ALT 001

001421

RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION
6-18-86

Site: A. L. Taylor Site (Valley of the Drums), Bullitt County, Kentucky

Documents Reviewed

I am basing my decision primarily on the following documents describing the analysis of cost and effectiveness of remedial alternatives for the A. L. Taylor Site.

Conestoga-Rovers and Associates Limited, 1986 Preliminary Remedial Construction Design, A.L. Taylor Site, Bullitt County, Kentucky.

Metcalf and Eddy, Inc., 1984, Feasibility Study Addendum and Endangerment Assessment of the A. L. Taylor Site, Brooks, Kentucky.

Geosciences Research Associates, Inc., 1984, Hydrologic Investigation of the A. L. Taylor Site, Bullitt County, Kentucky.

Geosciences Research Associates, Inc., 1983, Technical Proposal for Soil and Groundwater Testing and Permeability Determination at A. L. Taylor Landfill Site, Bullitt County, Kentucky.

NUS Corporation, 1983, Sampling Investigation Report, A. L. Taylor Site, Brooks, Kentucky.

Metcalf and Eddy, Inc., 1983, Review of Data and Proposed Remedial Alternative for one A. L. Taylor Site, Brooks, Kentucky.

Geosciences Research Associates, Inc., 1983, A. L. Taylor Site Onsite Containment Plan.

Tenech Environmental Engineers, Inc., 1983, Final Design Report for Remedial Action of the A. L. Taylor Hazardous Waste Disposal Site.

Ecology and Environment, Inc., 1982, Feasibility Study of Remedial Alternatives for the A. L. Taylor Site, Task Report to the EPA.

Ecology and Environment, Inc., 1982, Remedial Action Site Investigation, A. L. Taylor Site, Brooks, Kentucky. Task Report to the EPA.

U.S. EPA, 1982, Historical Analysis A. L. Taylor Site, Brooks, Kentucky. Environmental Monitoring System Laboratory Environmental Photographic Interpretation Center, Warrenton, Virginia.

Ecology and Environment, Inc., 1982, A. L. Taylor Site Deep Test Boring, Letter Report.

Ecology and Environment, Inc., 1981, Geologic Investigation at A. L. Taylor Site, Letter Report to Richard D. Stonebraker.

Technos, Inc., 1981, Subsurface Investigation of the A. L. Taylor Hazardous Material Site, Bullitt County, Kentucky, Report to Ecology and Environmental Inc. and U.S. EPA.

Tenech Environmental Engineers, Inc., 1983, Contract Documents for Remedial Actions at the A. L. Taylor Hazardous Waste Disposal Site.

Tenech Environmental Engineers, Inc., 1983, Remedial Actions for the A. L. Taylor Hazardous Waste Disposal Site.

U.S. EPA, 1980, Valley of the Drums, Bullitt County, Kentucky, Oil and Special Materials Control Division, Washington, D.C.

U.S. EPA, 1979, Valley of the Drums, Shepherdsville, Kentucky, Environmental Response Team, Edison, New Jersey.

U.S. EPA, 1979, Soil Coring Study, A. L. Taylor Hazardous Waste Site, Bullitt County, Kentucky, Region IV Surveillance and Analysis Division, Athens, Georgia.

U.S. EPA, 1979, Environmental Monitoring Activities Associated with Hazardous Waste Storage Sites, Louisville, Kentucky, Region IV Surveillance and Analysis Division, Athens, Georgia.

U.S.G.S., 1960, Availability of Groundwater in Bullitt, Jefferson and Oldhall Counties, Kentucky.

Staff Summaries and Recommendations are atttached.

Description of Selected Remedy

The selected remedy includes:

° Remove surface water from the site.

° Secure pond sediments, sludge and materials from low-lying areas beneath the cap.

° Install final cap cover for containment of the waste materials.

° Construct a surface water drainage diversion which will route surface water around the cap area and which can accommodate a 25 year/24 hour storm.

° Implement a performance monitoring program on Wilson Creek (the only potential receptor of chemical migration) to evaluate the effectiveness of the clay cap insuring mitigation of surface chemical migration.

° Following the completion of the remedial construction the site will be secured with the installation of a six foot high chain link fence with appropriate gates.

° The site will be subject to a regular inspection and maintenance program following completion of remedial construction for a period of thirty (30) years.

° The active contaminant migration pathway at the A. L. Taylor site is by surface water runoff. The final cover is proposed as a method of containing waste materials and preventing contact between surface water and waste.

° Based on the cost-effective criteria of Section 300.68 (j) of the National Contingency Plan, evaluation of the remedial alternatives and the endangerment assessment, EPA recommends that the onsite containment alternative as proposed in the conceptual design submitted by the potentially responsible parties be implemented at this site.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), I have determined that the on site containment alternative is a cost effective remedy and provides adequate protection of public health, welfare and the environment. The Commonwealth of Kentucky has been consulted and agrees with the approved remedy.

In addition, the action will require future O & M activities to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved actions and eligible for Trust Fund monies for a period not to exceed 1 year.

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

JUN 18 1986

Date

Jack E. Ravan
Regional Administrator

Record of Decision
Remedial Alternative Selection
A. L. Taylor Site
Brooks, Kentucky

SITE LOCATION AND DESCRIPTION

The A. L. Taylor site, also known as "Valley of the Drums", is an uncontrolled industrial waste dump located in a small valley in northern Bullitt County just south of the Jefferson County line off Kentucky State Highway 1020 outside the community of Brooks, Kentucky (see figure 1).

The topography of the north-central portion of Bullitt County is characterized by steep slopes, particularly in that portion of the county bordering Jefferson County. The A. L. Taylor site falls within this general characterization having 20 to 30 percent slopes on the western and northern sides of the site and 10 percent on the southern and eastern sides. The site is not within any 100 year flood plain. Most of the surface area of the site has been graded so that the land gradually slopes eastward toward Wilson Creek, located adjacent to the site. There are five residences and a private country club located within a few thousand feet of the site.

Groundwater at the site occurs in two aquifers: a shallow unconfined perched aquifer and a deeper confined limestone aquifer. Groundwater monitoring wells drilled on site in both water-bearing units show that both are unusable as drinking water supplies due to poor quality and low yield. Local populations around the site use cisterns and public water supplies.

Wilson Creek, located adjacent to the site, is a small stream subject to seasonal low flow conditions. The stream lies within the Salt River drainage basin and is classified for recreational use.

SITE HISTORY

The A.L. Taylor site was first identifed as a waste disposal site by the Kentucky Department of Natural Resources and Environmental Protection (KDNREP) in 1967. The actual disposal site covers 13 acres of the 23-acre tract owned by Mr. Taylor. The surface features of the site have been substantially disturbed. Mr. Taylor excavated pits on site and emptied the contents of the drums into them and recycled the drums. Soil from nearby hillsides was eventually used to cover the pits after the KDNREP stopped Mr. Taylor from burning solvents. Thousands of drums were also stored on the surface, especially during later years of operations. During the remedial investigation, four or five major cells of buried wastes containing chemical liquids, sludges and crushed drums were identified.

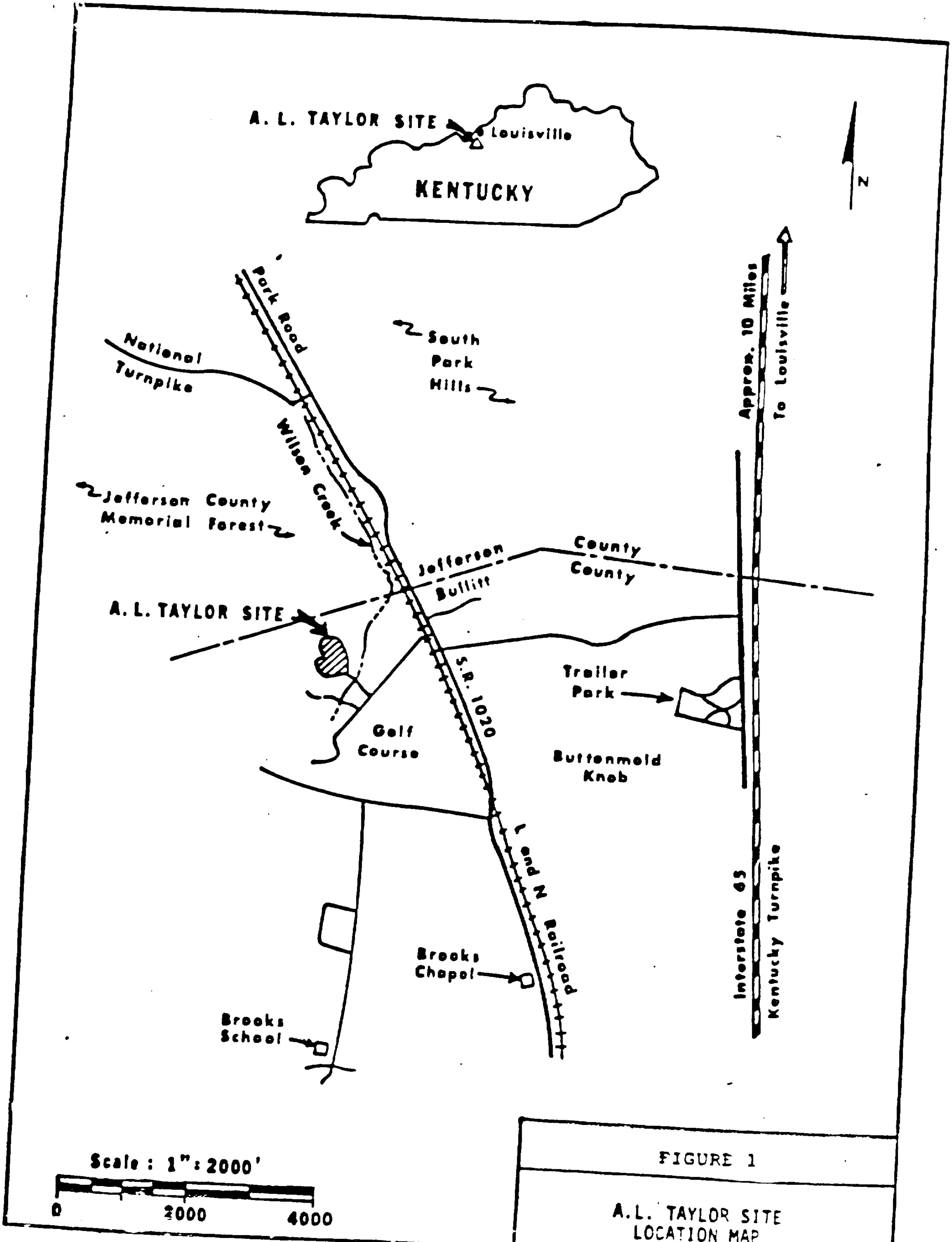

FIGURE 1

A.L. TAYLOR SITE
LOCATION MAP

Throughout the history of site operations from 1967 to 1977 Mr. Taylor never applied for the required state permits. The KDNREP first documented releases of hazardous substances from the site in 1975. They pursued legal actions against Mr. Taylor until his death in late 1977.

