No 0000006

CRA
Consulting Engineers

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October 18, 1990

Reference No. 1989

Via Federal Express

Rec'd
10-19-90

Mr. Kevin Adler
United States Environmental Protection Agency
Region V (5HE)
230 South Dearborn Street
Chicago, Illinois
U.S.A. 60604

Dear Mr. Adler:

Re: G & H Landfill Comments on PRAP and RI/FS

On behalf of the G & H Landfill PRP Group, we are submitting two (2) copies of our technical comments on the PRAP and RI/FS. The PRP Group will be submitting additional comments under separate cover.

Should you have any questions, please do not hesitate to contact our office.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Alan K. Richardson

for Alan Van Norman, P. Eng.

AVN/cz
Encl.

c.c. Brian Monroe, MDNR
Lauri Adams, U.S. EPA (5CS-TUB-3)
G & H PRP Group

COMMENTS ON THE PROPOSED REMEDIAL ACTION PLAN AND REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

G & H Landfill Site
Shelby Township, Michigan

Rec'd
10-19-90
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COMMENTS ON THE PROPOSED REMEDIAL ACTION PLAN AND REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

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OCTOBER 1990
REF. NO. 1989 (11)

CONESTOGA-ROVERS & ASSOCIATES

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

The G&H Landfill Site (Site) is located in Shelby Township, Macomb County, Michigan. The Site consists of three distinct landfill areas comprising a total landfill area of 69 acres. The Remedial Investigation (RI) concluded that municipal solid waste and liquid and solid industrial waste were codisposed in the Phase I landfill. The Phase II and III landfill areas were found to contain solely municipal solid waste. Waste disposal began in the Phase I landfill in the mid 1950s and continued in the Phase II and Phase III landfills until 1973. Landfilling in the three landfill areas at the Site was conducted under various State of Michigan permits.

The Site was placed on the National Priorities List (NPL) in September 1983. The United States Environmental Protection Agency (U.S. EPA) conducted a three stage RI at the Site between 1983 and 1990. An independent investigation was conducted by the Michigan Department of Natural Resources (MDNR) in 1988 and 1989. U.S. EPA also completed a Feasibility Study (FS) in 1990. A Proposed Remedial Action Plan (PRAP) was released by U.S. EPA in August 1990.

A Potentially Responsible Party (PRP) group has formed and has monitored the progress and results of the RI/FS and PRAP. The PRP group met with U.S. EPA and MDNR several times during the RI/FS and has provided written comments on previously released RI/FS reports and documents.

This present report contains PRP comments on the RI/FS and PRAP and outlines a proposed modified remedy. Major substantive comments are presented in the following titled paragraphs of this Executive Summary. More detailed comments are presented in the accompanying text.

Landfill Cap

The PRAP preferred remedy consists of a minimum site grade of 3%. A 2% slope would provide equivalent technical performance and would reduce the amount of grading fill required. The number of 20 cubic yard dump truck loads delivered to the Site would be reduced by approximately 4,000 round trips. A cost saving of approximately $800,000 could be realized by reducing the grade to 2%. The savings would more than cover any potential increased maintenance cost that may result from a 2% minimum slope. The type of material used for grading fill should not be limited to soil fill. Other types of fill, such as clean demolition rubble or excess construction soil etc., should be investigated as potential sources of grading fill.

The grading plan could be further optimized to reduce the volume of grading fill required by creating more intermediate drainage swales. This would create a "sawtooth pattern" in profile.

The PRAP preferred remedy consists of a three foot clay cap with a three and a half foot fill cover. As indicated in Section 2.2.1, a 60 mil high density polyethylene (HDPE) flexible membrane liner (FML) would achieve superior performance over the three foot clay layer. The FML

cap design has already been approved by MDNR at the Adrian Landfill located in southern Michigan. The FML would decrease the estimated infiltration rate of the three foot clay layer and thus provide better protection. A two and a half foot cover soil layer on top of the membrane will provide adequate protection to the FML from frost, burrowing animals and deep roots. Desiccation is not a concern with a FML cap. Periodic maintenance will also help to control animals and deep roots.

The FML cap design will eliminate the use of imported clay materials, thus solving problems associated with acquiring and transporting the clay. The substitution of a 60-mil FML for the three feet of clay and the reduction of cover soil from 3 1/2 feet to 2 1/2 feet would reduce the number of 20 cubic yard dump truck loads delivered to the Site by approximately 19,000 round trips. Figure 1 presents the proposed modified cap design. This cap design, including the FML and 2 1/2 feet of cover soil provides superior technical performance and has an estimated cost which is $5,000,000 less than the PRAP preferred cap design. The membrane can be placed at a rate of one acre per day at an estimated cost of $.50 per square foot.

Leachate Collection Drain

Leachate collection drain laterals consisting of perforated pipe in a gravel trench extending up into the steep western slope should be added to the toe drain on the west side of the Phase III Landfill. The location of the drains will be at right angles to the toe drain extending approximately 20 feet up the face of the Phase III Landfill as shown on Figure 2.4.

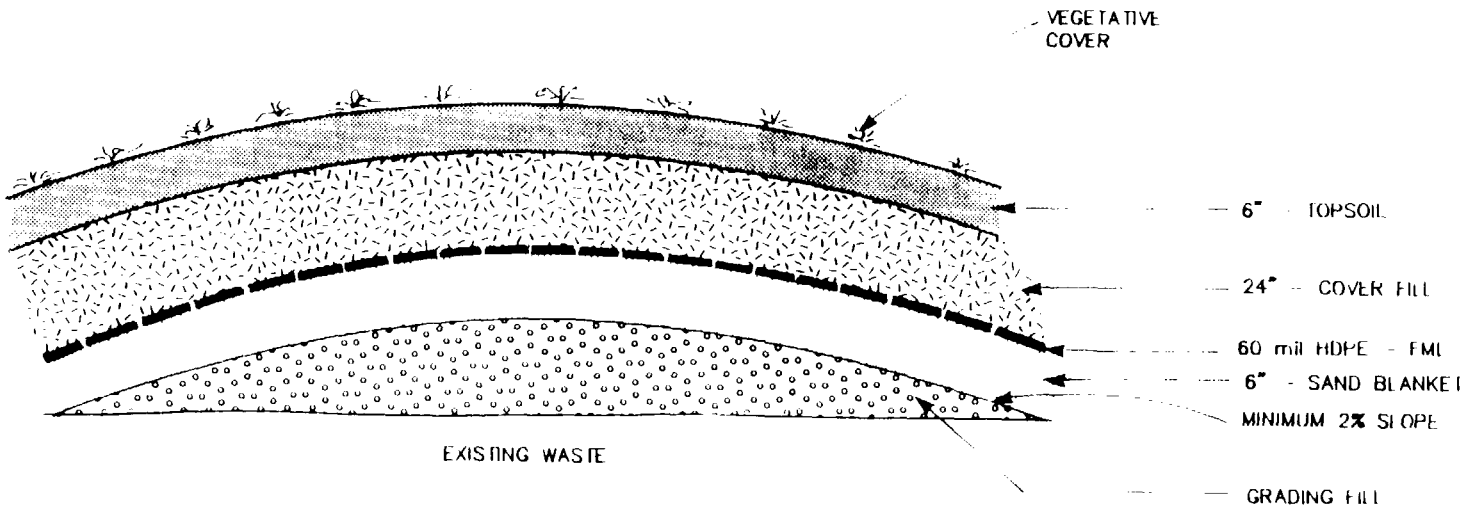

figure 1

PROPOSED MODIFIED CAP DESIGN

G & H Landfill

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1989-15/10/90-11-0

Leachate seeps occur where layers of daily cover or impermeable waste intersect the side of the landfill. The lateral drains will collect leachate that seeps out the steep western face of the Phase III Landfill and protect the cap materials from eroding or sloughing off.

Slurry Wall/Gradient Control Wells

The PRAP preferred remedy includes a vertical barrier slurry wall to help contain and collect groundwater from beneath the Site. The FS states that the barrier will reduce the amount of groundwater that would require removal and treatment. Water balance calculations on the PRAP preferred remedy, however, indicate that the wall would only decrease the amount of groundwater to be removed and treated by approximately 3 gpm than that which would be removed by the proposed modified remedy without the wall. Based on RI data, an estimated 59 gpm would be pumped with the wall in place and 62 gpm would have to be pumped to achieve the same interception with the proposed modified remedy.

An additional problem with the slurry wall is the possible backwater effect. Reducing the amount of flow into the Site creates a possibility that the groundwater levels upgradient of the Site may rise. This may cause flooding in basements and in the lakes in the subdivision north of 23 Mile Road. By deleting the wall the upgradient areas will not be affected by the Site remediation.

Physical containment using the slurry wall can be replaced by hydraulic containment to hydraulically isolate the landfill. The proposed

modified remedy consists of replacing the slurry wall and the 47 gradient control wells with 13 source control wells. Figure 2 presents the proposed modified hydraulic containment system. The 47 gradient control wells, in the PRAP preferred remedy, each one pumping at less than 1/4 gpm will cause frequent long term operation and maintenance problems due to insufficient flow velocities and the resultant fouling of pumps, screens and pipes. The 13 source control wells in the proposed modified remedy would each pump at 2 gpm reducing problems associated with extremely low flows. The reduced number of wells also reduces the amount of maintenance required. Operational problems associated with 47-1/4 gpm gradient control wells are presented in Section 2.2.2.

Therefore, the construction of the slurry wall and 47-1/4 gpm gradient control wells can be replaced with 13-2 gpm source control wells to provide hydraulic containment. The small reduction of groundwater to be removed and treated (5 percent) with the PRAP preferred remedy results in an increased capital cost of $4,235,000 including contingencies and allowances.

Groundwater Extraction Wells

The number of groundwater extraction wells can be reduced from 20 to 12 by eliminating redundancy in the PRAP design. A better designed system will achieve the same objectives while reducing costs. The PRAP preferred remedy included groundwater extraction wells off Site to the east side which should be eliminated as they address problems not related to the Site. The toe drain on the west side of the Phase III Landfill is included

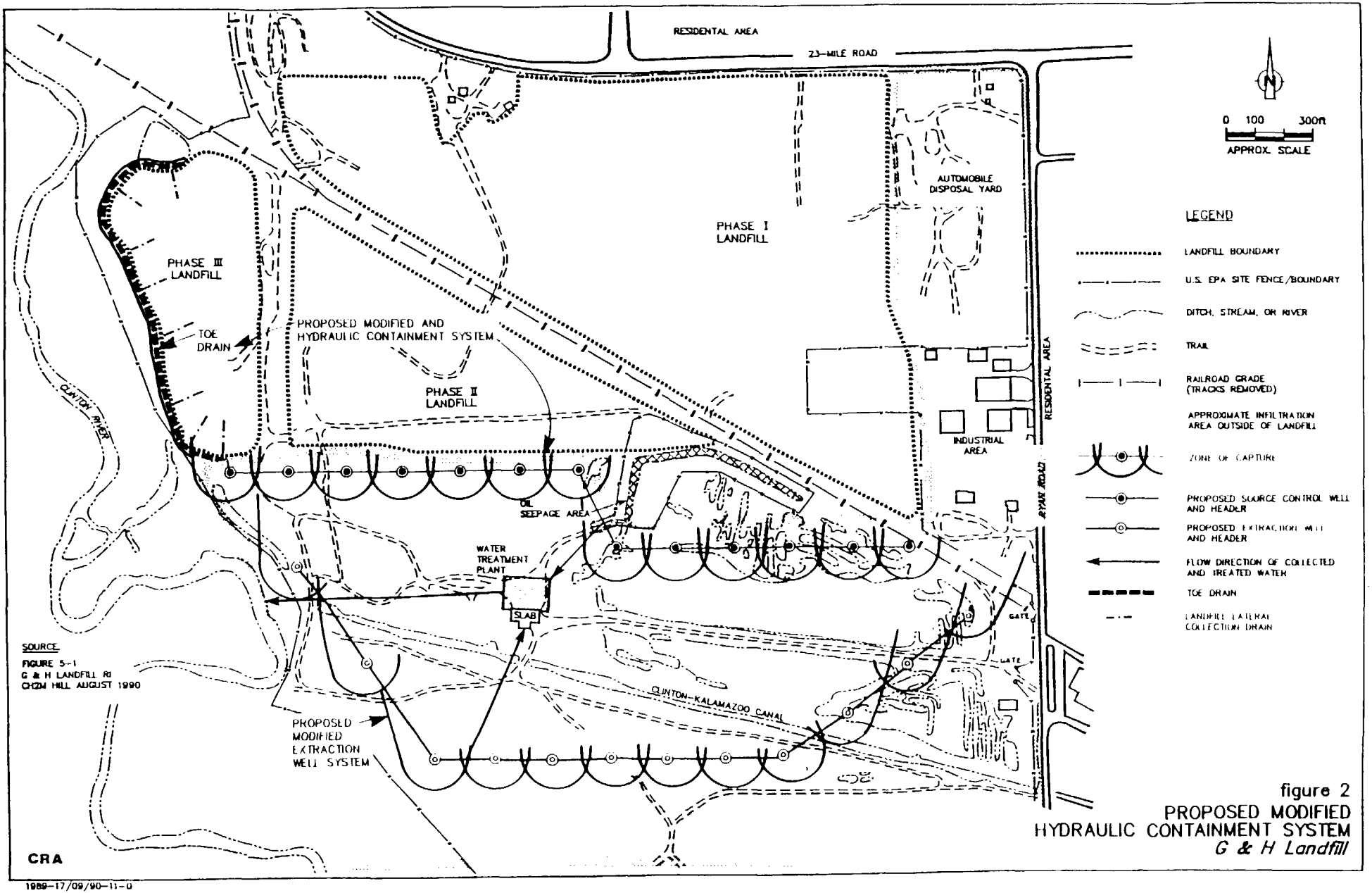

figure 2
PROPOSED MODIFIED
HYDRAULIC CONTAINMENT SYSTEM
G & H Landfill

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in the proposed modified design. The total amount of groundwater that will be extracted with the proposed modified system is estimated to be 62 gpm. Figure 2 also presents the locations of the groundwater extraction wells.

