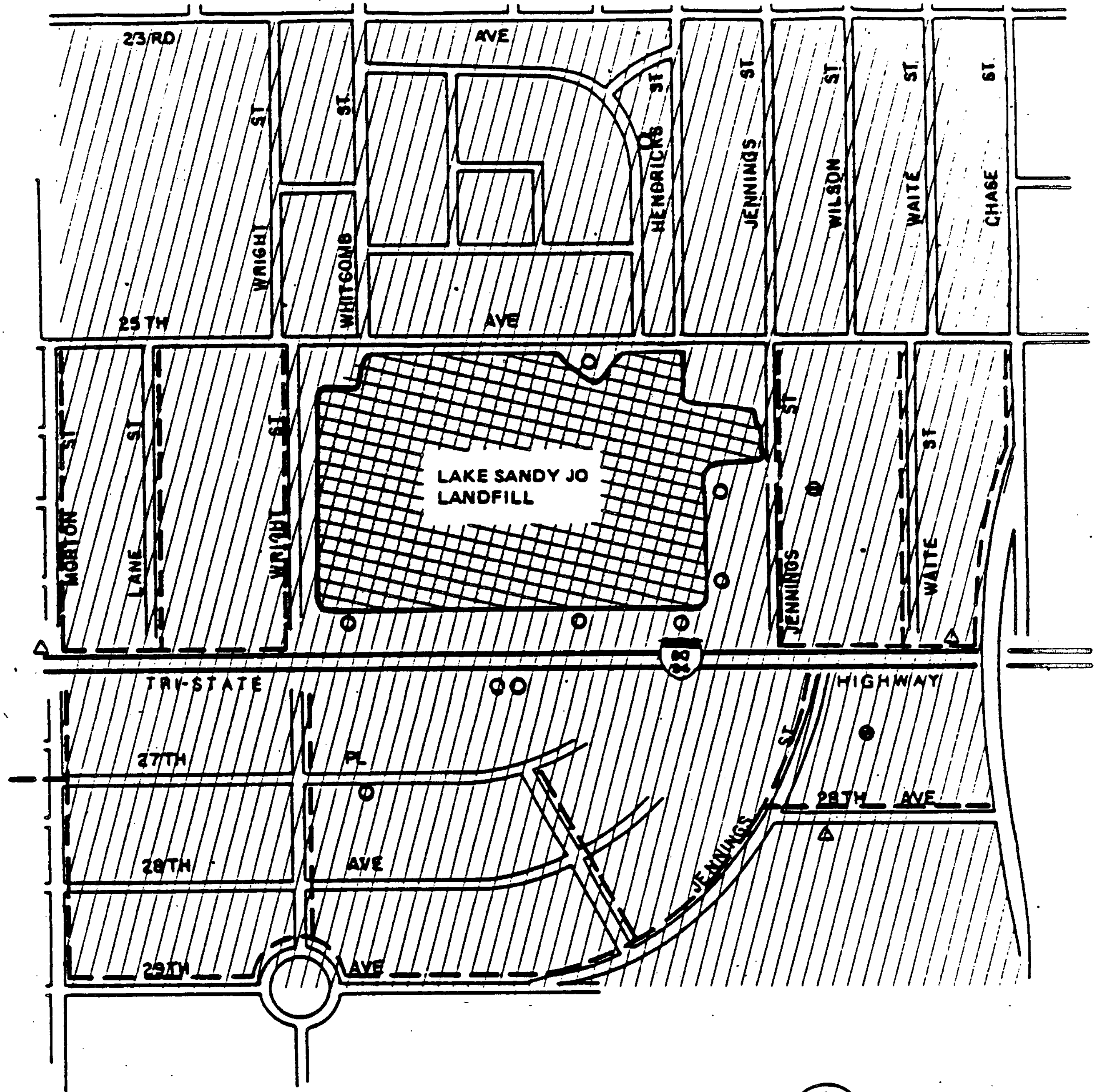
LEGEND

APPROXIMATE LOCATION OF SOUTHEAST DRAINAGE DITCH

AREA OF CALUMET AQUIFER WHICH MAY BE AFFECTED BY POTENTIAL FUTURE RELEASES OF CONTAMINANTS FROM THE LANDFILL

DASHED LINES SHOW AREA PROVIDING A BUFFER ZONE TO ACCOUNT FOR UNCERTAINTIES IN INTERPRETATIONS OF GROUNDWATER FLOW REGIME

FIGURE 2-3
IMPACT OF FUTURE RELEASES ON GROUNDWATER
LAKE SANDY JO FS



LEGEND

WATER MAIN

APPROXIMATE AREA OF DEED RESTRICTIONS

MONITORING WELL SAMPLING LOCATION

MONITORING WELL SAMPLING LOCATION, NEW WELL INSTALLED

SURFACE WATER AND SEDIMENT SAMPLING LOCATION

AREA OF SOIL COVER

N

0 600

SCALE IN FEET

FIGURE 5-3
ALTERNATIVE 3
WATER SUPPLY – WITH SOIL COVER AND ACCESS RESTRICTIONS
LAKE SANDY JO FS

ATTACHMENT 1

ENFORCEMENT (Confidential)

U.S. EPA sent a notification and information request to potentially responsible parties (PRPs) for the Lake Sandy Jo site on December 5, 1984. The list of PRPs included owners, operators, and some generators. The absence of records for the site limited our PRP list to only a few potential generators. Although most of the generators contacted responded to the request virtually no additional records came to light.

U.S. EPA will notify the PRPs of the Remedial Action contemplated at the site after issuance of the Record of Decision to give them an opportunity to conduct the Remedial Action. It is not anticipated that the PRPs will undertake this action.

Based upon insufficient documents and evidence, the chances of successful negotiations or of a fruitful cost recovery action appear slim. A Fund-financed cleanup with limited ability for cost recovery seems necessary and probable.