In January 1979, at the request of the KDNREP EPA responded to releases of oil and hazardous substances at the A. L. Taylor site. Under the authority of Section 311 of the Clean Water Act, the EPA Emergency Response Branch On-Scene Coordinator prevented further releases of pollutants into nearby Wilson Creek by constructing interceptor trenches and a temporary water treatment system, securing leaking drums, and segregating and organizing drums on site.

In 1980 the KDNREP contacted six responsible parties who identified and removed approximately 30 percent of the waste remaining on the surface of the site. Following this removal an estimated 4,200 drums remained.

In 1981 EPA again inspected the site and discovered deteriorating and leaking drums and discharges of pollutants into Wilson Creek occurring once again. EPA, responding under the emergency provisions of CERCLA, upgraded the existing treatment system and removed the remaining 4,200 drums of surface wastes off site for recycling or disposal. There remains, however, an unknown amount of waste buried on site.

CURRENT SITE STATUS

The paints and coatings industries of the Louisville area were the primary waste generators using the A. L. Taylor site. Some of the drums were emptied into open pits, cleaned and recycled. Other drums were buried on site, and during the later years of operation many drums were stored on the surface. The open pits which were once used for burning solvents had been covered over prior to EPA's involvement.

The initial drum inventory conducted in 1979 showed 17,051 drums on the surface and of those, 11,628 were empty. During the 1979 emergency response, several disposal pits were discovered. Over the next three years several investigations were conducted to define those disposal pits, including exploratory test pits and the use of geophysics (see Figure 2). An estimated volume of material and number of drums in each disposal pit is given in Figure 3.

Analytical data has been collected during several site actions including the two immediate removals and the remedial investigation. Hazardous substances detected on site include the following classes of compounds: heavy metals, ketones, phthalates, polychlorinated biphenyls (PCB), chlorinated alkanes and alkenes, aromatics, chlorinated aromatics, and polynuclear aromatics. In all,

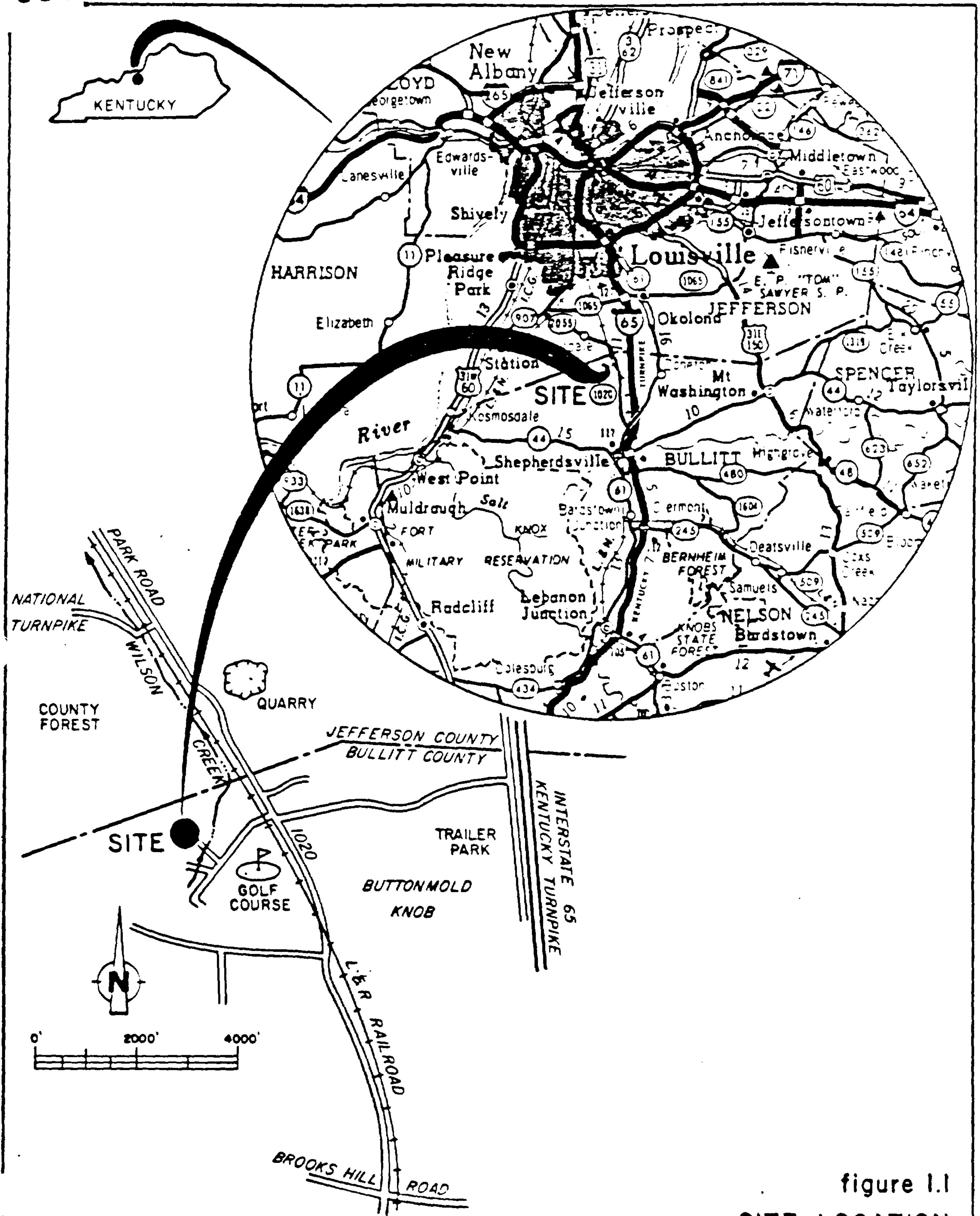

figure 1.1

SITE LOCATION
A.L. TAYLOR SITE
Bullitt County, Kentucky

CRA

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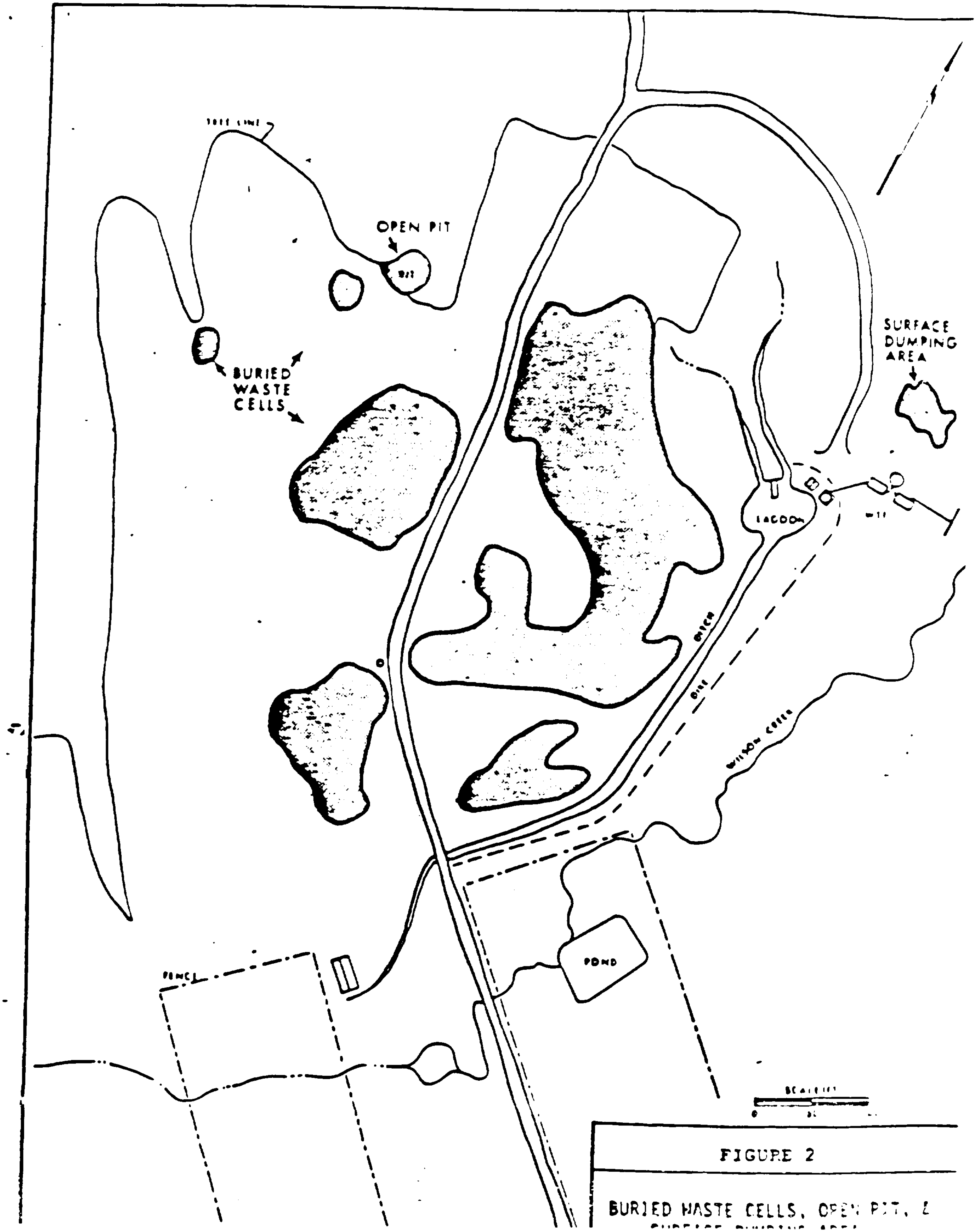