Cleanup Levels

Cleanup levels are not consistently presented in the FS and PRAP. The proposed modified remedy includes a list of Site indicator chemicals and groundwater cleanup goals for the indicator chemicals as presented in Table 4.1. The point of compliance for the proposed modified remedy is at the southern property boundary.

Automobile Salvage Yard

The automobile salvage yard which was an independently owned and operated business separate from the G&H landfill and with waste management practices dissimilar to the G&H Landfill should not be considered part of the Site. The automobile salvage yard has not been included as part of the Site in previous U.S. EPA studies. In fact, the Stage III RI/FS Work Plan dated March 29, 1988 refers to the installation of off-Site gas probes, three of which were installed in the automobile salvage yard. Any chemicals that may be present on or under the automobile salvage yard property should be treated as a separate Site not related to the G&H Landfill. Inclusion of the automobile salvage yard as part of the Site is improper and is not consistent with the NCP.

Summary of Proposed Modified Remedy

The proposed modified remedy consists of the following components:

1. 60 mil HDPE FML over landfill areas with 30 inches of soil cover at a minimum slope of 2%;
2. 13 source control wells;
3. leachate collection toe drain and laterals along west side of Phase III landfill;
4. 12 groundwater extraction wells;
5. groundwater treatment;
6. provision of municipal water supply;
7. institutional controls; and
8. groundwater monitoring.

1.0 INTRODUCTION

The G & H Landfill Site (Site) is located in Shelby Township, Macomb County, Michigan. The Site location is presented on Figure 1.1. Waste disposal operations at the Site began in the mid 1950s and ended in 1973. The Site consists of three distinct landfill areas with a total landfill area of 69 acres. A Site plan is presented on Figure 1.2. The RI concluded that municipal waste and liquid and solid industrial waste were codisposed in the Phase I landfill. The Phase II and III landfill areas contain solely municipal solid waste. Landfilling at the Site was conducted under various State of Michigan permits.

In September 1983, the Site was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). A Stage I and II Remedial Investigation (RI) was completed by a United States Environmental Protection Agency (U.S. EPA) Superfund contractor between 1983 and 1987. An independent investigation was conducted by a Michigan Department of Natural Resources (MDNR) contractor in 1988 and 1989. Finally, a Stage III RI was completed by a U.S. EPA contractor in 1989 and 1990. A Feasibility Study (FS) was also completed by a U.S. EPA contractor in 1990. A Proposed Remedial Action Plan (PRAP) was released by U.S. EPA in August 1990.

This report presents comments on the U.S. EPA RI report, FS report and the PRAP. General comments on the PRAP, relating to overall issues, are presented in Section 2.0. Section 3.0 of this report presents an evaluation of the proposed modified remedy. The modifications proposed in

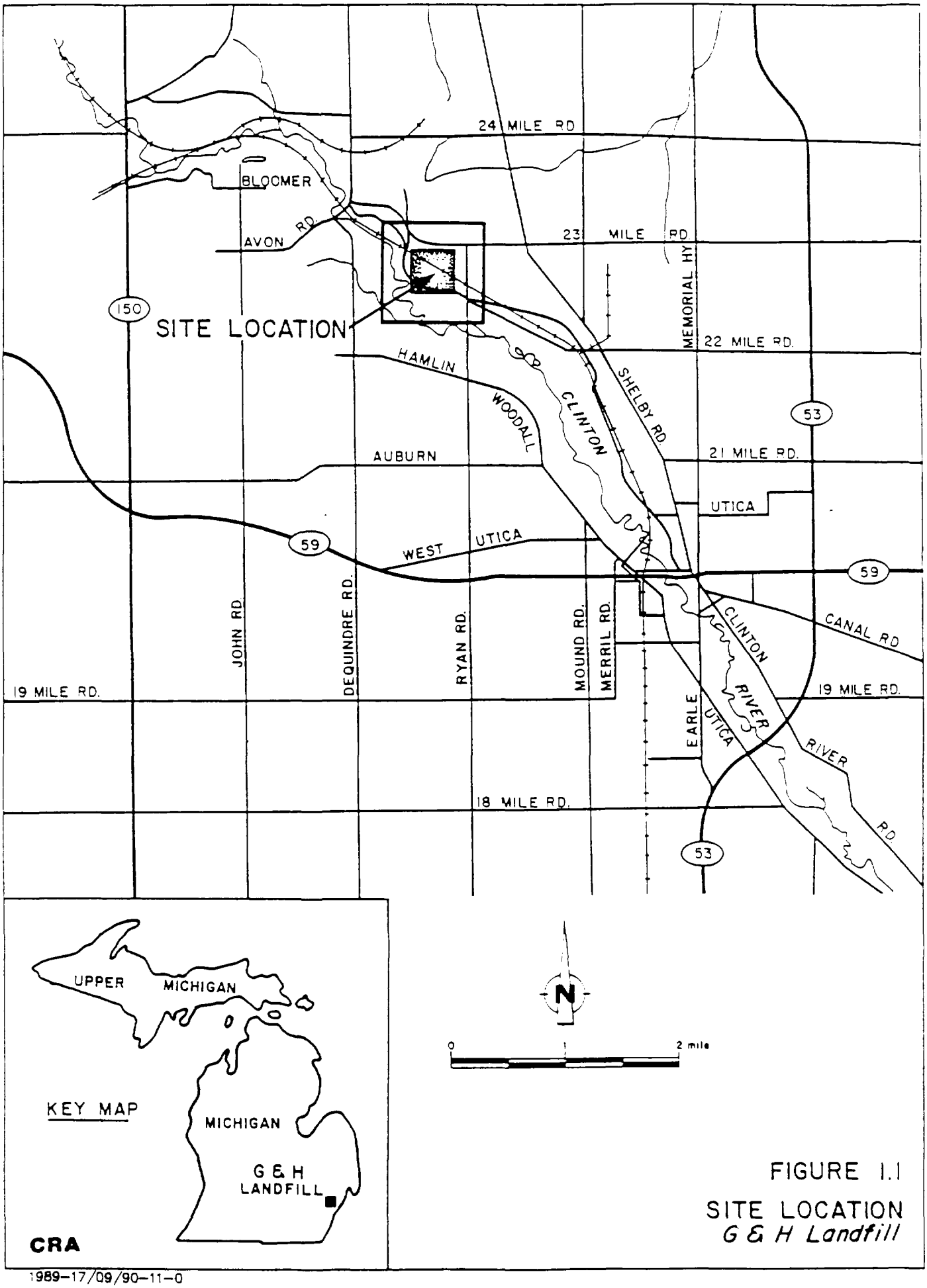

FIGURE 1.1

SITE LOCATION

G & H Landfill

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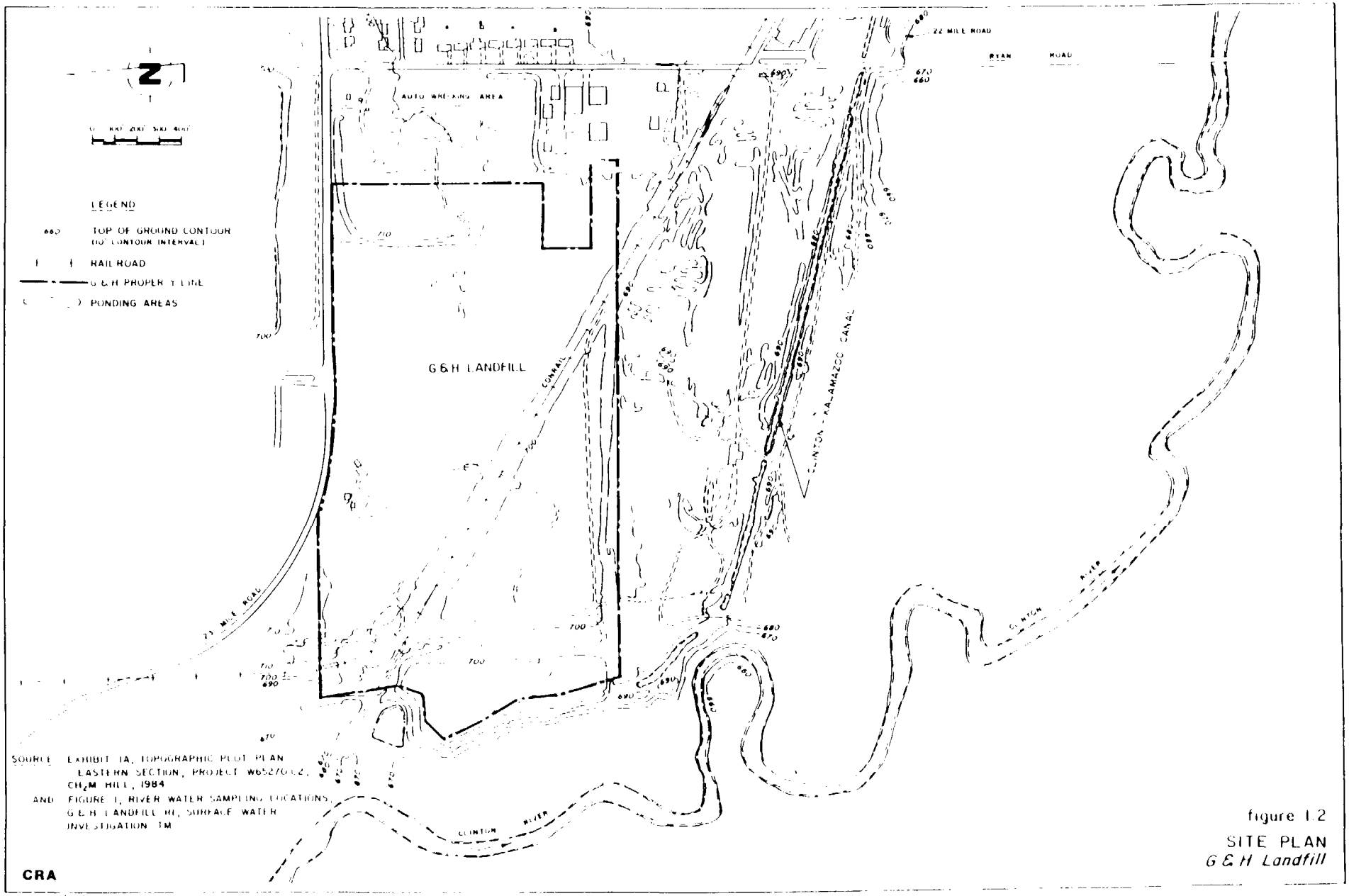

SOURCE: EXHIBIT 1A, TOPOGRAPHIC PLOT PLAN EASTERN SECTION, PROJECT W65270.C2, CH2M HILL, 1984
AND FIGURE 1, RIVER WATER SAMPLING LOCATIONS, G & H LANDFILL RI, SURFACE WATER INVESTIGATION TM

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figure 1.2
SITE PLAN
G & H Landfill

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this report provide an optimized remedy which meets or exceeds the required remedial objectives, is technically equivalent to the PRAP preferred remedy and is more cost effective. The proposed modified remedy is consistent with the NCP, is protective of human health and the environment and is responsive to both State and federal ARARs.

General comments on the FS report are presented in Section 4.0 and general comments on the RI are presented in Section 5.0.

Specific comments on the PRAP, FS and RI, relating to specific items in portions of these reports, are presented in Appendices A, B, and C.

2.0 COMMENTS ON PROPOSED REMEDIAL ACTION PLAN (PRAP)

2.1 GENERAL COMMENTS

The Proposed Plan for Remedial Action (PRAP) dated August 1990, presents a summary of the RI/FS process, data base and evaluations completed for the G & H Landfill Site. Additionally, the PRAP presents U.S. EPA's and MDNR's preferred cleanup plan to remediate the Site. The PRAP preferred cleanup plan includes:

- *Capping the landfill,*
- *Constructing a slurry wall around the landfill (except the west side),*
- *Extracting and treating contaminated groundwater*
- *Providing affected residences and businesses along Ryan Road with municipal water,*
- *On-Site and off-Site groundwater monitoring,*
- *Studying the junkyard area and evaluating additional cleanup measures as needed,*
- *Evaluating emerging technologies to reduce the potential long-term containment risks (PRAP, page 7).*

U.S. EPA/MDNR have determined that Alternative 4A from the FS, provides the best balance of tradeoffs within the evaluation criteria. Alternative 4A includes the following remedy components:

1. 3 foot clay cap on the Phase I, II and III landfills,
2. slurry wall, and

3. groundwater pump and treat system.

An independent estimate of the cost to implement the PRAP preferred alternative is $43,903,000. This is $3,943,000 more than the FS cost estimate. The estimates are within 10% of each other, but the FS has significantly underestimated the costs of the following remedy components:

1. health and safety,
2. slurry wall, and
3. groundwater extraction.

A detailed evaluation of the FS cost estimate is presented in Table 2.1 and in Section 2.2.4.

A proposed modified remedy, which was not considered in the FS, but which addresses all of the remedial goals identified in a much more cost effective manner, is described in Section 2.2. The proposed modified remedy has an estimated present worth cost which is $14,264,000 less than the present worth cost of the PRAP preferred remedy. An evaluation in terms of the remedial goals for the Site, of the proposed modified remedy as compared to the PRAP preferred remedy, is presented in Section 3.0 of this report.

2.2 REMEDY EVALUATION

2.2.1 Selected Cap

The PRAP preferred cap consists of 3 feet of clay and 3 1/2 feet of cover soil at a minimum 3% slope. The PRAP preferred cap can be optimized to provide superior technical performance and meet all remedial objectives in a much more cost effective way. Figure 2.1 presents a schematic of the proposed modified cap design.