FIGURE 2

BURIED WASTE CELLS, OPEN PIT, &

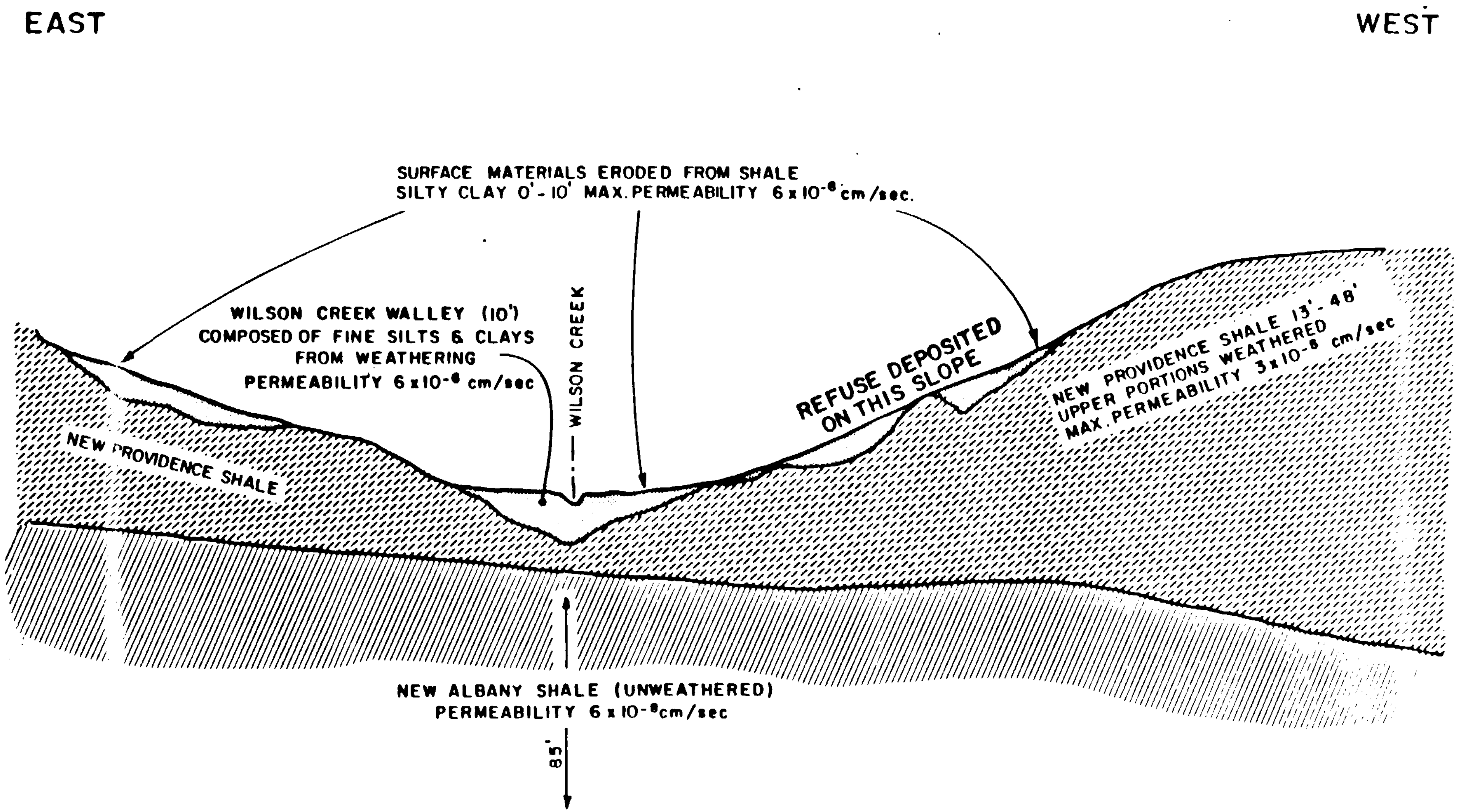

figure 2.1

SCHEMATIC OF
ORIGINAL VALLEY AND CURRENT GEOLOGY
Bullitt County, Kentucky

CRA

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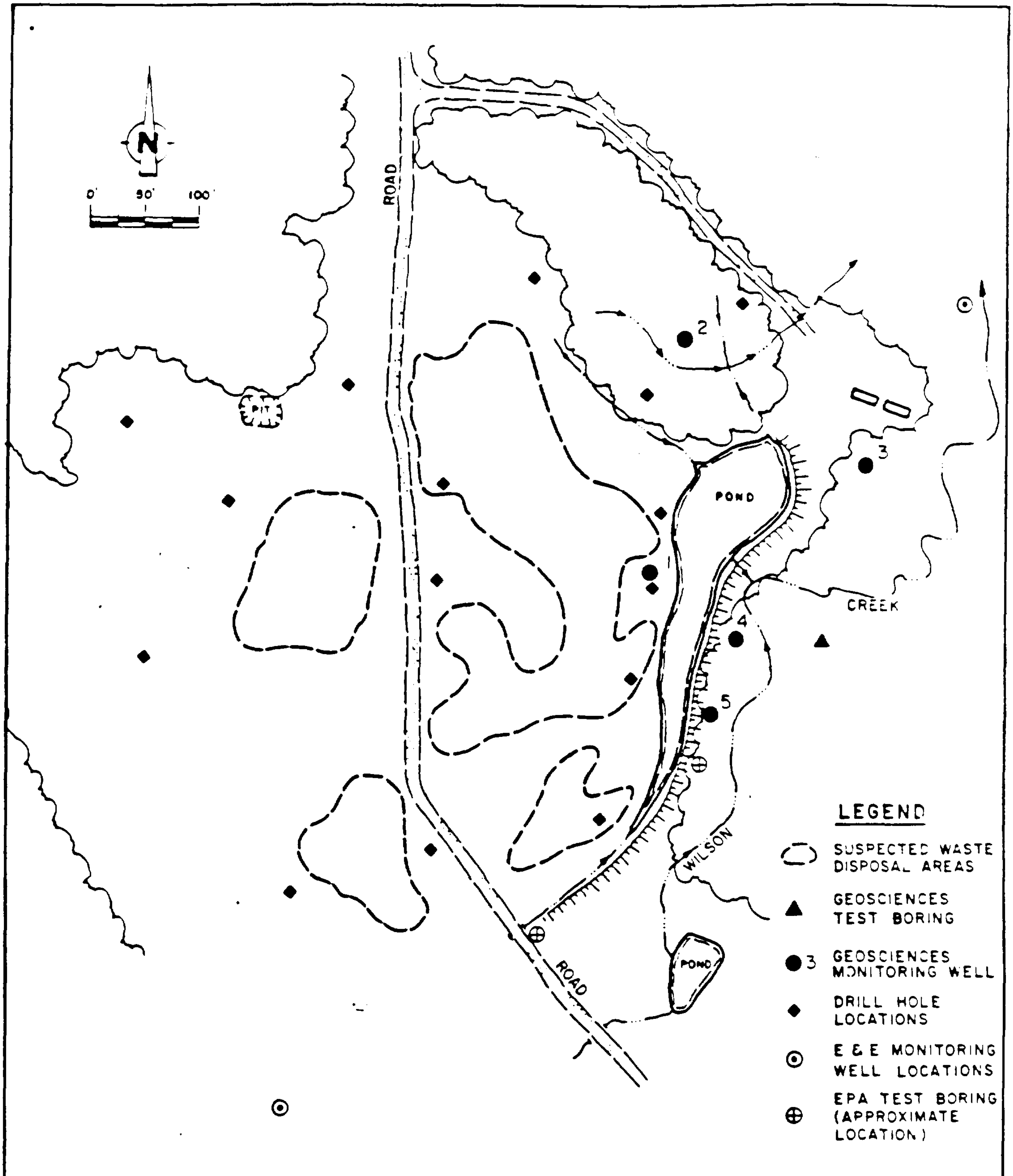

NOTE: REFERENCE TAKEN FROM FIGURE 1 - MAP OF TAYLOR SITE SHOWING LOCATIONS OF TEST BORINGS AND MONITORING WELLS

MAP MODIFIED FROM TENECH, SEPTEMBER 1983, FINAL DESIGN REPORT

figure 2.3

EXISTING TEST BORING AND MONITORING WELL LOCATIONS
A.L. TAYLOR SITE
Bullitt County, Kentucky

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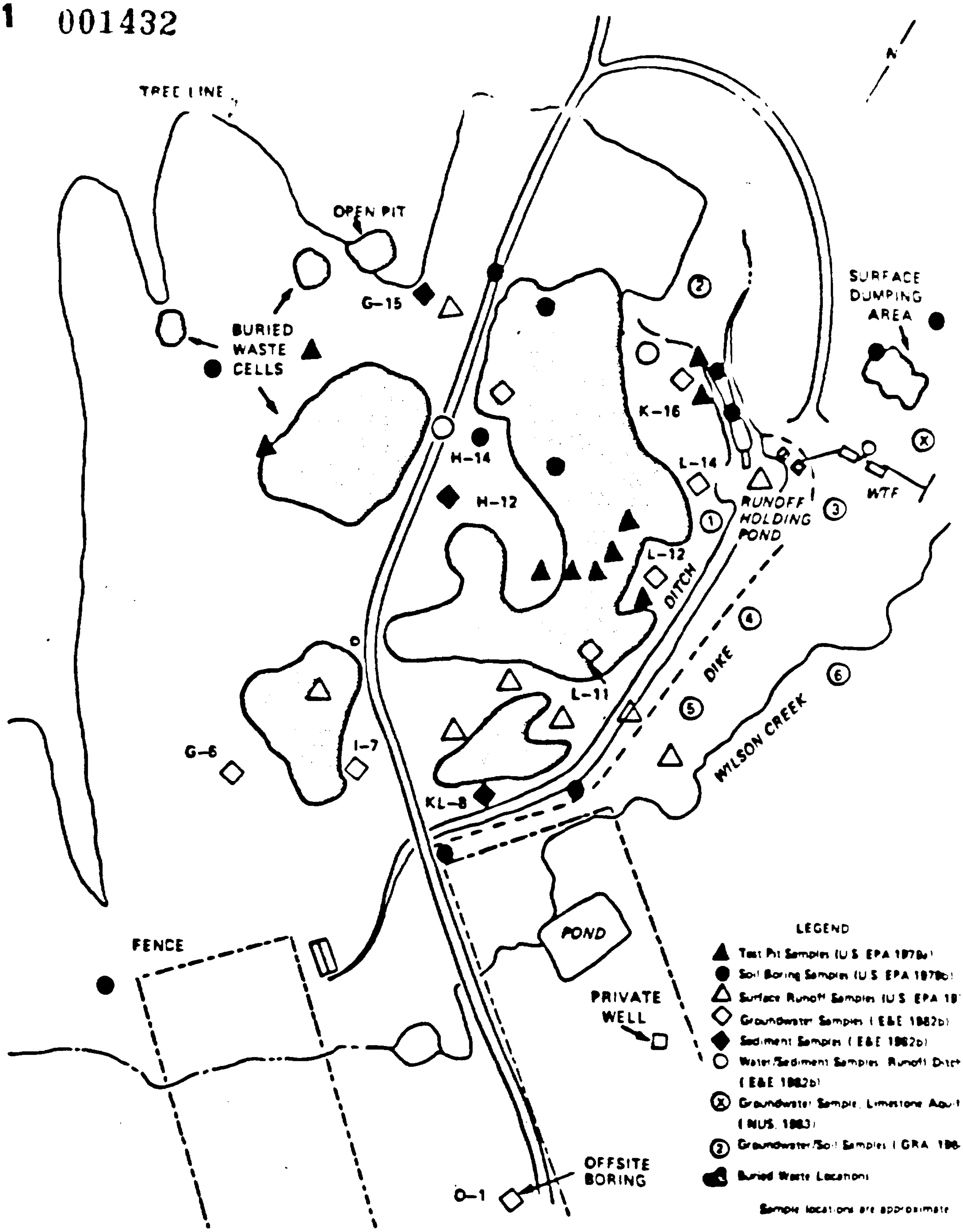

SAMPLING LOCATIONS AND SUSPECTED WASTE DISPOSAL
AREAS (SHADED AREAS)

METCALF & EDDY

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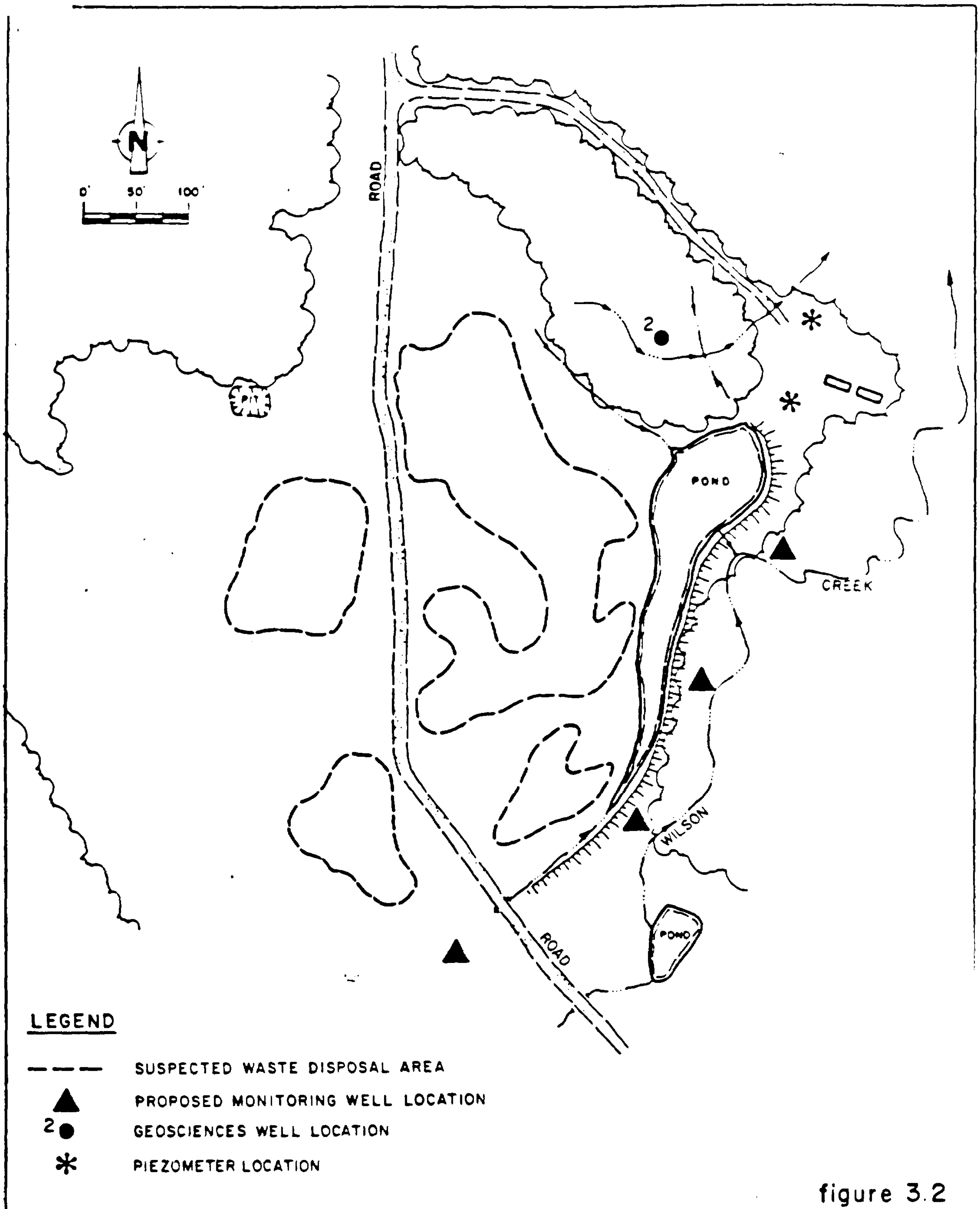

figure 3.2

PROPOSED MONITORING WELL LOCATIONS
A.L. TAYLOR SITE
Bullitt County, Kentucky

CRA

1715 – 20/11/85

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FIGURE 3

ESTIMATED QUANTITY OF BURIED WASTES
AT THE A. L. TAYLOR SITE
BROOKS, KENTUCKY

LOCATION	VOLUME OF MATERIAL (in cubic feet) Minimum[1]	Maximum[2]	NUMBER OF DRUMS (uncrushed) Minimum[3]	Maximum[4,5]
Trench 1	78,875	147,125	2155	8040
Trench 2	40,875	66,625	1117	3641
Trench 3	13,750	25,500	376	1393
Trench 4	38,000	63,750	1038	3484
Trench 5	21,812	36,312	596	1984
Totals	193,312	339,312	5282	18,542

NOTES:

1. Calculated using major anomaly area times 5 feet thickness plus significant anomaly area times 2 feet thickness.

2. Calculated using major anomaly area times 10 feet thickness plus significant anomaly area times 2 feet thickness.

3. Calculated using density of one drum per 36.6 cubic feet and minimum volume.

4. Calculated using density of one drum per 18.3 cubic feet and maximum volume.

5. If drums are crushed, the estimated number may increase from two to five times the number of drums given.

6. The values given are order of magnitude estimates only. Area locations are indicated in Figure 1-2. One 55-gallon drum occupies about 9.15 cubic feet. Estimates calculated assume that the drums were randomly dumped, yielding densities ranging from 18.3 to 36.6 cubic feet/drum.

approximately 140 compounds have been identified. The chemicals found most often and in highest concentrations were:

xylene	methyl ethyl ketone
methylene chloride	acetone
phthalates	anthracene
toluene	fluoranthene
alkyl benzene	vinyl chloride
dichloroethylene	aliphatic acids

PCBs were detected in low concentrations and several metals including barium, zinc, copper, strontium, magnesium and chromium were detected in concentrations exceeding background levels.

The highest concentrations of organic contaminants detected on site, other than from drum samples, were from liquid samples collected in the test pits. The average concentration of the major organic compounds detected are found in the first column of Table 2. Some of the same compounds were detected in water samples from borings located downgradient of the test pits and are included in Table 2. It is significant to note that some water samples from the borings were collected immediately downgradient of the disposal cells, yet the analyses showed relatively low concentrations of contaminants when compared to the pit samples.

Groundwater and surface water resources were evaluated as potential routes of exposure to hazardous substances released from the A. L. Taylor site. Under existing and projected usage patterns neither of the sources appears to be a likely route of exposure to populations located downstream of surface water routes or downgradient of groundwater movement from the site.

Groundwater is not currently a source of drinking water in the vicinity of the site. The five homes located closest to the site are on cisterns, other nearby residences and businesses are either on cisterns or are connected to municipal water supplies. Poor water quality and low yield account for the low use of both shallow and deep aquifers near the site. An adjacent landowner had a well drilled but it was never used because of low yield. This well was sampled during the remedial investigation and found to contain concentrations of iron and manganese that were approximately 30 and 3 times National Drinking Water Standards, respectively.

Similarly, a deep well installed in the limestone aquifer during the remedial investigations had a flow rate of four gallons per minute and contained concentrations of chloride that exceeded National Drinking Water Standards by a factor of five.

Another factor limiting future human exposure risks is the limited population growth projected in the vicinity of the site. Topographic features of the area surrounding the site make it largely unsuitable for development.

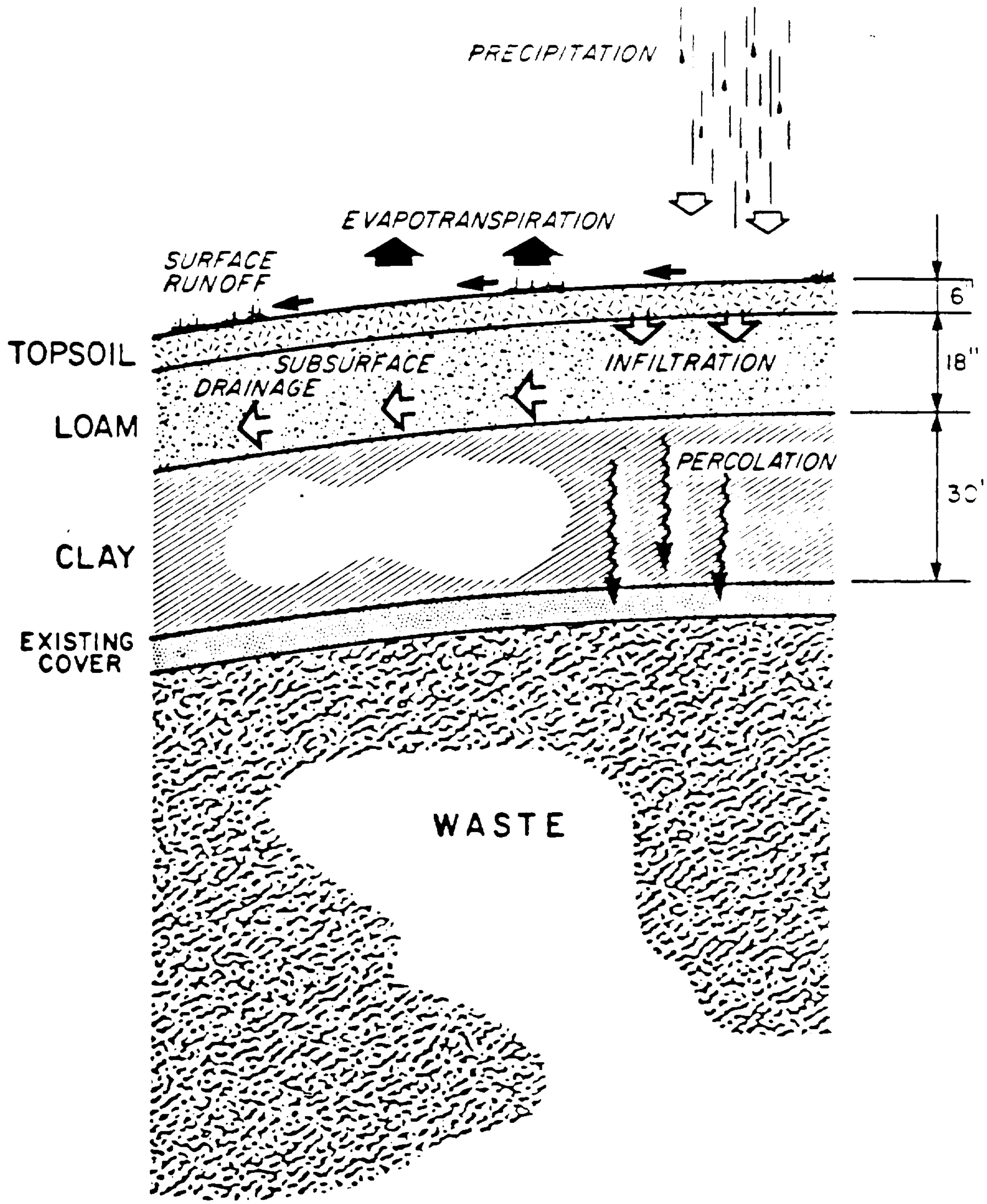

figure 6.2

FINAL COVER SCHEMATIC
A.L. TAYLOR SITE
Bullitt County, Kentucky

CRA

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Geohydrologic studies of the site show that migration of contaminants off site is likely to be very slow. The annual volume of groundwater moving through the site is calculated to be low and assuming the fastest rate of groundwater flow, 2.41 feet/year, and no attenuation of contaminants in the site soils, any contaminant plume might take 20 years to move 50 feet.

A deep well drilled on site revealed up to 85 feet of unweathered shale isolating the limestone aquifer from the contaminated overburden. Pressure permeability tests performed on both shale units indicated little or no fracturing in the formations reducing the likelihood of contaminants moving into the deeper limestone aquifer.