A 60 mil high density polyethylene (HDPE) flexible membrane liner (FML) may be effectively substituted for the specified 3 feet of 10^{-7} cm/sec clay as the 60 mil HDPE FML, with appropriate bedding and cover soils, provides superior technical performance. The 60 mil HDPE FML has a permeability of 4×10^{-13} cm/sec which is 6 orders of magnitude less permeable than 1×10^{-7} cm/sec clay. In other words, under a unit gradient, the travel time of water through the 60 mil HDPE FML would be the same as the travel time through over 1,100 feet of 1×10^{-7} cm/sec clay.

The PRAP preferred cap consists of 3 1/2 feet of cover soil over the clay barrier layer. The purpose of the 3 1/2 feet of cover soil is to provide frost protection to the clay layer and to protect the clay against damage from desiccation, burrowing animals and deep roots. In this area of Michigan the required depth of frost protection is 2 1/2 feet as presented in the U.S. EPA guidance document "Final Cover on Hazardous Waste Landfills and Surface Impoundments" (EPA/530-SW-89-047, July 1989). Thus, the 3 1/2 feet of cover soil specified for the selected cap is not required for frost

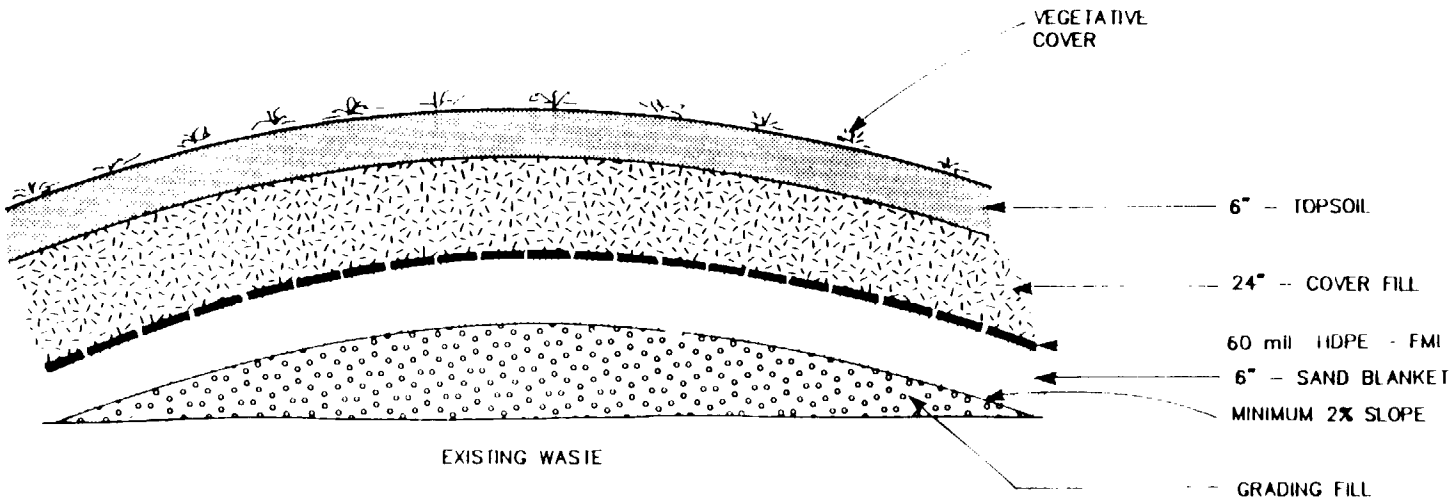

figure 2.1

PROPOSED MODIFIED CAP DESIGN

G & H Landfill

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1989-15/10/90-11-0

protection. A reduction of the cover soil by 12 inches will not result in damage by animals or deep roots. Desiccation is not a concern with the FML cap. Animals and deep roots will be controlled as part of the periodic maintenance that will take place for the cap.

The substitution of a 60 mil HDPE-FML for three feet of clay and reduction of the cover soil layer thickness from 3 1/2 to 2 1/2 feet would reduce the number of 20 cubic yard dump truck loads delivered to the Site by approximately 19,000 round trips.

The PRAP preferred remedy consists of a minimum Site grade of 3%. A 2% slope would provide equivalent technical performance to a 3% slope and would reduce the amount of grading fill required. The number of 20 cubic yard dump truck loads delivered to the Site would be reduced by 4,000 trips. Although a 2% slope may require more maintenance, the potential cost saving by constructing minimum 2% slopes would more than cover any future maintenance efforts.

In summary, an optimized cap may be constructed which provides superior technical performance while being more cost effective. This superior and more cost effective cap would include the following components:

1. prepared base (grading fill);
2. sand base;
3. 60 mil HDPE liner;
4. 24" cover soil; and

5. 6" topsoil with prairie grass.

The PRP Group has verified that a 60 mil HDPE FML could be constructed over all three phases of the landfill at a cost of approximately 50 cents per square foot. FML suppliers have indicated that by the summer of 1991 they will be able to construct FML liners at the rate of approximately one acre per day.

The proposed modified cap described above will eliminate the movement of up to 455,000 cubic yards of grading fill, clay and cover soil. The proposed modified cap could potentially reduce the number of 20 cubic yard dump truck round trips over local roads by approximately 23,000. The elimination of the requirement to construct a 3-foot clay cap alone will reduce the importation of soil materials by over 280,000 cubic yards.

Considering the fact that there is no local clay source, it is imperative that a technically equivalent cap be evaluated for the G&H Landfill. The utilization of a 60 mil HDPE FML in the construction of a technically superior cap makes the best sense for the Site.

A similar 60 mil FML has been approved by the MDNR at the Adrian Landfill in southern Michigan.

As indicated in Section 4.1.2 of this report indicates that, U.S. EPA has not completed its evaluation of ARARs for the landfill cap. CRA has completed this evaluatior and the proposed modified cap meets all ARARs for the landfill cap.

The following cost savings will be realized by utilizing the proposed modified cap design.

1.	eliminate 3' clay layer (no known clay source available within 10 miles radius)	$ -5,080,600
2.	eliminate 12" common fill (to provide appropriate level of frost protection)	$ -955,700
3.	eliminate 1/3 of the grading fill (to meet a 2% minimum slope)	$ -820,000
4.	add 60 mil HDPE liner	$ +1,700,000
5.	final grading prior to liner installation	$ +150,000
	NET	$ -5,006,300

This simple evaluation indicates that an optimized cap utilizing a FML liner could provide a cost savings on the order of $5,000,000.

Additional cost efficiencies could be achieved by optimizing the final contour plan such that the overall minimum amount of fill is required. To complete this optimization, the constraint would be that a 2% minimum slope must be maintained on the landfill. Minimizing the fill requirements by optimizing the final grade may result in an additional savings of some portion of the grade fill costs (which may be on the order of $500,000).

As a result, the total potential capital cost saving with the proposed modified cap design may be as high as $5,500,000. After applying

allowances and contingencies, the capital cost saving may be as high as $10,180,000.

2.2.2 Slurry Wall

A vertical barrier slurry wall is selected as a component of the U.S. EPA remedy. The FS states that vertical barriers minimize long-term management costs by ***"lowering the quantity of contaminated groundwater that would require removal and treatment"***. The FS also states that groundwater flow beneath the Site in the upper aquifer was estimated to range from 40 to 180 gpm. This estimate is not consistent with the RI which estimates that 11 gpm flow away from the Site in the upper aquifer. CRA's estimate of flow through the upper aquifer under the Site is 24.5 gpm based on the average gradient and average hydraulic conductivity.

To properly evaluate the need for and performance of a vertical barrier slurry wall it is necessary to consider a water balance for the whole site. Figure 2.2 presents a summary of water balances from various sections in the RI/FS. There are many inconsistencies in these water balances. A water balance for current site conditions which is more realistic is presented by CRA on Figure 2.3.

If a landfill cap and a vertical barrier slurry wall are installed, as proposed in the PRAP, it is expected that the water balance would be as presented on Figure 2.4.