Surface water, like groundwater, is not believed to be a severe potential exposure route. The Salt River drainage basin which drains into the Ohio River is not a source of drinking water in the vicinity of the Salt-Ohio River confluence. Louisville does get its drinking water from the Ohio River but at a location upstream of the Ohio-Salt River confluence. No other water intakes are located along the Ohio River for many miles downstream but even if there were, the dilution factor (a million fold) should be great enough to prevent any measurable effects.

Potential exposure through recreational use of surface waters also is low due to the dilution factor. Recreational use of the streams leading from the site, although not documented, is believed to be low until the Salt River confluence is reached.

ENFORCEMENT

On April 1986, the United States filed a cost recovery action pursuant to Section 107 of CERCLA, Section 311 of the Clear Water Act, and Section 7003 of the Resource Conservation and Recovery Act for emergency and other response costs incurred at the site since 1979. The lawsuit was filed in the United States District Court for the Western District of Kentucky against the current and past owners and operators of the site and four of the primary generators. The pending action was filed following the unsuccessful conclusion of negotiations concerning future remedial activities at the site. Additional cost recovery may be expected as future remedial activities are completed at the site.

COMMUNITY RELATIONS

Two public meetings were held to present the recommended remedial alternative. The first meeting was held on August 11, 1982 to discuss the modified onsite containment/excavate-and relocate alternative. Representatives of EPA, KDNREPC, local authorities, local media and the community were present. Discussions were held outlining the development of the alternatives and the selection process. Following the public meeting, 30-day comment period was given. All reports and data were left on file at the Bullitt county courthouse. No written comments were received.

Another public meeting was scheduled for presentation of the second remedial alternative recommendation. In this second meeting, held on June 16, 1983, the onsite containment alternative was presented as the newly selected remedial alternative. As in the first meeting, community turnout was low and no written comments were received during the 30-day comment period following the public meeting.

ALTERNATIVE EVALUATION

Remedial alternatives evaluated at the A.L. Taylor Site are source control measures. The migration of hazardous substances from their original disposal area is minimal and the remedial alternatives considered are to control off-site migration.

The objectives of the remedial action are broad enough to address all routes of release but focus on those areas with the greatest potential for having adverse effects on public health and the environment. The remedy will also take into account cost-effective considerations. With these criteria, the following are the objectives for remedial action at the A.L. Taylor site:

1. The air quality will be protected by the control of emissions of particulate matter and toxic gases.

2. The recreational users and biota of downstream surface waters will be protected from leachate and contaminated runoff.

3. Groundwater, although low yielding and unpotable, contributes to surface water and will be protected by reducing aquifer recharge.

4. Local populations will be protected from direct contact with contaminated soils.

The following remedial alternatives were evaluated.

1. No Action

The no action alternative is not acceptable because the wastes would remain on site in an uncontrolled manner. The site would continue to pose a potential threat to Wilson Creek.

2. Minimum Action Alternative

This alternative consists of leaving all buried waste in place, regrading and revegetating the existing site surface, removing wastes from the open pit and surface dumping area northeast of the site, establishing a groundwater monitoring program, operating and maintaining the existing runoff collection and treatment system and preparing and filing a record plat. This alternative is developed as a base line comparison for the other alternatives and is not intended to meet the requirements of a RCRA facility.

3. Onsite Containment Alternative

The basic idea behind the onsite containment alternative is to isolate the buried hazardous waste without disturbing the existing waste cells. The RCRA regulations governing a hazardous waste landfill will be used as guide lines where possible.

The alternative includes a slurry wall keyed to bedrock, clay soil cover, leachate/gas collection system, leachate treatment system, runoff/drainage diverson, revegetation, security fence and sign, and record plat.

4. Excavate-And-Relocate Offsite

This alternative includes excavating most of the onsite contamination, transporting it to an approved disposal facility and restoring the site. This alternative will be most effective in controlling long-term pollution levels at the site. The cost of this approach is strongly dependent on distance to the ultimate disposal site.

Ultimate disposal facilities costs for contaminated soils are given for comparison in the Table 15

5. Modified Onsite Containment/Excavate-And-Relocate

This alternative combines onsite containment and excavate-and-relocate to provide a hybrid alternative. One approach considered was removing only the free liquid in the waste pits but was rejected for cost reasons. The approach developed will remove the most toxic and highly polluted material on site. Both groundwater and surface water diversion will be provided, to prevent soil moisture, shallow groundwater, and surface water from contacting these contaminated materials and acting as a transport medium Groundwater diversion will be accomplished by a combination of upgradient slurry walls and french drains. Surface water diversion will be provided by a drainage method similar to the diversion ditch proposed in the onsite containment alternative. In addition to diversion, a landfill cap will prevent vertical infiltration of rainwater into the contaminated zone. The landfill cap consists of 2 feet of topsoil and clay. The site will be surrounded with a chain link fence and a locking gate for site security. Monitoring wells will be installed between the site and Wilson Creek. Operation and maintenance requirements at the site will be kept to a minimum. Leachate collection requirements have been eliminated. Annual maintenance of the site will consist of repair of erosion damage, mowing and revegetation. Annual monitoring of the sampling wells will be required.

6. Excavate-and-Relocate Onsite

This alternative consisted of excavation of all contaminants onsite and placing them in a cell constructed onsite which would conform fully with RCRA requirements.

A conceptual design of a landfill cell was developed for consideration as a remedial alternative. The scope of this study included a geophysical remote sensing investigation of two areas within the general site which were being considered for the construction of the land disposal cell. The quantities of buried wastes found during the second phase of this investigation indicated much more waste remained onsite than could safely be disposed of in this small landfill area.

7. Modified Onsite Containment Alternative (Potential Responsible Party)

Geosciences Research Associates, Inc. (GRA) and Tenech Environmental Engineers, Inc. (TEE) have developed a modified onsite containment approach at the A. L. Taylor Site for the PRPs. This approach is based on work performed by Ecology and Environment, Inc. (E&E). This alternative consisted of an impermeable cap and soil cover, drainage diversion ditch, groundwater monitoring well system, site clearing, regrading and revegetation, security fence and signs.

Where possible RCRA regulations governing a hazardous waste landfill will be used as guidelines. The proposed cap will prevent surface runoff contact with contaminated soil and the subsequent generation of contaminated runoff. The installation of upgradient diversion ditches will eliminate surface runon.

Upgradient monitoring wells will be installed on the site to augment the existing downgradient system. The proposed modified containment alternative would mitigate the threat to public health and the environment by eliminating the present routes of exposure.

Initial Alternatives Recommended - 1982

On August 11, 1982, a Decision Memorandum was issued from EPA Region IV recommending the modified onsite containment/excavate-and-relocate alternative. A review meeting was held August 23, 1982 to discuss the recommendation. The meeting resulted in EPA Headquarters requesting additional information to justify removal of wastes offsite. As the result of these further studies the Modified Onsite Containment/Excavate-and-Relocate alternative could not be justified under the cost-effective requirements of CERCLA. EPA Headquarters indicated that the onsite containment alternative should be considered in more detail.

During negotiations for the final remedy, the Potentially Responsible Parties (PRPs) submitted a conceptual design for the onsite containment alternative. This conceptual design differed from the onsite containment alternative presented in the feasibility study in that the leachate collection system and slurry wall had been eliminated. EPA, Region IV requested additional information before the conceptual design could be fully evaluated. A hydrogeologic investigation was conducted by the PRPs consultants. This information was included as an addendum to the feasibility study prepared under EPA contract by Metcalf & Eddy, Inc. (M & E) in August, 1984.

The addendum also included updated cost estimates for the alternatives developed by E & E and gave cost estimates for the onsite containment alternative as proposed by the PRPs. For comparison an estimate for the cost of constructing a RCRA landfill onsite was given, and an endangerment assessment was added. These cost estimates are included in Table 3-7.

Table 3 presents a comparison of the most significant criteria affecting the alternative selection process. The alternatives are compared using the evaluation criteria presented in the feasibility study. Table 13 presents each of the alternatives and the important facts relative to each comparative evaluation criteria: reliability, implementability, RCRA conformance, safety and operation and maintenance.

Table 5 presents a summary of the proposed Remedial Alternative costs which includes capital cost for implementation of the remedy and the associated long-term monitoring costs.

In August 1985 the Potentially Responsible Parties (PRPs) submitted the conceptual design of the onsite containment alternative. EPA added the following changes:

1. to upgrade the proposed cap to conform with the guidelines of the Resource Conservation and Recovery Act (RCRA).

2. to install additional upgradient monitoring wells

3. to establish a long term operation and maintenance program that included a groundwater and surface water monitoring program, well maintenance, rehabilitation, cover, and cap maintenance.

4. Final slope of cover will be between three and five percent where possible.

The total cost with the additional EPA requirements added would be $713,250 for construction costs and $503,876 for O & M cost, with a total project cost of 1,217,126.

Recommended Alternative - 1986 (Alternative #7)

The selected remedy is consistent with the remedy first proposed in the EDD (1985) and is the most cost effective remedy which adequately protects the public health and welfare and the environment.

As a result of Negotiations with the Potentially Responsible Parties Committee, technical changes and considerations were made to the previously proposed remedy.

The selected remedy includes:

Removal of ponded water from the site.

Secure pond sediments, sludge and materials from low-lying areas beneath the cap.

Install final cap cover for containment of the waste materials.

Construct a surface water drainage diversion which will route surface water around the cap area and which can accommodate a 25 year/24 hour storm.

Implement a performance monitoring program on Wilson Creek (the only potential receptor of chemical migration) to evaluate the effectiveness of the clay cap to mitigate surface chemical migration.

Monitoring of groundwater quality will be accomplished by eight (8) newly installed nested wells placed along the Creek valley at four locations, to monitor both the shallow and the deeper groundwaters. In addition, these wells will provide an early warning of any contaminant movement toward Wilson Creek via groundwater, if groundwater is present.

Following the completion of the remedial construction, the site will be secured with the installation of a six foot high chain link fence with appropriate gates.

The site will be subject to a regular inspection and maintenance program following completion of remedial construction for a period of thirty (30) years.

The cover will consist of a 30- inch layer of clay to attain a permeability of 1 x 10 -7 cm/sec., followed by an 18-inch layer of material with a permeability between 10 -3 and 10 -5 cm/sec. A 6- inch layer of topsoil will be placed as final cover and vegetated with cover plants having root systems which will stabilize the top soil and loam against erosion but which will not penetrate the clay material of the cap.

The active contaminant migration pathway at the A.L. Taylor site is by surface water runoff. The final cover is proposed as a method of containing waste materials and preventing contact between surface water and waste.

RCRA Closure Standards

After review of the information, the decision was made that groundwater flow at the site is minimal, recharge rates are very slow and there are no residential (drinking) wells within miles of the site. Naturally occurring high levels of Mg & Ca in the groundwater also combine to make the groundwater marginally useful as a drinking water source. The naturally occurring soils fulfill the permeability requirements of RCRA closure standards.

RCRA Cap

The specifications for the RCRA cap are essentially the same as in the original remedy noted in the Feasibility Study. However, based on information supplied by the PRPs and review of the files, a flexible membrane liner does not appear to be needed at the A.L. Taylor Site. This decision was based on the very low permeability of the underlying materials.

Groundwater Monitoring Wells

Four (4) additional nested groundwater monitoring wells will be installed (2 at each location). Locations and specifications are in the project work plan.