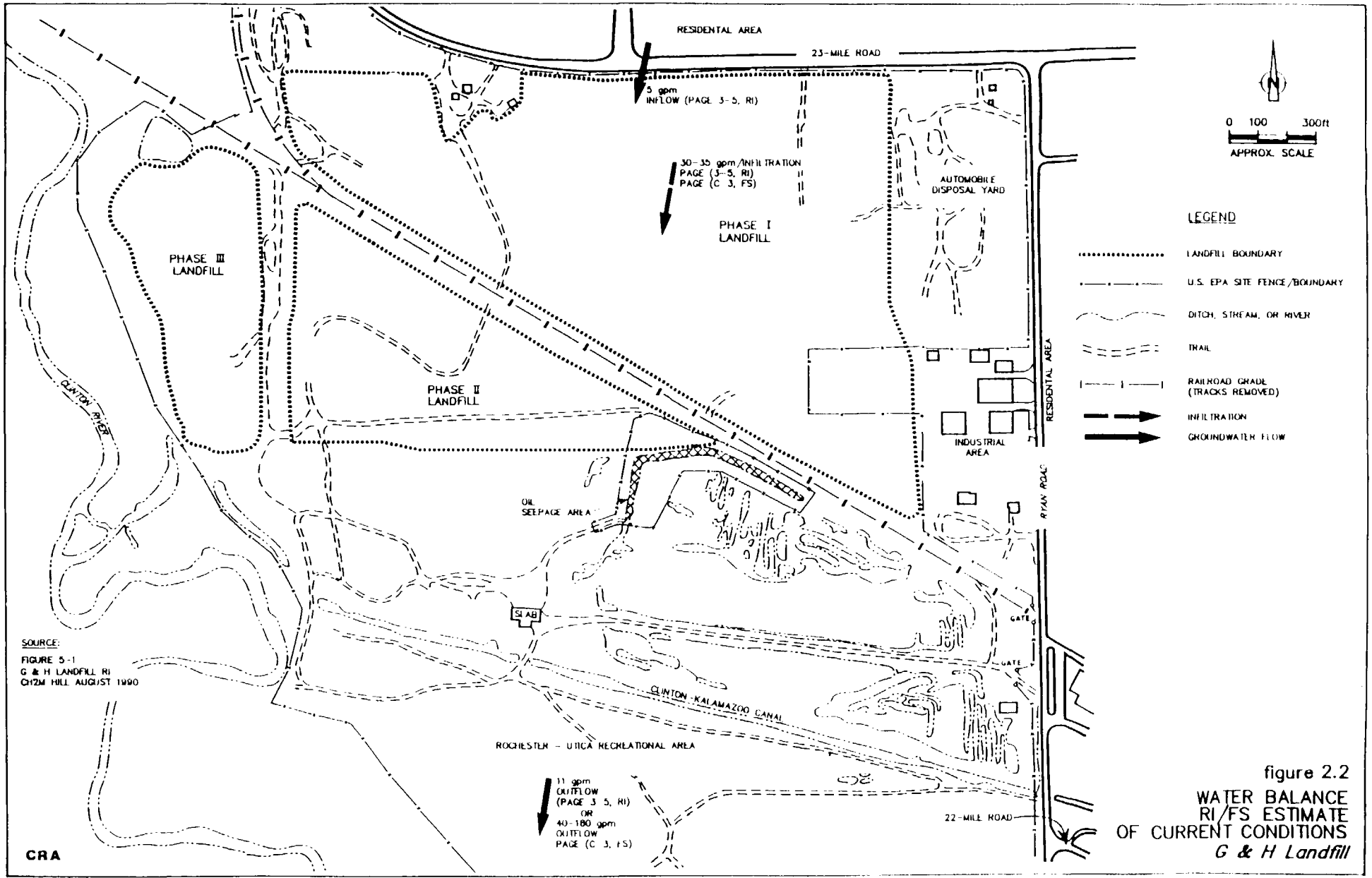

figure 2.2
WATER BALANCE
RI/FS ESTIMATE
OF CURRENT CONDITIONS
G & H Landfill

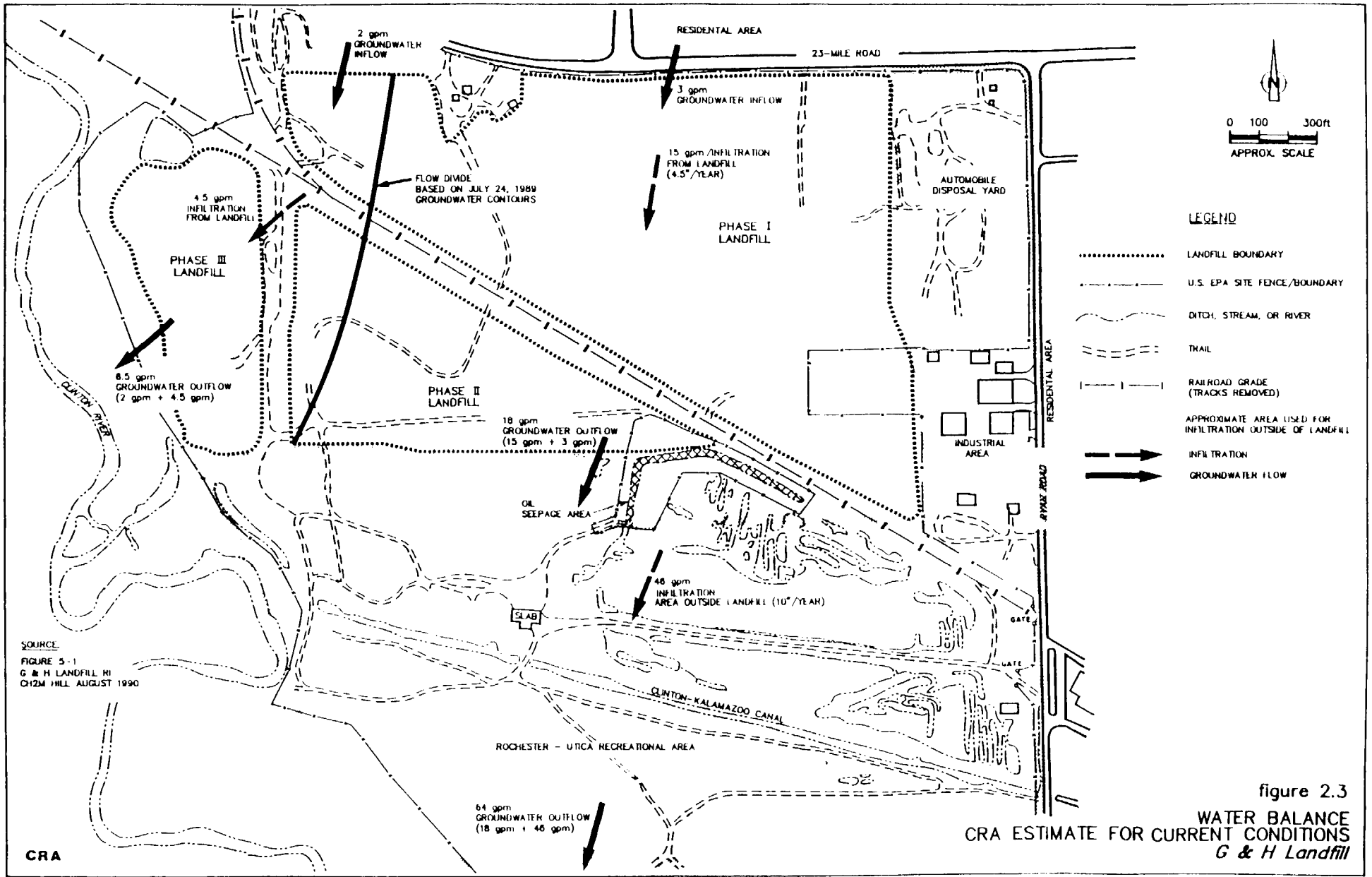

figure 2.3

WATER BALANCE
CRA ESTIMATE FOR CURRENT CONDITIONS
G & H Landfill

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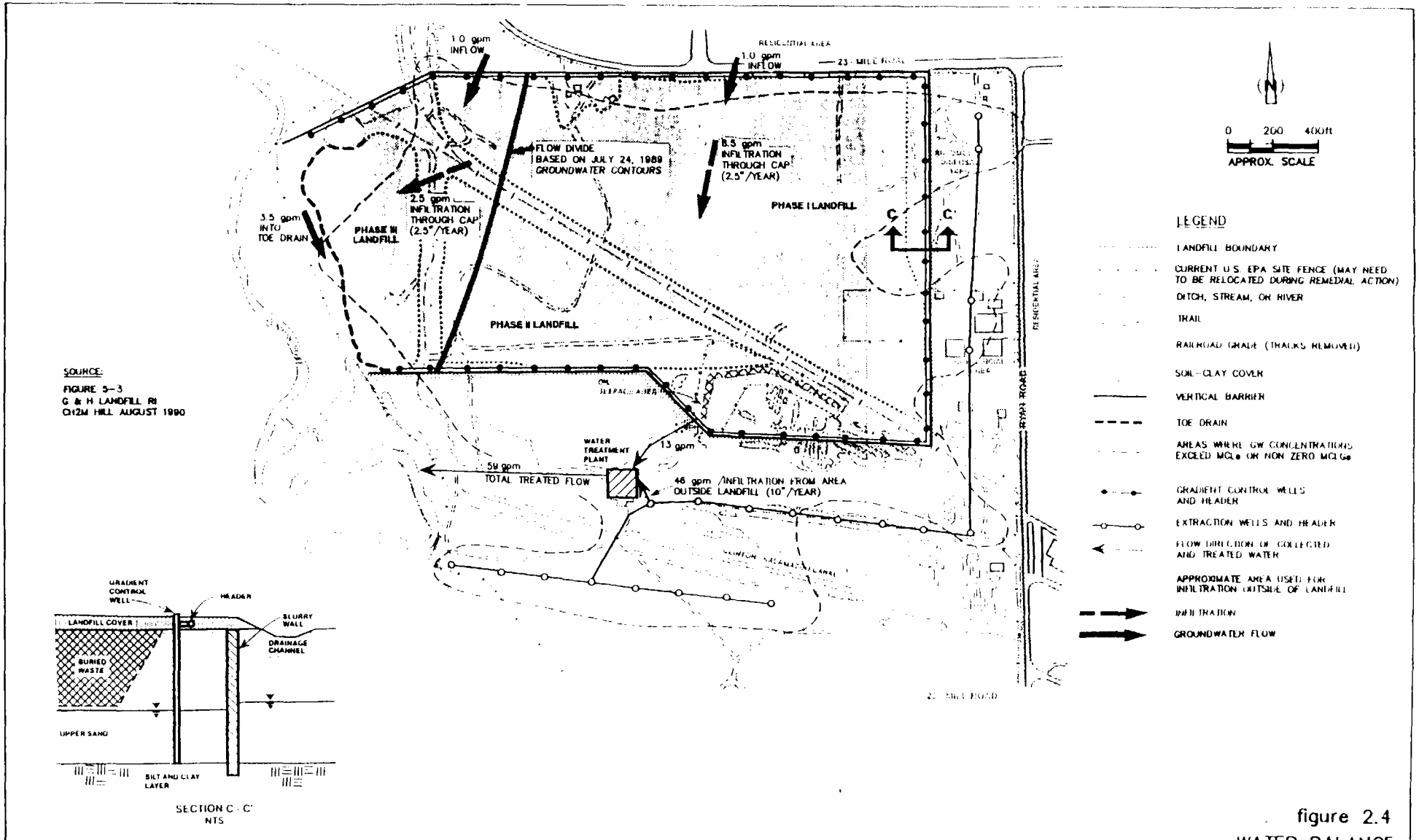

figure 2.4

WATER BALANCE
CRA ESTIMATE FOR PRAP PREFERRED REMEDY
G & H Landfill

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With the PRAP preferred remedy, it is estimated that 3.5 gpm would be collected by the drain on the west side of the Phase III landfill, an additional 9.5 gpm would be collected by the perimeter gradient control wells and 46 gpm would be collected from the plume control extraction wells. The total volume of groundwater water requiring treatment is estimated to be 59 gpm. After the chemicals are reduced to below the clean up goals, the long term flow requiring treatment would be 13 gpm for the PRAP preferred remedy. This reduction in pumping is not expected to occur for at least 35 years.

It should also be noted that operation of the 47 gradient control wells each pumping less than 1/4 gpm of leachate, as specified in the PRAP preferred remedy will result in frequent long term operation and maintenance problems.

Operation and maintenance problems on 47-1/4 gpm gradient control wells would include fouling with biological slimes and/or precipitation of minerals resulting from the low flow rates and low pipe flow velocities. The fouling will be made worse by the presence of landfill leachate. Simple routine pump, well and pipe maintenance of 47 wells is a large endeavor even when pumping clean water. These wells will be pumping essentially landfill leachate which will support the growth of biological slimes resulting in frequent long term operation and maintenance problems.

Source control could be achieved in a much more practical manner using a line of source control wells to hydraulically contain

and isolate the landfill. It is estimated that 13 source control wells could replace both the slurry wall and 47 gradient control wells, yet provide the same overall benefit. Figure 2.5 presents the water balance for this proposed modified remedy. With the 13 source control wells, while retaining the toe drain from the PRAP preferred remedy, the landfill would be hydraulically contained. With this proposed modified remedy, it is estimated that 4.5 gpm would be collected by the toe drain on the west side of the Phase III landfill, an additional 23 gpm would be collected by the source control wells and 34.5 gpm would be collected from the extraction wells. The total volume of water requiring treatment is estimated to be 62 gpm, which is only 3 gpm more than the PRAP preferred remedy. After the chemicals in the groundwater are reduced to below the clean up goals the long term flow requiring treatment would be approximately 27.5 gpm for this system. This reduction in pumping is also not expected to occur for at least 35 years.

Although the proposed modified remedy would require treating more groundwater after the chemicals in the groundwater are reduced below cleanup goals, the difference between pumping 27.5 gpm under the proposed modified remedy and 13 gpm under the PRAP preferred remedy is insignificant when consideration is given to the fact that these reduced pumping rates would not be realized for at least 35 years and that the treatment system would already be designed, constructed and operated at much higher flows for the initial 35 years of operation.

The replacement of the slurry wall and 47-1/4 gpm gradient control wells with 13 source control hydraulic containment wells

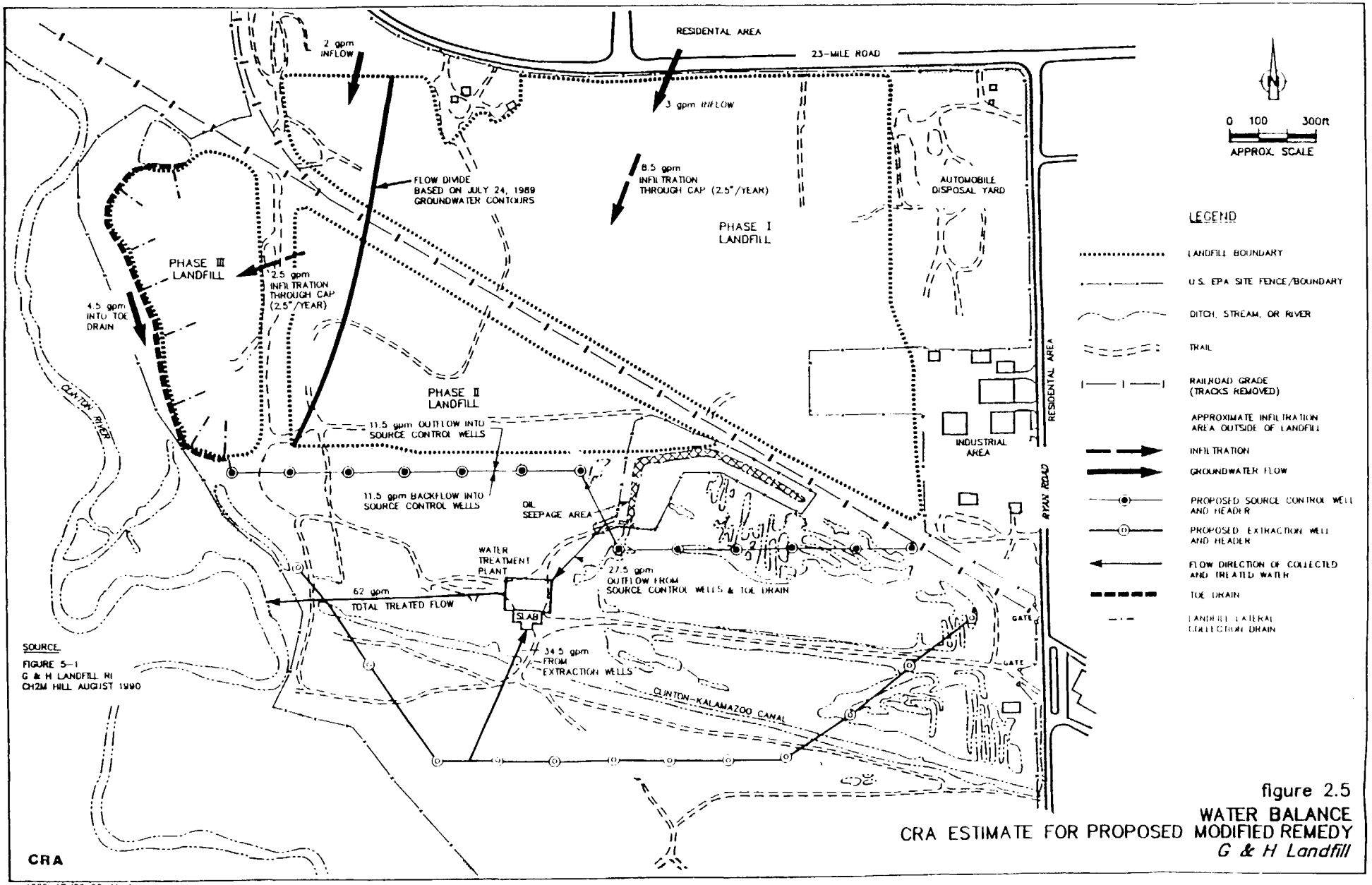

figure 2.5
WATER BALANCE
CRA ESTIMATE FOR PROPOSED MODIFIED REMEDY
G & H Landfill

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provides for containment of the landfill in a much more practical and cost effective manner.

The potential cost saving by implementing the proposed modified remedy source control wells is $2,288,000. After applying allowances and contingencies, the capital cost saving is estimated to be $4,235,000.

2.2.3 Groundwater Pump and Treatment

The PRAP preferred remedy consists of groundwater extraction to remove any chemicals above cleanup levels and groundwater extraction for gradient control inside the slurry wall. All groundwater that will be collected will be treated in an on-Site treatment plant prior to discharge.

Based on CRA's water balance estimates for the PRAP preferred remedy it is expected that the groundwater extraction wells will collect 46 gpm, the toe drain will collect 3.5 gpm and that the gradient control wells would collect 9.5 gpm for a total of 59 gpm. It is expected that it will take 35 years to remove 5 pore volumes from the area of affected groundwater. The removal of five pore volumes is commonly used as an estimate of the time required for aquifer clean up. At a 70% removal efficiency per pore volume, 99.8% of the chemicals would be removed after 5 pore volumes. After the extraction wells are shut off it will be necessary to treat 13 gpm for a very long time with the PRAP preferred remedy.

The RI/FS for the Site was completed without a groundwater treatability study. The full extent of the groundwater treatment plant that will be required cannot be identified until the treatability study is completed.