The Remedial design of the final cover should accomplish the following objectives:

provide long-term minimization of migration of liquids through the final cover (to minimize leachate),

Function with minimum maintenance,

Promote drainage and minimize erosion or abrasion of the cover,

Accomodate settling and subsidence so that the cover's integrity is maintained,

Have a permeability less than or equal to the permeability of any bottom liner or natural subsoils present.

Listed below are programmed construction cost estimates.

PROGRAMMED CONSTRUCTION COST ESTIMATE

A. L. TAYLOR SITE REMEDIATION

PROJECT START-UP AND CLOSE-OUT	$ 28,500.00
HEALTH AND SAFETY	$ 22,000.00
SITE PREPARATION	$ 43,410.00
CAP PLACEMENT	$372,620.00
RESTORATION	$ 81,749.00
SUB-TOTAL	$548,279.00
CONTINGENCIES (25% of SUBTOTAL)	$137,070.00
ENGINEERING DESIGN, SUPERVISION AND CONTRACT MANAGEMENT	$110,000.00
TOTAL	$795,349.00

Remedial Alternative Analysis

The feasibility study for the A.L. Taylor site was initially developed by Ecology and Environment, Inc. (EE) in 1982. The study contained evaluations of minimum action, onsite containment, and excavate and relocate offsite alternatives. A modified alternative was subsequently developed. The modified onsite containment/excavate and relocate alternative was developed at the request of the KDNREP. This alternative was incorporated in the revised feasibility study. The following are the criteria used to assess the remedial options:

Reliability: This considers the extent to which a system, device, or technology will perform a desired function correctly for a number of repeated trials or for an extended period of time. Without test data to measure performance against an established standard, reliability of each alternative was based on scientific judgement. The alternatives were ranked as to their relative reliability without attempting to establish the quantitative reliability of each alternative.

Implementability: This is the physical, finanical and legal power to carry out the alternative. Because of the varied nature of the possible remedial alternatives, they were evaluated based on their ease of implementation. Consideration was given to public opinion, regulatory procedures, duration, scheduling, natural constraints (such as weather), and technical feasibility. The alternative that could be implemented most easily was given preference.

RCRA Conformance: Each alternative design was compared to new landfill design standards permitted under the Resource Conservation and Recovery Act (RCRA). The alternative which provided environmental protection performance similar, to a RCRA permitted landfill was given preference.

Environmental Concerns: These were identified for each alternative, and the alternative with the least adverse environmental impact received preference.

Safety Requirements: These were developed to mitigate the risks of construction of each alternative. Where necessary, risk assessments were made on each operation. The safety requirements and relative preference was given to the alternative having the lowest relative risk and least safety requirements.

Operation and Maintenance Efforts: Manpower and equipment requirements were identified for each alternative for a 30 year project period. Maintenance effort was based on parts replacement, corrosion control, and safety requirements when applicable. Operation personnel, utility cost, and major system replacement requirements for each alternative were developed. Preference was given to the alternative with the least long term commitment of capital, manpower, and equipment.

Table 14 presents a comparison of the most significant criteria affecting the alternative selection process. The alternatives are compared using the evaluation criteria presented in the feasibility study. Table 13 presents each of the alternatives and the important facts relative to each comparative evaluation criteria: reliability, implementability, RCRA conformance, safety, and operation and maintenance.

Table 1 presents a summary of the proposed Remedial Alternative costs which includes capital costs for implementation of the remedy and the associated long-term monitoring costs.

Consistency With Other Environmental Laws

-Clean Water Act is a state delegated program and the Commonwealth has not stated any objections to the selected alternative.

-There are no impacts to the air in the area therefore the remedy will comply with the Clean Air Act.

-No proposed actions will require TSCA compliance.

-Resource Conserative and Recovery Act (RCRA) staff have been contacted and state no objection to the proposed remedy.

Operation and Maintenance (O & M)

O & M costs at this site will be the collection and analysis of groundwater and surface water samples, maintenance of the fence, cap, vegetated cover and monitoring wells over a period of 30 years. The Commonwealth will assume these functions one year after completion of construction.

Funding

It is recommended that this remedy be funded at 10% Commonwealth funds, 90% Federal Funding.

Schedule

June 18, 1986	Sign Record of Decision
June 30, 1986	Initiate Remedial Design
March 31, 1987	Complete Design
September 1, 1987	Initiate Construction
September 1, 1987	Complete Construction

APPENDIX

TABLE 1. SUMMARY OF PROPOSED REMEDIAL ALTERNATIVE COSTS

Alternative	Capital Cost	O&M Costs	O&M Costs[1]	Total Costs[2]
E&E Minimum Action Alternative	$157,000	$114,676	$332,200	$489,200
E&E Onsite Containment Alternative	$602,000	$239,290	$704,000	$1,306,000
E&E Excavate-and Relocate Alternative	$2,934,000	$86,396	$242,200	$3,176,200
PRP Consultant Onsite Containment Alternative	$531,875	$114,676	$332,200	$864,075
RCRA Landfill Alternative	$1,423,100	$294,656	$890,300	$2,313,400
RCRA Offsite Disposal Alternative #1	$4,359,425	-	-	$4,359,425
RCRA Offsite Disposal Alternative #2	$5,497,285	-	-	$5,497,285

1. These costs assume that the cost escalation factor is the same as the interest rate, 10%.
2. The total cost includes the O&M costs with the cost escalation factor the same as the interest rate.

TABLE 2 ORGANIC CHEMICAL CONCENTRATIONS IN GROUNDWATER. A. L. TAYLOR SITE

	Test Pit Liquid[1] 1979		Test Soil Borings[2] 1982	
	Average Condition	(Std. Deviation) ug/l		
Acenapthene	36,000	(80,498)	--	
Anthracene/Phenanthrene	34,000	(76,026)	--	
Bis (2-ethylhexyl) Phthalate	580,641	(1,296,562)	--	
Ethyl Benzene	7,704	(10,106)	1,150	(2,371)
Methyl Ethyl Ketone	7,940	(10,926)	--	
Methyl Isobutyl Ketone	9,976	(12,985)	--	
Napthalene	240,020	(536,645)	38	(28)
Toluene	11,980	(10,643)	1,642	(1,879)
Trans 1,2-Dichloroethylene	33,680	(70,648)	302	(598)
Vinyl Chloride	989	(1,264)	30	(60)
Xylene	2,212,360	(4,912,446)	NQ[3]	

1. U.S. EPA, 1979a. Liquid found in test pits dug by backhoe in principal area suspected of containing buried wastes. A-4, A-5, A-6, A-7, A-10. When no value was reported for a given site, zero concentration was assumed.
2. U.S. EPA, 1982c. Test wells drilled downgradient of same principal burial area. Average of K-16, L-14, L-12, L-11. When not detected in a given test well, zero ug/l was assumed.
3. NQ - Detected but not quantified.

TABLE 3 UPDATE OF E&E CONSTRUCTION COST ESTIMATE FOR THE MINIMUM ACTION ALTERNATIVE

Item	Cost, Thousand Dollars 1982 Lower	1982 Upper	1984 Lower	1984 Upper
Pit and Surface Dumping:				
Excavation & Backfill	12.6	18.9	13.5	20.2
Transport & Disposal	51.7	79.5	55.3	85.1
Site Rehabilitation (Minor grading, fertilizing, trees, seeding & mulching)	4.0	5.0	4.3	5.4
Wastewater treatment renovation/ operation/disassembly*	26.8	68.6	28.7	73.4
Monitoring Wells	10.5	10.5	11.2	11.2
Security & Safety, Plat Survey & Legal Fees	2.0	3.0	2.1	3.2
Warning Signs	0.1	0.1	0.1	0.1
TOTAL	107.7	185.6	115.2	198.6

* The wastewater treatment system will be renovated so that the lagoon water can be treated. Once the lagoon water is treated, the system will be disassembled and shipped to the KDNREP.

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TABLE 4 UPDATE OF E&E CONSTRUCTION COST ESTIMATE FOR THE ONSITE CONTAINMENT ALTERNATIVE

	Cost, Thousand Dollars			
	1982		1984	
Item	Lower	Upper	Lower	Upper
Slurry Wall	70	120	75	128
Clay Cap	52	102	56	109
Topsoil Cover	60	100	64	107
Drainage Diversion Channel	4	7	4	7
Monitoring Wells (1-up;3 down)	8	13	9	14
Leachate Collection System	43	72	46	77
Wastewater treatment renovation/ operation/disassembly	207	69	29	73
Site Grooming, Clearing, Grubbing & Initial Revegetation	4	7	4	7
Security Fence, Gate, Signs	28	46	30	49
Utilities Installation	1	1	1	1
Record Plat	3	4	3	4
Project Management, Monitoring, Sampling and Permitting	40	60	43	64
SUB-TOTAL	340	601	364	640
Undefined Details & Contingencies (20%)	68	120	73	128
TOTAL	408	721	437	768

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TABLE 5 UPDATE OF E&E CONSTRUCTION COST ESTIMATE FOR THE EXCAVATE-AND-RELOCATE ALTERNATIVE

Cost, Thousand Dollars				
1982	1984			
Item	Lower	Upper	Lower	Upper
Agency Management	5	12	5	13
Project Management	15	32	16	34
Pre-Excavation Sampling and Permitting	29	29	31	31
Mobilization	17	17	18	19
Excavation	85	204	91	218
Pollution Control*	68	151	73	162
Backfilling & Topsoil	80	179	86	192
Closure	29	32	31	34
Utilities	1	1	1	1
SUBTOTAL	329	657	352	704
Undefined Details (10%)	33	66	35	70
Contingencies (10%)	33	66	35	70
SUBTOTAL	395	789	422	844
Transport & Disposal	1,000	3,300	1,070	3,531
TOTAL	1,395	4,089	1,492	4,375

* E&E has included the wastewater treatment costs in this item.

TABLE 6 SUMMARY OF CONSTRUCTION COST ESTIMATE FOR PRP CONSULTANT REMEDIAL ALTERNATIVE

Technology	Cost
Site Clearing	$7,930
Renovation of Treatment System	$39,200
Processing Lagoon Water	$7,000
Removal of Renovated Treatment System	$9,800
Diversion Trench Installation	$39,875
Site Grading	$22,820
Monitoring Well System	$18,200
Site Cover and Cap	$313,150
Revegetation	$28,300
Security Fence and Signs	$40,600
Record Plat	$5,000
	$531,875

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TABLE 7 SUMMARY OF CONSTRUCTION COST ESTIMATE FOR A NEW RCRA LANDFILL

Technology	Cost
Site Clearing	$7,930
Renovation of Treatment System	$39,200
Processing Lagoon Water	$7,000
Removal of Renovated Treatment System	$9,800
Excavation and On-Site Storage of Site Soils	$420,000
Diversion Trench Installation	$39,875
Bottom Liner and Leachate Control	$234,080
Monitoring Well System	$25,280
Site Cover and Cap	$573,525
Revegetation	$21,500
Security Fence and Signs	$40,000
Record Plat	$5,000
	$1,423,110

001454

TABLE 8 PRESENT WORTH CALCULATION(1) OF THE LONG TERM MONITORING COSTS-MINIMUM ACTION ALTERNATIVE

1. Sampling/analytical costs:	
P/A - 1st year - $18,000	$16,364
P/A - 4 years - $9,000/year = $28,530	
P/F - 1 year - $28,530	$25,936
P/A - 25 years - $6,000/year = $54,420	
P/F - 5 years - $54,420	$33,790
2. Replacement of Monitoring Wells	
P/F - 15 years - $18,200	$4,358
3. Well Maintenance and Rehabilitation	
P/A - 50% - 5 - $4,000	
P/F - 5, 10, 15, 20, 25 years - $4,000	$5,948
4. Cover and Cap Maintenance	
P/A - 30 years - $3,000	$28,280
	$114,676

1. Assume: 10% interest.

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TABLE 9 PRESENT WORTH CALCULATION(1) OF THE LONG TERM MONITORING COSTS-ONSITE CONTAINMENT ALTERNATIVES

1. Leachate management system*	
P/A - 30 years - $9,000/year	$ 84,834
2. Sampling/analytical costs:	
P/A - 1st year - $18,000	16,364
P/A - 4 years - $9,000/year = $28,530	
P/A - 1 year - $28,530	25,936
P/A - 25 years - $6,000/year = $54,420	
P/F - 5 years $54,420	33,790
3. Replacement of Monitoring Wells	
P/F - 15 years - $18,200	4,358
4. Well Maintenance and Rehabilitation	
P/A - 50% - 5- $4,000	
P/F - 5, 10, 15, 20, 25 years - $4,000	5,948
5. Cover and Cap Maintenance	
P/A - 30 years - $3,000	28,280
6. Gas Monitoring	
P/A - 1 year - $12,000/year	10,900
7. Miscellaneous (utilities, surface water control maintenance)	
P/A - 30 years - $3,000/year	28,280
	$239,290

1. Assume: 10% interest

* The operation and maintenance costs for the leachate management system include depreciation costs for the leachate pump and storage tank, $1,200 per year, and the offsite shipment and disposal of 120 55 gallon drums of leachate per year at a cost of $65 per drum.

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001455

TABLE 10 PRESENT WORTH CALCULATION(1) OF THE LONG TERM MONITORING COSTS-EXCAVATE-AND-RELOCATE ALTERNATVE

1. Sampling/analytical costs:	
P/A - 1st year - $18,000	$16,364
P/A - 4 years - $9,000/year = $28,530'	
P/F - 1 year - $28,530	25,936
P/A - 25 years - $6,000/year = $54,420	
P/F - 5 years - $54,420	33,790
2. Replacement of monitoring Wells	
P/F - 15 years - $18,200	4,358
3. Well Maintenance and Rehabilitation	
P/A - 50% - 5 - $4,000	
P/F - 5, 10, 15, 20, 25 years - $4,000	5,948
	$86,396

1. Assume: 10% interest

TABLE 11 PRESENT WORTH CALCULATION(1) OF THE LONG TERM MONITORING COSTS - PRP CONSULTANT ALTERNATIVE

1. Sampling/analytical costs:	
P/A - 1st year - $18,000	$16,364
P/A - 4 years - $9,000/year = $28,530 P/F - 1 year - $28,530	$25,936
P/A - 25 years - $6,000/year = $54,420 P/F - 5 years - $54,420	$33,790
2. Replacement of Monitoring Wells	
P/F - 15 years - $18,200	$4,358
3. Well Maintenance and Rehabilitation	
P/A - 50% - 5 - $4,000 P/F - 5, 10, 15, 20, 25 years - $4,000	$5,948
4. Cover and Cap Maintenance	
P/A - 30 years - $3,000	$28,280
	$114,676

1. Assume: 10% interest

TABLE 12 PRESENT WORTH CALCULATION(1) OF THE LONG TERM MONITORING COSTS - RCRA LANDFILL

1. Leachate Management System*	
P/A - 30 years - $9,000/year	$84,834
2. Sampling/analytical costs:	
P/A - 1st year - $26,000	$23,636
P/A - 4 years - $13,000/year = $41,207	
P/F - 1 year - $41,207	$37,460
P/A - 25 years - $8,600/year = $78,000	
P/F - 5 years - $78,000	$48,431
3. Replacement of Monitoring Wells	
P/F - 15 years - $27,300	$6,535
4. Well Maintenance and Rehabilitation	
P/A - 50% - 5 - $6,000	
P/F - 5, 10, 15, 20, 25 years - $6,000	$8,900
5. Cover and Cap Maintenance	
P/A - 30 years - $3,000/year	$28,280
6. Gas Monitoring	
P/A - First year - $12,000/year	$10,900
7. Miscellaneous (utilities, surface water control maintenance)	
P/A - 30 years - $3,000/year	$28,280
	$277,276

1. Assume: 10% interest.

* The operation and maintenance costs for the leachate management system include depreciation costs for the leachate pump and storage tank, $1,200, and the offsite shipment and disposal of 120 55 gallon drums of leachate per year at a cost of $65 per drum.

TABLE 13

COMPARISON EVALUATION CRITERIA

ITEM	ALTERNATIVE		
	MINIMUM ACTION	ONSITE CONTAINMENT	EXCAVATE-AND-RELOCATE OFFSITE
Reliability	Waste remains Natural containment of limited certainty Treatment plant over-flows occasionally Long-term commitment to maintenance and monitoring	Waste remains 4 of 4 release pathways contained Treatment plant eliminated Long-term commitment to maintenance and monitoring	Waste removed 4 of 4 release path-ways controlled Treatment plant eliminated Minor long-term commitment to monitoring
Implementability	Technically possible Needs technical expertise at WTP Needs owner permission Potential community opposition Zoning of WTP needed	Technically possible Limited technical skills needed Need owner permission Potential community support	Technically possible Limited technical skills required Landowner's consent likely Potential community support
RCRA Conformance	Does not conform	Conforms except for no botton liner	Conform by placement of waste in RCRA facility
Safety	Minor risks of fire, explosion, toxic gas release or spill	No risk of fire, explosion, toxic gas release or spill	No risk of fire or explosion; medium risk of toxic gas release or spill

(a)

TABLE 13
(CONTINUED)
COMPARISON EVALUATION CRITERIA

ITEM	ALTERNATIVE MINIMUM ACTION	 ONSITE CONTAINMENT	 EXCAVATE-AND-RELOCATE OFFSITE
Operation & Maintenance	Major commitment of manpower and money for 5 years Significant maintenance for 30 years Monitoring for 30 years	Significant maintenance for 30 years Monitoring for 30 years	Significant maintenance for 5 years Monitoring for 30 years
Environmental Protection	Does not control air emissions Limited control of surface runoff No control of groundwater No control of direct contact	Control of air emissions Control of surface runoff Control of groundwater Control of direct contact	Control of air emissions Control of surface runoff Control of groundwater Control of direct contact

(b)

TABLE 13

COMPARISON EVALUATION CRITERIA

ITEM	ALTERNATIVE	
	MODIFIED ONSITE CONTAINMENT EXCAVATE-AND-RELOCATE	EXCAVATE-AND-RELOCATE ONSITE
Reliability	Waste removed 4 of 4 release pathways controlled treatment plant eliminated minor long-term commitment to monitoring	Waste removed excavation of all contaminants placing them in a cell constructed onsite which would conform fully with RCRA requirements. Results of a geophysical investigation showed that the size of a disposal cell that could be constructed on site in a suitable area had insufficient capacity material buried at the site.
Implementability	Technically possible limited technically skills required landowner's consent likely potential community support	Technically not possible due to insufficient land capacity to contain the material
RCRA Conformance	Conforms except for no bottom liner	Conforms except for no bottom liner
Safety	No risk of fire or explosion; medium risk of toxic gas release or spill	No risk of fire or explosion; medium risk of toxic gas release or spill

(c)

TABLE 13

COMPARISON EVALUATION CRITERIA

ITEM	ALTERNATIVE	
	MODIFIED ONSITE CONTAINMENT/ EXCAVATE-AND-RELOCATE	EXCAVATE-AND-RELOCATE ONSITE
Operation & Maintenance	Significant maintenance for 5 years; monitoring for 30 yeras	Significant maintenance for 5 years; monitoring for 30 years
Environmental Protection	Control of air emissions Control of surface runoff Control of groundwater Control of direct contact	Control of air emissions Control of surface runoff Control of groundwater Control of direct contact

(d)

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TABLE 13

COMPARISON EVALUATION CRITERIA

ITEM	ALTERNATIVE	
	MODIFIED ONSITE CONTAINMENT EXCAVATE-AND-RELOCATE	EXCAVATE-AND-RELOCATE OFFSITE
Reliability	Waste removed 4 of 4 release pathways controlled treatment plant eliminated minor long-term commitment to monitoring	Waste removed excavation of all contaminants placing them in a cell constructed onsite which would conform fully with RCRA requirements. Results of a geophysical investigation showed that the size of a disposal cell that could be constructed on site in a suitable area had insufficient capacity material buried at the site.
Implementability	Technically possible limited technically skills required landowner's consent likely potential community support	Technically not possible due due to insufficient land capacity to contain the material
RCRA Conformance	Conforms except for no bottom liner	Conforms except for no bottom liner
Safety	No risk of fire or explosion; medium risk of toxic gas release or spill	No risk of fire or explosion; medium risk of or spill toxic gas release or spill

TABLE 13

COMPARISON EVALUATION CRITERIA

ITEM	ALTERNATIVE: MODIFIED ONSITE CONTAINMENT ALTERNATIVE (POTENTIALLY RESPONSIBLE PARTIES)	ALTERNATIVE: ONSITE CONTAINMENT POTENTIALLY RESPONSIBLE PARTIES
Operation & Maintenance	Significant maintenance for 5 years; monitoring for 30 years	Significant maintenance for 5 years; monitoring for 30 years
Environmental Protection	Control of air emissions Control of surface runoff Control of groundwater Control of direct contact	Control of air emissions Control of surface runoff Control of groundwater Control of direct contact

(f)

TABLE 14

DECISION MATRIX OF MOST SIGNIFICANT
SELECTION CRITERIA

ELEMENTS OF COMPARISON	(1) MINIMUM ACTION	(2) ONSITE CONTAINMENT	(3) EXCAVATE AND RELOCATE	(4) PRP ONSITE CONTAINMENT (a)
Long-Term Release Control				
Air	Slight	Yes	Yes	Yes
Surface Runoff	Slight	Yes	Yes	Yes
Groundwater	No	Yes	Yes	Yes
Direct Contact	No	Yes	Yes	Yes
Life Cycle Cost	Least	Middle	Most	Less than Option (2)
RCRA Conformance	No	Potentially Yes (b)	Yes	Potentially Yes (c)
Reliability	Poor	Excellent	Superior	Excellent
Operation & Maintenance Cost	Most	Middle	Least	Middle

a. Onsite containment modified by elimination of slurry wall and leachate collection

b. Assuming integrity of shale layer.

c. Weathered shale may serve as a slow to medium release mechanism for limited quantities of shallow ground-water.