Figure 2.5 presents the source control and groundwater extraction well locations for the proposed modified remedy. The number of groundwater extraction wells can be reduced from 20 to 12 wells by eliminating redundancy in the U.S. EPA design. A better designed system will achieve the same objectives while reducing cost. The PRAP proposed groundwater extraction wells off Site to the east would be eliminated as they address problems not related to the Site. The toe drain on the west side of the Phase III landfill would be upgraded to include laterals and is included in the proposed modified remedy. As presented previously, the total volume of water requiring treatment for the first 35 years would be 62 gpm which is only 3 gpm more than the PRAP preferred remedy. It is expected that under this scenario 4.5 gpm would be collected by the toe drain, 23 gpm would be collected by the source control wells and that 34.5 gpm would be collected at the groundwater extraction wells. This system would require that 27.5 gpm be treated once the groundwater was remediated. The additional water requiring treatment in the long term would include 3 gpm entering the Site on the upgradient side and 11.5 gpm of clean water being drawn back by the source control wells once the groundwater extraction wells are shut off.

The potential cost saving by eliminating redundancy in the PRAP preferred groundwater extraction system design is $120,000. After

applying contingencies and allowances the cost saving is estimated to be $222,000.

2.2.4 Evaluation of FS Costs

CRA has evaluated the FS cost estimate for the PRAP preferred alternative 4A. Table 2.1 presents a summary of FS costs and an evaluation of the cost estimate by CRA. Where appropriate CRA has adjusted the FS cost estimate. The rationale for the cost adjustments are presented as notes in Table 2.1.

In general, the FS cost estimate appears to be reasonable and appropriate with the exception of the following items:

1. the FS has underestimated health and safety costs,

2. the FS has underestimated the cost for remote mixing of the slurry wall backfill,

3. the FS has underestimated the unit cost of pumps and controls for the gradient control and extraction wells,

4. the FS has underestimated the cost or inspecting the Site fence,

5. the FS has underestimated the cost of operation and maintenance of the gradient control and extraction well systems, and

TABLE 2.1

EVALUATION OF FS COST ESTIMATE

Capital Costs

Item	*FS Cost Estimate*	*CRA Cost Estimate*	*Notes*
1. Health and Safety	$ 236,000	$ 565,000	- FS estimate too low - Personnel Protective Equipment for 10-man crew plus Health and Safety Officer $1,250/day - FS estimate allows 188 working days with no reporting - CRA estimate allows $65,000 for Contractor Health and Safety Plan and reporting, and 400 working days
2. Institutional Controls	$ 136,000	$ 136,000	- FS estimate seems appropriate
3. Site Preparation	$ 149,000	$ 149,000	- FS estimate may be low but with in contingency allowance - no provision for PCB shed and tanks
4. Landfill Cover	$ 11,177,000	$ 11,177,000	- all unit prices seem reasonable for 10-mile haul - not clear what is intended for drain channels - estimate seems low but within contingency allowance
5. Phase II Landfill West Slope	$ 316,000	$ 409,000	- FS estimate seems reasonable - CRA has added $93,000 to allow construction of leachate collection laterals into bank of waste
6. Vertical Barrier	$ 1,835,000	$ 2,483,000	- FS cost estimate too low - FS unit cost for slurry wall $6.00/SF too low for remote mixing - CRA estimate $8.00/SF - FS cost for pumps and controls at $1,600 each too low. - CRA estimate $15,000 each for pump controls electrical and installation

TABLE 2.1

EVALUATION OF FS COST ESTIMATE

Item	*FS Cost Estimate*	*CRA Cost Estimate*	*Notes*
7. Groundwater Extraction Wells	$ 104,000	$ 300,000	- FS cost estimate too low - FS cost for pumps and controls at $1,600 each too low - CRA estimate $15,000 each (including header, pump, piping and electrical and installation) - FS shows 20 extraction wells costs estimated for 16 extraction wells
8. Water Treatment Plant	$ 637,000	$ 637,000	- FS estimate made without treatability studies - could easily go to $1,000,000
9. Water Discharge	$ 22,000	$ 22,000	- FS estimate seems reasonable
Allowances (17 %)	$ 2,484,000	$ 2,699,000	
Construction Subtotal	**$17,096,000(1)**	**$18,577,000**	
Contingencies (40 %)	$ 6,838,000	$ 7,431,000	
Construction Total	**$23,934,000**	**$26,008,000**	
Other (13 %)	$ 3,111,000	$ 3,381,000	
Total Implementation Cost	**$27,045,000**	**$29,389,000**	
Engineering	$ 1,832,000	$ 1,832,000	
TOTAL CAPITAL COST	**$28,877,000**	**$31,221,000**	

Note:

(1) Changes as a result of addition error in FS cost estimate.

TABLE 2.1

EVALUATION OF FS COST ESTIMATE

Annual O & M Costs

Item	*FS Cost Estimate*	*CRA Cost Estimate*	*Notes*
1. Site Fence	$ 3,000	$ 5,000	- FS estimate assumes 4 hrs per month - CRA estimate assumes 8 hrs per month
2. Groundwater Sampling	$ 167,000	$ 167,000	- FS estimate seems reasonable
3. Soil-Clay Cover	$ 123,000	$ 123,000	- FS estimate seems reasonable
4. Gradient Control/ Extraction Wells	$ 51,000	$ 132,000	- FS estimate too low - will likely require full time maintenance/operation person - maintenance for gradient control wells in particular will be nearly continuous - CRA estimate operator 2,080 hrs - CRA estimate $45,000 for equipment maintenance
5. Water Treatment	$ 233,000	$ 233,000	- FS estimate as made without treatability studies could easily go higher
Annual O & M Subtotal	$ 577,000	$ 660,000	
Scope Contingency (25 %)	$ 144,000	$ 165,000	
Annual O & M Cost	$ 721,000	$ 825,000	

TABLE 2.1

EVALUATION OF FS COST ESTIMATE

PRESENT WORTH	FS Cost Estimate	CRA Cost Estimate
TOTAL CAPITAL	$ 28,877,000	$ 31,221,000
ANNUAL O & M COST	$ 721,000	$ 825,000
PRESENT WORTH ANNUAL O & M (i = 5%, n = 30 years)	$ 11,083,000	$ 12,682,000
TOTAL PRESENT WORTH	$ 39,960,000	$ 43,903,000

6. The addition of contingencies and allowances totalling 85% of the capital cost estimate seems excessive. For purposes of comparison, CRA has used the percentage increases used in the FS.

The overall impact impact of these changes increases the present worth cost estimate of the PRAP preferred remedy from $39,960,000 to $43,903,000 an increase of $3,943,000. The increase is less than 10% of the FS estimate, however, $43,903,000 is a better estimate of the PRAP preferred remedy cost.

2.2.5 Proposed Modified Remedy

The proposed modified remedy will achieve or surpass the technical objectives of the PRAP preferred remedy, will be more easily operated and maintained and will achieve these objectives in a more cost effective manner. The proposed modified remedy is summarized in this section.

The proposed modified remedy consists of the PRAP preferred remedy with the following modifications:

1. reduce landfill grading from 3% to 2%,
2. replace 3' clay with a 60 mil HDPE FML,
3. reduce common fill cover from 3 1/2' to 2 1/2',
4. add laterals to leachate collection on west side of Phase III landfill,

5. replace slurry wall and 47-1/4 gpm gradient control wells, with thirteen 2 gpm source control wells, and
6. optimize PRAP preferred groundwater extraction well locations to extend capture to overlap with Phase III landfill toe drain (20 wells reduces to 12 wells).

Table 2.2 presents a summary of costs estimated by CRA for the PRAP preferred remedy as compared to the proposed modified remedy. CRA has adjusted several of the FS unit costs based on CRA's previous experience on similar projects in Michigan. The total capital cost saving of the proposed modified remedy over the PRAP preferred remedy is $14,264,000. The proposed modified remedy satisfies all remedial objectives and technical performance requirements. Moreover, since it would eliminate many of the operational problems associated with the PRAP preferred remedy, it better meets the technical performance requirements. In addition, the proposed modified remedy is significantly more cost effective than the PRAP preferred remedy.

The annual O & M for operating the proposed modified remedy is expected to be $32,000 less per year than the PRAP preferred remedy. This annual O & M saving is related to eliminating the gradient control wells and the operational problems associated with them. Annual O & M for the cap has been increased by $27,000 due to the 2% slopes proposed for the proposed modified remedy. The 2% slopes are expected to require some additional maintenance over the 3% slopes in the PRAP preferred remedy.

TABLE 2.2

SUMMARY OF COST ESTIMATE

	PRAP Preferred Remedy	*Proposed Modified Remedy*
Health & Safety	$ 565,000	$ 565,000
Institutional Controls	$ 136,000	$ 136,000
Site Preparation	$ 149,000	$ 149,000
Landfill Cover	$ 11,177,000	$ 6,000,000(1)
Phase III Landfill West Slope	$ 409,000	$ 409,000
Vertical Barrier	$ 2,483,000	$ -0-
GW Extraction Wells	$ 300,000	$ 180,000
Source Control Wells	$ 0	$ 195,000
Water Treatment Plant	$ 637,000	$ 637,000
Water Discharge	$ 22,000	$ 22,000
Allowances (17 %)	$ 2,699,000	$ 1,410,000
Construction Subtotal	**$ 18,577,000**	**$ 9,703,000**
Contingency (40 %)	$ 7,431,000	$ 3,881,000
Construction Total	**$ 26,008,000**	**$ 13,584,000**
Other (13 %)	$ 3,381,000	$ 1,765,000
Total Implementation Cost	**$ 29,389,000**	**$ 15,349,000**
Engineering	$ 1,832,000	$ 1,700,000
TOTAL CAPITAL COST	**$ 31,?21,000**	**$ 17,049,000**

Note:
(1) This estimate does not include potential 500,000 saving resulting from optimizing the landfill grading plan.

TABLE 2.2

SUMMARY OF COST ESTIMATE

	PRAP Preferred Remedy	*Proposed Modified Remedy*
OPERATION AND MAINTENANCE COSTS		
Site Fence	$ 5,000	$ 5,000
GW Monitoring	$ 167,000	$ 167,000
Soil Clay Cover	$ 123,000	$ 150,000
Extraction/Gradient Control/ Source Control Wells	$ 132,000	$ 100,000
Treatment	$ 233,000	$ 233,000
Annual O & M	$ 660,000	$ 655,000
Contingency	$ 165,000	$ 164,000
	$ 825,000	$ 819,000
PRESENT WORTH SUMMARY		
CAPITAL COST	$ 31,221,000	$ 17,049,000
ANNUAL COST	$ 825,000	$ 819,000
PRESENT WORTH ANNUAL O & M	$ 12,682,000	$ 12,590,000
PRESENT WORTH (i = 5 % n = 30 years)	$ 43,903,000	$ 29,639,000
TOTAL PRESENT WORTH COST SAVINGS:	$ 14,264,000	

It is expected that at least 5 pore volumes will have to be removed to achieve clean up goals, and it is expected that removing 5 pore volumes will take approximately 35 years. As a result, the annual operation and maintenance costs for the PRAP preferred remedy and the proposed modified remedy will be the same for the first 35 years. After 35 years the annual operation and maintenance costs for the proposed modified remedy may be slightly higher as the water requiring treatment in the modified remedy would be 27.5 gpm and the water requiring treatment for the PRAP preferred remedy would be 13 gpm. The present worth of annual cost for the PRAP preferred remedy and the proposed modified remedy are essentially the same using a standard 30 year period and a 5% interest rate.

The total present worth of the proposed modified remedy is $14,264,000 less than the total present worth of the PRAP preferred remedy. This $14,264,000 saving is achieved while attaining the overall intent of the PRAP preferred remedy and surpassing the technical performance.

3.0 EVALUATION OF PROPOSED REMEDY MODIFICATIONS

3.1 SCOPE OF CHANGES

The proposed modified remedy consists of the PRAP preferred remedy with the following modifications:

1. reduce landfill grading from 3% to 2%,
2. replace 3' clay with a 60 mil HDPE FML,
3. reduce common fill cover from 3 1/2' to 2 1/2',
4. add laterals to leachate collection on west side of Phase III landfill,
5. replace slurry wall and forty-seven (47) 1/4 gpm gradient control wells with hydraulic containment using thirteen (13) 2 gpm source control wells, and,
6. optimize groundwater extraction well locations to extend capture to overlap with Phase III landfill toe drain (12 extraction wells to be constructed).

3.2 EVALUATION OF REMEDIAL GOALS

The general goal of the Superfund Program is to select a remedy that protects human health and the environment, attains ARARs, uses treatment technologies to the maximum extent practicable and is cost effective. The proposed modified remedy achieves these overall goals and is more cost effective than the PRAP preferred remedy.

The Site specific remedial action goals for the G & H landfill site are to:

1. prevent direct contact with contaminated soil, sediment, landfill contents, groundwater, leachate, oil seeps and surface water.

   The proposed modified remedy includes a cap and groundwater and leachate collection to achieve this objective.

2. control leaching of hazardous substances from the landfills to the groundwater.

   The proposed modified remedy includes a low permeability cap which would achieve this objective.

3. control or reduce the volume of contaminated groundwater to prevent health risks posed by using contaminated groundwater as a drinking water source.

   The proposed modified remedy includes a low permeability cap (which would reduce the quantity of affected groundwater) and includes source control and extraction wells to control the groundwater. The proposed modified remedy achieves this objective.

4. control the movement of oil containing hazardous substances.

The cap, groundwater collection and source control wells will achieve this objective.

5. provide clean up remedies that bring groundwater into compliance with state and federal standards.

The source control wells, extraction wells and leachate toe drain will achieve this objective.

6. prevent the release of groundwater contaminants into the Clinton River and nearby wetlands that would endanger aquatic life.

The groundwater extraction wells, leachate collection toe drain, and source control wells would achieve this objective.

7. reduce or contain the amount of contaminated soil, landfill contents, buried waste oils and other buried waste.

The cap and source control wells would reduce and contain the contaminated soils, landfill contents, buried waste oils and other buried waste. The modified remedy would achieve this objective.

8. reduce long-term site management and maintenance requirements.

The proposed modified remedy replaces 47-1/4 gpm gradient control wells and a slurry wall with 13 source control wells. The proposed

modified remedy greatly reduces site management and maintenance requirements in the short term and in the long term.

3.3 ASSESSMENT OF PROPOSED MODIFIED REMEDY USING FS EVALUATION CRITERIA

Table 3.1 presents an assessment of the proposed modified remedy using FS evaluation criteria. The proposed modified remedy satisfies all of the evaluation criteria used in the FS and is preferred over the PRAP preferred remedy in some categories, such as long term operation and maintenance.

3.4 RISK ANALYSIS

Section 5.1.2 of this report reviews the RI baseline public health risk evaluation and concludes that the health risk was based on unreasonable assumptions and was overly conservative. Nevertheless, the health risk assessment identified only four exposure pathways which currently exist at the Site. These were:

- direct contact with surface soil,
- direct contact with sediment in Oil Seep Area,
- an accidental exposure to the oil seep area (falling in),
- residential use of contaminated groundwater as a drinking water source.

TABLE 3.1

ASSESSMENT OF PROPOSED MODIFIED REMEDY USING FS EVALUATION CRITERIA

Evaluation Criteria	*Proposed Modified Remedy*
1. Overall Protection of Public Health and the Environment	The groundwater collection and treatment system would protect the Clinton River adjacent wetlands from discharge of affected groundwater. Groundwater collection and treatment would also control future migration of affected groundwater to the commercial and residential areas along Ryan Road. Institutional controls and monitoring are not relied on as heavily as other alternatives as active groundwater collection will be used. This alternative eliminates all of the potential exposure scenarios identified by the baseline public health risk assessment. The four potential exposures were: 1. direct contact with surface soil on Phase I landfill - eliminated by cap; 2. direct contact with sediments in oil seep area - eliminated by cap; 3. ingestion of and dermal exposure to oil seep water - eliminated by cap and groundwater extraction and treatment; and 4. use of affected groundwater as a drinking water source - eliminated by groundwater extraction source control, groundwater treatment and institutional controls.
2. Compliance with applicable or relevant and appropriate requirements (ARARs)	60 mil HDPE FML with appropriate frost protection complied with ARARS. Chemical concentrations outside limit of source control wells at the property boundary point of compliance would be reduced to below Michigan Act 307 type C criteria of 1×10^{-5} for each individual carcinogenic indicator chemical before the groundwater extraction wells are shut off. Source control wells would continue to operate even after groundwater remediation is complete.
3. Long Term Effectiveness and Performance	
- magnitude of residual risk	Affected groundwater outside the zone of capture of the source control wells would be reduced to below cleanup goals before the groundwater extraction system is shut off. The source would be controlled by continued pumping of the source control wells.

TABLE 3.1

ASSESSMENT OF PROPOSED MODIFIED REMEDY USING FS EVALUATION CRITERIA

Evaluation Criteria	*Proposed Modified Remedy*
- adequacy and reliability of controls	Groundwater monitoring is reliable for detecting increasing parameter concentrations before people or aquatic life are exposed. Reliability of institutional controls on groundwater use is unknown over the long term. Reliability of the source control wells can be assured by water level monitoring in conjunction with groundwater sampling.
4. Reduction of Contaminant Toxicity, Mobility, or Volume through treatment	Flow equalization, oil/water separation, precipitation, filtration, air stripping, and carbon adsorption would be used to remove VOCs, metals, PCBs/pesticides, and separate phase liquids form groundwater. 130 pounds of VOCs would be treated in the first year. The amount of VOCs treated will likely decline in succeeding years. 90 percent of VOCs are assumed to be removed from treated groundwater. 6 to 9 cubic feet of sludge would be produced per day containing metals, TSS and oil.
5. Short Term Effectiveness	
- protection of community during remediation	Unlike the PRAP preferred remedy excavation of the slurry wall is not required. Slurry wall construction may involve VOC emissions and would increase nuisance dust and noise over cap construction alone. Minimal exposure is expected during extraction and source control well and leachate collection drain construction.
- protection of workers during remedial action	It is expected that most work would be completed in Level D with occasional upgrade to Level C. Elimination of Slurry wall construction will reduce likelihood of upgrades to Level B and will decrease the number of construction related accidents. Less traffic accidents associated with FML cap
- time until remedial objectives are achieved	Design procurement and construction of all remedy component including pre design groundwater treatability study could be completed in 3 years. Time to remediate groundwater to below clean up goals is estimated at 35 years for both the proposed and modified remedy and PRAP preferred remedies. Eliminates up to 30,000 truck loads of cover soil and clay. This will allow the cap to be completed in a much shorter period of time.

TABLE 3.1

ASSESSMENT OF PROPOSED MODIFIED REMEDY USING FS EVALUATION CRITERIA

Evaluation Criteria	*Proposed Modified Remedy*
- environmental impacts	Soil erosion during earthwork could result in silt reaching the Clinton River and adjacent wetlands. If silt were to reach the river or wetlands it could negatively affect fish and other aquatic life. Control measures such as silt curtains and berms would be used to minimize erosion. This effect will be reduced by eliminating the slurry wall. Sludge from the groundwater treatment plant would be tested and, if necessary, placed in a RCRA landfill. Wetlands near the Clinton River may be affected by groundwater extraction, though groundwater drawdowns are expected to be small, and treated water could be reinjected to maintain the wetlands. The possible groundwater mounding and flooding of basements and the lake that would have been caused north of 23-mile road by the construction of a slurry wall is eliminated. Clay is not available within a 10 mile radius. A 60 mil HDPE FML is available and could easily be constructed.
3. Implementability	
- technical feasibility	Groundwater extraction wells are proven and reliable. Groundwater treatment system uses standard technology and is expected to be reliable. Mechanical breakdowns are expected. The design of the system would include automatic shutdown of well pumps in the event of a treatment system failure. Other treatment processes could be added, as necessary. Elimination of slurry wall eliminates concerns with compatibility with separate phase liquids and concerns regarding groundwater mounding north of 23-Mile Road.
- availability of services and materials	Quantities of cover materials may require longer haul distances. The modified remedy substantially reduces quantities without sacrificing technical performance.
- administrative feasibility	Monitoring and institutional controls require review by MDNR and local officials - discharge permit required for treated water discharge. Elimination of slurry wall eliminates difficult slurry wall performance monitoring.

TABLE 3.1

ASSESSMENT OF PROPOSED MODIFIED REMEDY USING FS EVALUATION CRITERIA

Evaluation Criteria — *Proposed Modified Remedy*

7. Cost

	PROPOSED MODIFIED REMEDY	PRAP PREFERRED REMEDY
Capital Cost	$17,049,000	$31,221,000
Annual Cost	$819,000	$825,000
Present Worth (i=5% n=30 years)	$29,639,000	$43,903,000

The remedy modified remedy achieves the same objectives as the PRAP preferred remedy at a present worth of $14,264,000 less.

The groundwater pathway was based on consumption of groundwater with concentrations the same as those measured directly below the waste. The Stage III RI did not identify a single private residential water supply well which contained a single Site related parameter.

The proposed modified remedy involves capping which would eliminate the potential for direct contact with surface soil, sediment or the oil seepage area and thus the first three pathways are eliminated. The groundwater pathway is eliminated by the groundwater extraction, source control wells and leachate collection drain proposed as part of the modified remedy. After remediation of the groundwater is completed, the source control wells would ensure that affected groundwater did not migrate from the Site.

The proposed modified remedy eliminates the exposure pathways which were identified by the RI risk assessment.

3.5 COST

The proposed modified remedy is a variation of the PRAP preferred remedy that was not considered in the FS, but which achieves all of the Superfund and Site specific remedial goals, is protective of human health and the environment, is easier to operate and maintain and is much more cost effective than the PRAP preferred remedy. The present worth cost saving of the proposed modified remedy over the PRAP preferred remedy is $14,264,000.

4.0 COMMENTS ON THE FEASIBILITY STUDY REPORT

4.1 GENERAL COMMENTS ON FS

4.1.1 Remedial Goals

The Remedial Goals for the G&H Landfill Site are presented in Chapter 2 of the FS. Specific remedial goals for the Site are presented on page 2-2 of the FS.

The first item to consider in developing an approach for achieving the remedial goals is to consider the current and contemplated use for the landfill Site. Since municipal solid waste landfills are dedicated for waste disposal, regulations properly do not require that they be cleaned up to the point where they could be used for residential purposes. This indicates that the soil and groundwater within the boundaries of the Site need not be cleaned up to the point where the groundwater would be suitable for human consumption. In fact, this is a very reasonable conclusion founded on common sense. U.S. EPA has acknowledged this approach in stating that different degrees of groundwater cleanup should be considered ***"based on their vulnerability, use and value" (NCP, 1990).***

U.S. EPA's goal is to return groundwater that is capable of being used as drinking water to drinking water quality. In the case of the G&H Landfill, it must be acknowledged that the use of the Site as a landfill is a conscious and dedicated use. As a result, the groundwater below and in the

immediate vicinity of the Site cannot be considered to be readily available as a groundwater resource.

One of the stated remedial goals for the Site is to *"Control or reduce the volume of contaminated groundwater to prevent ingestion of groundwater with contaminants that exceed the MCLs, exceed non-zero MCLGs, exceed Michigan Act 307 type B criteria"* (page 2-2 of FS). These standards do not agree with each other and thus, do not present a consistent remedial goal. The FS later states that *"none of the alternatives would clean up groundwater to below MCLs/MCLGs or Act 307 Type B criteria in areas under the landfills within the proposed slurry wall alignment"*. Therefore, it is inappropriate to consider drinking water criteria as a relevant or appropriate clean up criteria within the boundaries of the landfill. The clean up goals for the groundwater leaving the Site should be developed in accordance with MCLs or with applicable Michigan Act 307 cleanup criteria (based on a Site specific evaluation of actual potential health risks).

Acceptable levels of residual risks (after remediation) are considered by the NCP to be in the 10^{-4} to 10^{-6} range (NCP, 1990). U. S. EPA has accepted residual risks in the 10^{-4} to 10^{-5} range in numerous Record of Decisions (RODs). More generally, a 10^{-4} risk level is presumed to be safe for public health purposes (55 Fed. Reg. 8292 (1990)).

The remedial goals for groundwater are not specified in the FS, only a list of inconsistent standards which do not present a consistent remedial goal are presented.

Remedial goals for groundwater should be established for a list of indicator parameters that are representative of Site conditions. The indicator chemicals for a particular situation are selected on the basis of frequency of detection, concentration, toxicity, mobility and bioaccumulation of the individual parameters (RAGS, December 1989). All of these factors are also taken into account in the development of drinking water standards.

At the G&H Landfill, the area of concern is identified in the RI as the "southeast canal area".

Table 5-11 of the RI identifies eight compounds in the "southeast canal" area which exceed U.S. EPA drinking water standards, and Table 5-9 identifies three compounds that contribute to carcinogenic risk in the "southeast canal area". Benzene appears on both lists. Therefore, a total of ten compounds are present above drinking water limits and/or at levels which contribute to carcinogenic risk in the "southeast canal area". This list forms the basis of an indicator parameter list.

The maximum probable background concentration (MPC) identified in Table 3-7 of the RI exceeds the concentration measured in the "southeast canal area" for two of the compounds, nickel and aluminum. Therefore, these compounds are not Site indicators.

Iron is not included on the indicator list as iron is naturally occurring in the environment and is not normally regarded as an indicator parameter when other indicators are present.

Manganese can safely be excluded from the indicator list as the concentrations in the "southeast canal area" are currently less than the Type B cleanup criteria for manganese.

Site indicator parameters therefore include arsenic, barium, lead, bis(2-chloroethyl)ether, benzene and vinyl chloride. These six parameters are appropriate indicator chemicals for the Site.

The 307 Rules do not specify a detailed selection process for determining whether Type A, B or C cleanup criteria is appropriate in a given instance. Instead, Rule 705(3) states that "a combination of [cleanup] types may be used at a single site to develop an acceptable remedial action". For some of the indicator parameters, Type B cleanup levels are protective of human health and the environment, technically achievable and appropriate for the Site. For other parameters, Type B levels ignore important considerations such as technical achievability, practical analytical detection limits, reasonable and foreseeable uses of the Site and natural resources, and cost effectiveness which can only be taken into account under Type C analysis.

Concentrations relevant to the determination of cleanup goals are presented in Table 4.1. The cleanup goal for arsenic is set at the maximum probable background concentration of 18 µg/L as presented in Table 3.7 of the RI consistent with Type A cleanup goals. This value is less than the MCL for arsenic, and is quantifiable.

The cleanup goals for lead and barium are set at the Act 307 Type B cleanup level. These concentrations are lower than the MCL

TABLE 4.1

SITE INDICATOR CHEMICALS AND CLEANUP GOALS

Site Indicator Chemical	*MCL*[1] *µg/L*	*Act 307 Type B Cleanup Level*[2] *µg/L*	*RI Practical Quantitation Limits*[3] *µg/L*	*RI Maximum Probable Background Concentration*[4] *µg/L*	*Proposed Modified Remedy Cleanup Goal µg/L*
arsenic	50	0.02	10	18	18
barium	1,000	350	200	188	350
lead	50	10	5	1	10
bis(2-chloroethyl)ether	-	0.03	10	-	10
benzene	5	1.2	5	-	5
vinyl chloride	2	0.02	10	-	10

Notes:

(1) MCL (54 FR 22062 May 1989).
(2) Act 307 Type B Cleanup Level calculated for 1×10^{-6} health risk based on 70-year exposure.
(3) RI Practical Quantitation Limit (RI Technical Memo Number 10 Tables 10-1 and 10-2).
(4) RI Maximum Probable Bakground Concentration (RI Table 3-7).

but higher than the maximum probable background concentration, and are quantifiable.