TABLE 15

ULTIMATE DISPOSAL FACILITIES FOR CONTAMINATED SOILS

LANDFILL	HAUL DISTANCE (one-way miles)	DISPOSAL COST (dollar/yd^3)
B.H.S., Inc. Wright City, Missouri	331	48.90
CECOS Cincinnati, Ohio	136	80.00
Chemical Waste Management Emelle, Alabama	515	50.00
U.S.Ecology Sheffield, Illinois	450	178.00
Adams Center Landfill Ft. Wayne, Indiana	273	40.00
Incinerator		
LWD, Inc. Paduka, Kentucky	240	250.00

TABLE I

REMEDIAL ALTERNATIVES FOR THE A. L. TAYLOR SITE

ALTERNATIVE	#1 MINIMUM ACTION	#2 ON-SITE CONTAINMENT	#3 EXCAVATE AND REMOVAL	#4 MODIFIED REMOVAL
Description	(1) Leave all buried wastes in place (2) Regrade and revegetate the existing site surface (3) Remove wastes from the open pit and surface dumping area (4) Establish a groundwater monitoring program (5) Operate and maintain the existing runoff collection and treatment system (6) Prepare and file a record plat	(1) Install total slurry wall around waste site (2) Install clay cap and soil cover (3) Install leachate/gas collection system (4) Operate leachate treatment system (5) Install runoff/drainage diversion ditches (6) Revegetate (7) Install security fence and signs	(1) Remove all contaminated materials from waste cells, open pit, and surface dumping area. Transport to RCRA disposal facility (2) Backfill all excavated areas with truck-in fill (3) Regrade and revegetate the site (4) Prepare and file a record plat	(1) Remove contaminated materials from main disposal trench, open pit, and surface dumping area. Transport to RCRA facility (2) Backfill (3) Install upgradient slurry wall and french drain (4) Install clay cap and soil cover (5) Install surface water diversion ditches (6) Revegetate (7) Install security fence and sign (8) Install remedial monitoring wells (9) Prepare and file a record plat

#5	#6	#7
EXCAVATE AND RELOCATE ON-SITE	MODIFIED ON-SITE CONTAINMENT (PRPs) PLUS EPA REQUIREMENTS UPGRADE TO RCRA CAP & LINER	MODIFIED ON-SITE CONTAINMENT (PRPs)
	Construction & O&M Cost - 1,217,126	Construction Cost - 795,349

	#1	#2	#3	#4
Construction Cost Range:	$ 119,000 - $211,600	$428,000 - $902,000	$1,589,000 - $4,641,000	$1,140,000
Midpoint:	$165,310	$665,000	$3,115,000	
Operation and Maintenance Cost: Range:	5 years: $38-$79,000	1st year: $43-$77,000 After 1st year:	1st year: $20-$31,000 After 1st year:	1st year $20-$34,000 After 1st year:

TABLE 2.1

SUMMARY OF SITE PERMEABILITIES

Formation	Horizontal Permeability (cm/sec.)	Vertical Permeability (cm/sec.)
Alluvium/colluvium	1.8×10^{-6} to 5.3×10^{-6}	2.5×10^{-7} to 7.0×10^{-7}
Residuum	--	4.5×10^{-7} to 1.7×10^{-8}
Weathered Shale	3.3×10^{-5} to 9.1×10^{-6}	2.0×10^{-7} to 4.5×10^{-7}
New Providence (Unweathered Shale)	--	6.3×10^{-8}

Notes: (1) Horizontal permeabilities determined from well response tests.
(2) Vertical permeabilities determined from laboratory permeability tests.

Source: Geosciences Research Associates, 1984.

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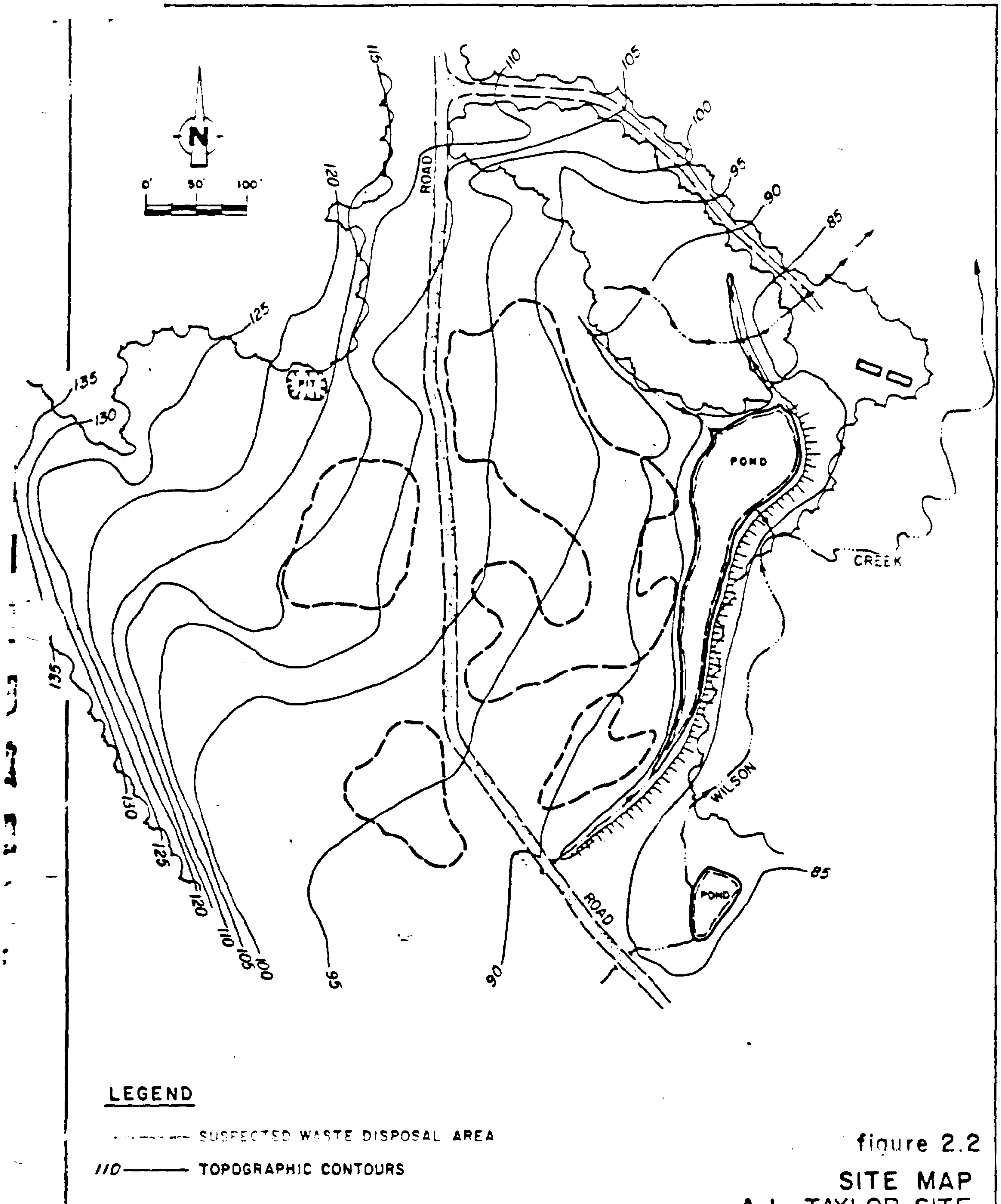
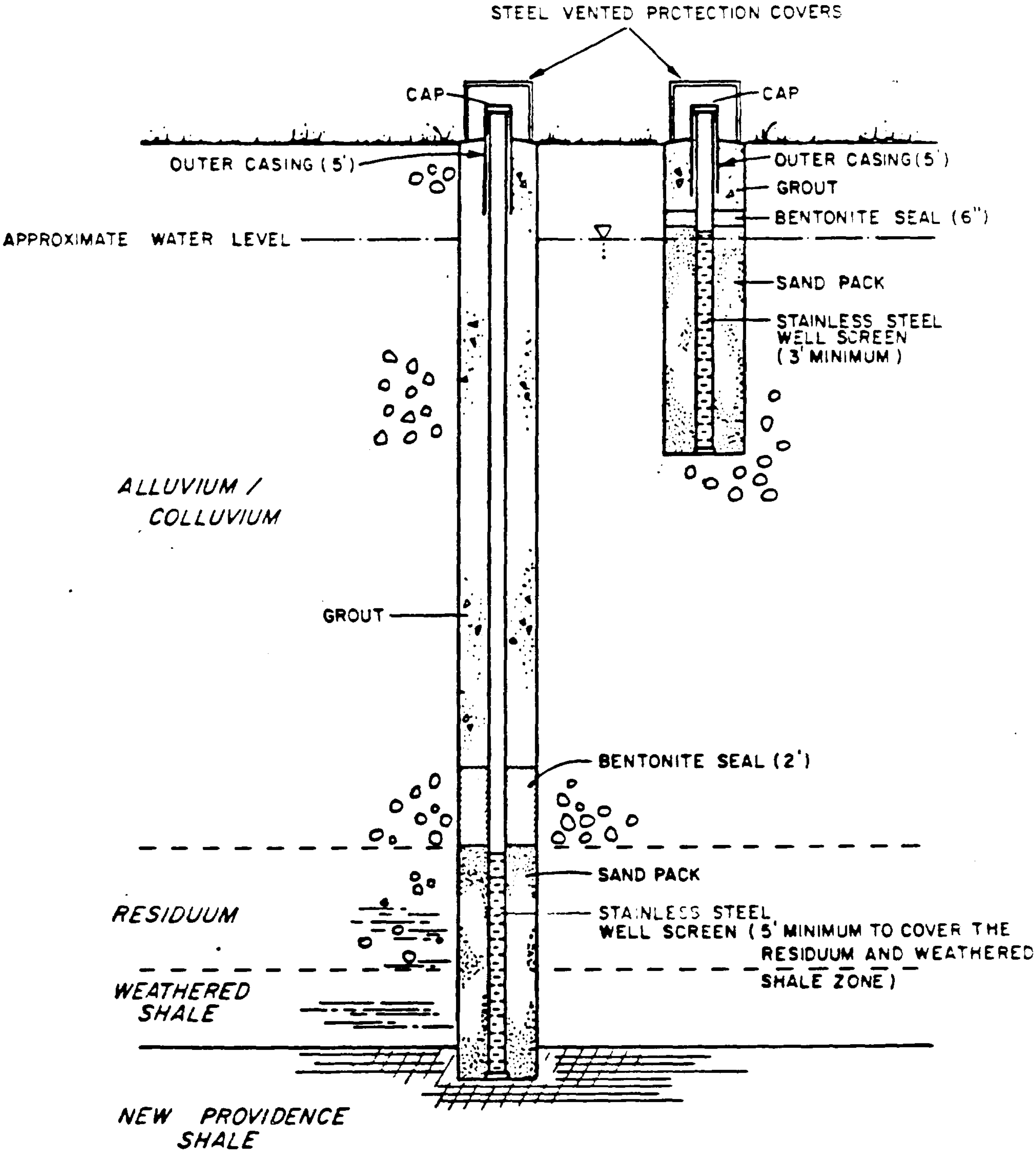


figure 2.2

SITE MAP
A.L. TAYLOR SITE
Bullitt County, Kentucky

17:5 - 20/11/85



SOURCE: GEOSCIENCES RESEARCH ASSOCIATES, INC.

figure 3.3

TYPICAL MONITORING WELL CLUSTER
A.L. TAYLOR SITE
Bullitt County, Kentucky

CRA