The 307 rules provide a framework for an analysis in Rule 717 dealing with the factors to be considered under a Type C remedial action. Rule 717(3) identifies specific factors which need to be addressed in consideration of a Type C remedial action. The factors are:

- Rule 717(3)(a) - Potential Exposure of Human and Natural Resource Targets

There are no potential exposure of human targets in the "southeast canal area" as no residences are located in this area. The Clinton River is a potential natural resource target; however, the Clinton River is more than 1,000 feet dowr gradient from the "southeast canal area" so that natural attenuation and dilution in the Clinton River will prevent a measurable impact on this natural resource target.

- Rule 717(3)(b) - Environmental Media Affected by Contamination

The environmental media at the Site include groundwater, soils and capped landfill materials. Landfill materials and soils will be covered by an improved cap as part of the Site remedy and access to the Site is already restricted by a Site fence. Groundwater will be controlled by the hydraulic containment source control wells and groundwater extraction wells in the proposed modified remedy.

- Rule 717(3)(c) - Physical Setting of the Site

The physical setting of the Site favors Type C criteria for the organic compounds. The downgradient area is uninhabited and undeveloped. Development is not anticipated as the downgradient lands are in the Clinton River floodplain.

- Rule 717(3)(d) - Background Groundwater, Surface Water and Air Quality at the Site

Implementation of a Type C cleanup will result in groundwater concentrations which are as close to background levels in groundwater as technically practicable and which will result in levels protective of human health and the environment.

- Rule 717(3)(e) - Current and Reasonable Foreseeable Natural Resource Use

No current or reasonable future use is anticipated for the landfill area. The downgradient area is fenced and is in the Clinton River floodplain and thus development is not anticipated.

- Rule 717(3)(f) - Potential Pathways of Hazardous Substance Migration

Pathways of migration are effectively limited to the groundwater path. The groundwater extraction and hydraulic containment source control wells will intercept groundwater and eliminate this pathway.

- Rule 717(3)(g) - Hazardous Substance Properties

Residual levels of the organic indicator chemicals will remain in the groundwater environment independent of the cleanup criteria applied. These compounds will adsorb to soil particles and will not continue to migrate after levels are reduced below a certain threshold value. Biodegradation may further reduce the residual concentrations below the threshold concentrations.

- Rule 717(3)(h) - Extent of Hazardous Substance Migration

The RI indicates that the migration of affected groundwater is limited and the FS indicates that it can be intercepted by the groundwater extraction wells.

- Rule 717(3)(i) - Impact of Future Migration

The impact of future migration after cleanup to Type C levels would be minimal as Type C levels would be set to ensure protection of human health and the environment. In addition, there are no downgradient groundwater users and no potential for future users to be established.

- Rule 717(3)(j) - Current or Potential Contribution to Food Chain

The depth to affected groundwater precludes the potential for vegetative uptake and subsequent potential contribution to the food chain.

- Rule 717(3)(k) - Climate

Winter climate at the Site is severe and will increase the cost of any remedial action of prolonged duration such as would be required to meet Type B levels because of frequent long term operation and maintenance problems.

- Rule 717(3)(l) - Technical Feasibility and Cost Effectiveness

Type C cleanup takes into account issues of technical achievability and measurability and cost effectiveness which are not considered in Type B cleanup levels.

- Rule 717(3)(m) - Evaluation of Remedial Alternatives

The basic remedy configuration is unchanged whether Type C or Type B cleanup goals are applied. The low levels applied to the organic compounds based on the practical quantitation limits from the RI, would essentially achieve the same goal as a Type B cleanup level.

- Rule 717(3)(n) - Uncertainties of the Risk

The uncertainties associated with the development of Type C criteria are the same as those associated with any risk assessment. The Type C levels selected are the lowest practical quantitation limits from the RI.

- Rule 717(3)(o) - Ability to Monitor Remedy Performance

The application of Type C cleanup criteria would allow the organic indicator compounds to be accurately and reliably measured using the practical quantitation limit in the RI. Type B criteria will result in levels which cannot be measured reliably.

- Rule 717(3)(p) - Great Lakes Policies

No impact to the Great Lakes will occur as a result of implementing a Type C cleanup.

In the preamble to the NCP, U.S. EPA commented on the potential role of natural attenuation in completing groundwater cleanups once groundwater extraction systems reached the point where further incremental reductions in groundwater concentrations were not cost effective.

"Those commenters supportive of the use of natural attenuation as a method of addressing ground water recognize that ground-water extraction and treatment ("pump and treat") is generally the most effective method of reducing concentrations of highly contaminated ground water, but note that pump and treat systems are less effective in further reducing low levels of

contamination to achieve remediation goals. These commenters suggest that natural attenuation may play a vital role in achieving the final increment of cleanup once pump and treat systems reach the point of diminishing returns. EPA agrees with the understanding reflected in these comments that active ground-water restoration may not always be able to achieve the final increment of cleanup in a timeframe that is reasonable. It is in recognition of the possible limitations on the effectiveness of pump and treat systems that EPA's approach provides for periodic evaluation of such systems and allows for the use of natural attenuation to complete cleanup actions in some circumstances. In some cases, proposed ground-water remediation goals may not be achievable. In these cases, it will be appropriate to modify the remediation goal to reflect limitations of the response action."
(NCP 55FR 8734, March 8, 1990).

Cleanup goals for the organic parameters bis(2-chloroethyl)ether, benzene and vinyl chloride are set using Type C criteria at practical quantitation limits as defined in the RI. Cleanup goals must be routinely and reliably measurable to assess remedy performance. A cleanup goal below practical quantitation limits would not be a reliable indicator of remedy performance.

4.1.2 ARARs

ARARs are developed for individual sites to identify design standards which may be useful. ARARs should not, however, be applied in an arbitrary, checklist manner without due regard for technical and performance requirements, especially when a multiple-component remedy is involved. In a multi-component remedy, overlapping remedial effects frequently mitigate or enhance part of the objective of other remedy components. Competing and complimentary remedy goals must be

considered when evaluating individual remedy components which may be assembled to form an alternative.

Chapter 2.0 of the FS describes "potential" ARARs which may be applicable to the Site. This chapter describes a universe of potential ARARs without identifying which are to be applied to the evaluation of alternatives.

On page 5-15 it is stated that ***"the MDNR and U.S. EPA are considering the relevancy and appropriateness of current RCRA and Michigan standards for landfill closures"***. This statement clearly indicates an incomplete evaluation and definition of actual ARARs for the Site.

Michigan Act 64 and RCRA are not applicable as the G & H Landfill was covered and closed prior to the effective dates of these Acts.

Michigan Act 64 and RCRA Subtitle C hazardous waste rules may be relevant for the Phase I landfill as it is known to contain both municipal solid waste and industrial waste. Act 64 and RCRA Subtitle C are not appropriate for the Phase I landfill as clay is not available locally and to construct a 3-foot clay cap over the Phase I landfill would require in excess of 9,000 20 cubic yard dump truck round trips through the local neighborhood.

Act 64 and RCRA Subtitle C, hazardous wastes rules are not relevant for the Phase II or III landfill as the RI data indicate that the Phase II and III landfills contains solely municipal solid waste.

Michigan Act 641 and RCRA Subtitle D solid waste rules may be relevant for the Phase I, II and III landfills as they are known to contain municipal solid waste. Act 641 and RCRA Subtitle D are not appropriate for the Phase I, II or III landfills as clay is not available locally and to construct a 2-foot clay cap over the landfill would require in excess of 9,500 20 cubic yard dump truck round trips through the local neighborhood.

The proposed modified cap utilizing a 60 mil HDPE FML is relevant and appropriate for the Site as it does not require clay which is not locally available and will significantly reduce the number of truck trips through the local neighborhood by as many as 14,000 round trips which would be required for the PRAP preferred remedy. The PRAP preferred cap construction would present unnecessary risks to and interference in the local community.

With regards to groundwater cleanup, page 5-15 states that ***"The MDNR and U.S. EPA are also considering the relevancy and appropriateness of using MCLs/MCLGs/Act 307 type B criteria as groundwater cleanup standards"***. The statement concludes that attainment of these standards outside of the slurry wall will result in a 10^{-6} residual cancer risk.

First, the remedial goals in the FS properly indicate that appropriate residual risks should be in the 10^{-4} to 10^{-6} range (consistent with the NCP).

The NCP clearly specifies MCLs as appropriate cleanup standards (for groundwater) which are protective of health. In the event that the cumulative residual risk in attaining the MCLs is greater than 10^{-4}, then Site-specific cleanup standards should be developed based on a Site-specific risk assessment.

As stated repeatedly in the PRAP (see pages 6 and 7), groundwater will be remediated to residual risk levels of 1 in 100,000 (10^{-5}). A 10^{-5} residual risk is consistent with the NCP and based upon the experience at other sites, is appropriate for establishing groundwater cleanup levels at the G&H Landfill. Site-specific cleanup levels resulting in a 10^{-4} to 10^{-5} residual risk level may be effectively developed using Michigan P.A. 307 rules Type C cleanup criteria. The 1×10^{-5} cleanup criteria presented in the PRAP is consistent with Type C criteria.

The FS, however, is fundamentally incomplete with respect to its lack of identification of the Michigan Environmental Response Act Type C cleanup criteria (Michigan P.A.307, as amended), as an ARAR for the Site. Part 7 of Michigan P.A. 307 provides specific requirements for establishing cleanup criteria at ***"all known sites of environmental contamination"*** [Rule 107(1)].

Rule 701 provides specific definition of three types of cleanup levels which may be applied either alone or in combination to all environmental contamination sites. They are:

Type A: *"the degree of cleanup which reduces hazardous substance concentrations such that those concentrations do not exceed background or method detection limits for a hazardous substance";*

Type B: *"the degree of cleanup which provides for hazardous substance concentrations that do not pose an unacceptable risk on the basis of standardized exposure assumptions and acceptable risk levels";* and

Type C: *"means the degree of cleanup which provides for hazardous substance concentrations that do not pose an unacceptable risk, considering a site-specific assessment of risks".*

It is appropriate that a Site-wide remedy including groundwater removal, treatment and containment components attains one or a combination of the Type A, B or C requirements.

The use of the Michigan P.A. 307 rules for establishing cleanup goals at the G&H Landfill Site will result in an effective approach to establish cleanup goals for this Site. It must be emphasized, as stated in Rule 705, that the attainment of cleanup goals as specified in Michigan P.A. 307 will result in a remedial action which *"shall be protective of the public health, safety and welfare and the environment and natural resources".*

As discussed in the Michigan P.A. 307 rules, Type A, B and C cleanups are potentially applicable either independently or in combination such that the cleanup standard is protective of the public health. Type C cleanup criteria are comparable to U.S. EPA's site cleanup approach.

Rule 717 states explicitly that "***Type C criteria shall be developed on the basis of a site-specific risk assessment***". Rule 717(2)(a) states that risk based cleanups must be demonstrated to be appropriate for the site being considered. The RI database provides the necessary information to conduct the Site-specific risk assessment evaluation.

The landfill property will not be developed for residential use. Rule 719(3) provides specific terms for placing institutional controls to ensure that human exposures to Site-related chemicals will not occur.

Utilizing a Type C risk based cleanup will allow a Site-wide remedy to be developed which is both cost effective [pursuant to Rule 717(2)(c)] while being protective of public health.

The existing RI database provides the necessary information to fully define the Type C cleanup criteria pursuant to the requirements of Rule 717(3)(a-q)(4)(5).

5.0 COMMENTS ON THE REMEDIAL INVESTIGATION REPORT

5.1 GENERAL COMMENTS ON THE RI

This section presents general comments on the RI. These general comments deal with broad issues and are not specifically directed towards a particular section of the RI.

5.1.1 RI Process

The RI for the G & H Site was initiated in 1983 and was completed in 1990. Over this 7 1/2-year period a large quantity of data has been collected at the Site. Throughout the project, however, U.S. EPA has failed to consistently consider the entire data base as a whole. No single document properly presents an overall assessment of the Site using all of the information. Even the latest RI report only includes the results of the Stage III RI work with occasional references to earlier reports. A major reason for the RI process is the assimilation of a complete data base to gain an understanding of the Site as a whole. An independent investigation conducted by MDNR was intended to supplement the U.S. EPA Stage III RI activities such that the data could be incorporated into the RI Report. The MDNR report did not analyze the data but merely transmitted it to U.S. EPA. The U.S. EPA RI report states on page 2-8 that only ***"some of the data collected for the SI have been used in this report to evaluate the site"***. The independent investigation data that was collected for the Site was not required and was never properly evaluated or utilized.

5.1.2 Baseline Public Health Risk Evaluation

The Baseline Risk Assessment (risk assessment) presented in Section 5.0 of the RI presents an ***"evaluation of potential threats to public health and the environment posed by the Site in the absence of any remedial action". (RI, page 5-1).*** The Baseline Risk Assessment for the G&H Landfill Site was based on the following major assumptions:

- ***No remedial actions will be taken,***

- ***No residential or industrial development will occur on the landfill due to geotechnical limitations,***

- ***No groundwater use restrictions are in place,***

- ***Contaminant concentrations will not change over time. (RI, page 5-1).***

The Baseline Risk Assessment is flawed because the above identified assumptions lead to the use of intake variables which are not representative of the Reasonable Maximum Exposure (RME) expected to occur. The Risk Assessment Guidance for Superfund (RAGS, December 1989) explicitly states, ***"for Superfund exposure assessments, intake variable values for a given pathway should be selected so that the combination of all intake***

variables results in an estimate of the reasonable maximum exposure[1] *for that pathway." (RAGS, page 6-19).*

Many of the assumptions utilized in the G&H Landfill Baseline Risk Assessment are improper and contrary to the above identified U.S. EPA guidance, because:

1) the Site is completely fenced, "No Trespassing" signs are posted, and the Site conditions have been widely publicized. These conditions will restrict and reduce the potential for unauthorized Site entry (trespass).

2) Site visitors would rarely come in contact with Site related contaminants. The status of a "Site Visitor" connotes an authorized entry to the Site. The only persons authorized to enter the Site would include Agency officials and/or Remedial Action (RA) workers (consultants and construction personnel) who are specifically trained to enter hazardous waste sites. It is unlikely that these authorized Site visitors would be exposed to Site contaminants to any significant degree.

3) The population which potentially could be exposed to Site related contaminants is limited to a small number of persons who are not authorized to enter the Site. The Site visitors referred to on page 5-4 of the RI should be referred to as Site trespassers. On page 5-4 it is stated that the Site has been used by small children in the past (RI, page 5-4).

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1 The RME is defined as the highest exposure that is reasonably expected to occur at a site (RAGS, page 6-5).

Due to the Site security features which have been added to the Site in recent years, it would be extremely unlikely that a child would ever play on Site. Additionally, as stated on page 5-4 of the RI, the visitor ***"may not come into contact with contaminants during every Site visit"***. As a result, it is overly conservative to assume that a trespasser may be exposed to the maximum concentration of each of the Site contaminants during all 25 visits per year. Even if a trespasser did enter the Site 25 times per year, as stated on page 5-4, it is unlikely that the trespasser would be exposed during each entry. It would be conservative to assume that a trespasser may be exposed to contaminants during 1 out of 5 trespassing events (i.e. 5 exposures per year). Additionally, the assumption that a child would be exposed 25 times per year, clearly exaggerates the risk associated with this scenario. It is reasonable to assume that a child would trespass on the Site less often than a teenager or adult. This may reasonably be translated into 1 or 2 exposures per year (in comparison to 5 exposure events for an adult).

4) Development of the Site will be restricted for additional reasons other than geotechnical limitations. Common sense will dictate that the Site could not be used for any purpose which would require the breaching of the cap.

5) The risk assessment erroneously assumes that the shallow groundwater below the Site will be used as a drinking water supply. On page 5-5/5-6 it is acknowledged that ***"it is anticipated that future***

residents in the area would use the municipal system". Additionally, the PRAP states that the preferred remedy includes *"providing affected residences and businesses on Ryan Road with municipal water" (PRAP, page 7)*. The risk assessment improperly assumes that 2 litres of groundwater would be consumed for 70 years for areas represented by the following individual monitoring wells and five Site areas:

Monitoring Wells		Site Areas	
1)	GR-01	1)	Area 1 (Phase I Landfill)
2)	GR-02	2)	Area 2 (Phase II Landfill)
3)	GR-03	3)	Area 3 (Phase II Landfill)
4)	GR-04	4)	Area 4 (SE Canal Area)
5)	GR-13	5)	Area 5 (Industrial Area)

It is improper and contrary to good sense to assume that an exposure to groundwater under the landfill will occur (Areas 1, 2 and 3). No one has access to groundwater below the Site for a drinking water supply. Consequently, a complete exposure pathway does not exist in the "Baseline" condition and will not exist in the future. A municipal landfill is an area dedicated to the disposal of wastes by definition. It is improper and unreasonable to assume that the groundwater within Areas 1, 2 and 3 would ever be used as a drinking water source. The risk assessment, therefore, misrepresents the existing condition of the Site. This Site is and will continue to be a former municipal landfill, not an area suitable for residential development, in accordance with waste disposal permits issued by MDNR.

Secondly, it is unreasonable to assume that groundwater resources to the south of the Site in the Rochester-Utica State Recreation Area (Area 4) would be developed as a drinking water supply (based on current/future land use projections).

The only plausible groundwater exposure scenario which should be evaluated as a potentially complete pathway includes the areas to the east of the Site (i.e. along Ryan Road). The risk assessment for the Ryan Road area is correctly evaluated using GR-01, 02, 03, 04, 13 and Area 5 monitoring wells as potential future groundwater exposure points. As discussed in the RI, there is no risk associated with these wells at present. Moreover, any future impact upon these wells most likely would be associated with waste disposal practices of businesses on Ryan Road. As noted above, these sources have not been properly investigated.

6) The risk assessment erroneously assumes exposure to Site groundwater for a duration of 70 years. According to U.S. EPA guidance it would be reasonable, according to the RME concept (RAGS, 1989), to assume residency in the affected areas for only 9 or 30 years (RAGS, page 6-22). Based upon the reasonably foreseeable landuse conditions for the Site and its environs, it seems reasonably plausible that the GR-01, 02, 03, 04, 13 and Area 5 wells represent exposure point concentrations which may result in a possible exposure to residential groundwater users in the area. It must be stressed, however, that a completed existing exposure pathway has not be demonstrated based

upon an evaluation of the RI data base. Additionally, it can not be demonstrated that the chemicals in Area 5 are even attributable to the Site.

7) Arsenic is reported at the following concentrations for each of the areas identified for the Site:

	Area	*Range (ppb)*	*Mean (ppb)*
1.	Phase I Landfill	0 - 307	61.2
2.	Phase II Landfill	0 - 316	104.9
3.	Phase III Landfill	10 - 54.8	33.7
4.	SE Canal Area	0 - 46.6	22.9
5.	Industrial Area	0 - 15.7	8.8

The RI determined that the maximum probable background concentration of arsenic is 18 ppb. Table 5-9 of the RI indicates that arsenic dominates the potential carcinogenic risks associated with Areas 2, 3, 4 and 5. However, in Areas 4 and 5, which are the areas where a potential exposure may be plausible, the levels of arsenic used in the risk assessment are only 22.9 and 8.8 ppb (respectively).

It is clearly inappropriate to represent risks attributable to the Site in the 10^{-4} range for Area 5 when the average arsenic concentration in this area is 8.8 ppb. This is below the background level established for the Site (which is 18 ppb) and the MCL (which is 50 ppb). The MCL of

50 ppb for arsenic was established by U.S. EPA to be protective of human health.

In summary, the baseline risk assessments for each of the above identified areas should discount the risks associated with the background components of arsenic (see Table 5.9, RI). In Area 5, the most plausible area for exposure, the resulting carcinogenic effects potentially relating to the Site would be in the 3×10^{-6} range (using U.S. EPA's exposure assumptions).

8) An exposure pathway to Site impacted air was forced through a modelling exercise even though U.S. EPA could not measure an air impact. The lack of a quantifiable impact from the Site is sufficient to eliminate this potential exposure pathway.

A summary of the RI risk assessment assumptions and CRA's comments based on those assumptions is presented on Table 5.1.

Even with the overly conservative assumptions, which are contrary to EPA's RAGS guidance, the only exposure pathways identified by U.S. EPA were:

- direct contact with surface soils,
- direct contact with sediment in Oil Seep Area,
- an accidental exposure to the oil seep area (falling in), and
- residential use of contaminated groundwater as a drinking water source.

TABLE 5.1

RI ASSUMPTIONS FOR BASELINE RISK ASSESSMENT

	Assumption	*Comment*
1.	No Remedial Action will be taken	- Reasonable for baseline risk assessment
2.	No Residential or industrial development will occur on the landfill due to geotechnical limitations	- geotechnical limitations are not the only reason that residential or industrial development will not occur at the Site; institutional controls and common sense will ensure that development does not occur on the landfill
3.	No groundwater restrictions are in place	- even without restrictions no one would drink groundwater from the upper sand aquifer directly under the landfill
4.	Contaminant concentrations will not change over time	- reasonable for baseline risk assessment
5.	Site is accessible to Site visitors	- the Site is currently surrounded by an 8 foot high, 3 mile long fence and thus the Site is not easily accessible. Hypothetical visitors assumed at risk are more appropriately described as trespassers. True Site visitors are not likely to be exposed
6.	25 visitors - 8 hours per day over a 5-year period would describe a reasonable maximum exposure frequency	- this exposure frequency is excessive considering the site is completely fenced
7.	Exposure to oil seep area limited to one-time accidental contact	- reasonable for baseline risk assessment
8.	Because suitable ambient air data was not available potential airborne concentrations were modeled using a conservative screening level approach	- a large quantity of air data was collected at the Site and the RI conclusion was that "differences in contaminant concentrations between upwind and downwind samples during either sampling event do not show wide enough variance to statistically determine the landfill's effect on ambient air quality" (RI Page 3-27). The air data didn't show any impact by the Site so it was inappropriate to use a model

TABLE 5.1

RI ASSUMPTIONS FOR BASELINE RISK ASSESSMENT

	Assumption	*Comment*
9.	Groundwater exposure based on a daily residential use for a 70-year lifetime	- the most recent RI data indicates that none of the private residential wells sampled contained any detected VOC. As a result, it is inappropriate to use a 70-year exposure when none of the private residential wells show contamination. In fact, the RI states that contamination east of Ryan Road is not clearly Site-related. Contamination west of Ryan Road is related to the automobile salvage yard rather than the landfill. The groundwater below a municipal landfill cannot reasonably be expected to be used as a drinking water source. It is improper to assume that groundwater exposures would occur for 70 years. A 9 or 30-year period should have been used according to U.S. EPA guidance
10.	Air releases based on constant continuous wind direction from the landfill for 70 years using modelled air releases	- see CRA comment for Item 8. Air sampling did not show a statistically significant effect on ambient air quality and it is unreasonable to assume that wind would blow in the same direction for 70 years
11.	Contact exposure with surface soil based on highest detected concentrations for each compound	- this clearly over estimates the risk even for a reasonable worst case scenario as even the maximum concentrations do not all occur at the same Site location
12.	Groundwater risks were based on existing individual private residential wells and monitoring data for five areas of the Site although the on-Site well water is not currently used for drinking or cooking	- It is reasonable and plain common sense to assume that the groundwater directly below the landfill will never be used for a drinking water supply - the industrial wells are not used for drinking - compounds detected in the industrial wells are related to the automobile salvage yard and other industries and not the landfill
13.	Background concentrations of arsenic were not evaluated	- upgradient (background) concentrations of arsenic are in the 15 to 20 ppb range, these values are similar to the values in Areas 4 and 5 and all are less than the MCL (50 ppb)

5.1.3 Misleading Presentation of Data

Several areas of the RI have been presented in a misleading manner.

The RI is not only a report which should point out the areas of affected groundwater but it should also delineate clearly those areas which are not affected by the Site. The best example of this is the private residential well samples. The RI did not identify a single private residential well which was affected by the Site. This should be clearly stated in the RI for the benefit of those residents east of the Site. The RI did state that "***VOC were detected in five of the wells sampled. Most of this VOC was detected in four industrial wells east of the Site and west of Ryan Road." (page 3-20, RI).*** What should have been stated is that the fifth well is an industrial well east of Ryan Road and that none of the industrial wells are used as a source of drinking water. The U.S. EPA conclusion that ***"it is unclear whether contamination east of Ryan Road is Site related based on known source areas and present groundwater flow directions" (page 3-21, RI)*** is misleading as stated. Based upon the data, the only supportable conclusion is that the very low 1.7 µg/L concentration of TCA/TCE at one industrial well east of Ryan Road is most likely related to an off-Site source. Additionally, the risk assessment clearly exaggerates the risks associated with the potential ingestion of groundwater. The only plausible groundwater exposure scenario which should be evaluated concerns the groundwater in the Ryan Road area (see Section 4.1.4).

The RI does not clearly state that the Phase II and III landfills are solely municipal refuse. Page 3-10 of the RI states that ***"solvents and oily materials are not present in the Phase II or III landfills."*** Page 3-21 of the RI states that ***"leachate from the Phase III landfill is contaminated and is flowing towards the Clinton River."*** The levels of BETX detected in Phase III landfill leachate are at the low end of the range of BETX concentrations measured at typical municipal solid waste landfills as stated in "Chemical Characteristics of Leachate from Municipal Solid Waste Landfills in Wisconsin" McGinley and Kmet, August 1984.

The subsurface soil contamination in commercial areas to the east of the Site was presented as being Site-related without discussing the likelihood of these commercial areas causing environmental problems of their own. Groundwater contamination of the industrial wells east of the Site appears to be related to the auto disposal yard based on the distribution of chlorinated VOCs and the groundwater flow pattern presented on Figure 3.10 of the RI. Previously, U.S. EPA used arguments such as the groundwater mound to explain how the landfill was causing contamination in the industrial wells east of the Site. Even if the hypothetical groundwater mound is present, groundwater contours presented on Figure 3.10 of the RI do not indicate an off-Site component of flow to the east.

The July 1987 RI report concluded that there was a continuous immiscible oil plume originating at Oil Pond No. 1 and discharging to the surface seeps south of the Conrail right-of-way. The Stage III RI does not support this conclusion.

5.1.4 Possible Adjacent Sources

The groundwater flow patterns, presented on Figure 3.10 of the RI indicate that the landfill Site is not the source of chemicals in the groundwater along Ryan Road. Additionally, the distribution of chemicals in the upper aquifer along Ryan Road vary significantly in comparison to affected groundwaters below the Site. These reasons generally indicate the likely presence of off-Site sources along the west side of Ryan Road.

The area southeast of the Site along Ryan Road was not adequately investigated as a possible source of contaminants. At least two businesses in this area are likely sources of liquid waste that could have entered the groundwater along Ryan Road east of the Site.

5.1.5 Automobile Salvage Yard

The automobile salvage yard which was an independently owned and operated business, separate from the G&H landfill, and with waste management practices dissimilar to the G&H landfill should not be considered part of the Site. The automobile salvage yard has not been included as part of the Site in previous U.S. EPA studies. In fact, the Stage III RI/FS Work Plan dated March 29, 1988 refers to the installation of off-Site gas probes, 3 of which were installed in the automobile salvage yard. Any chemicals that may be present on or under the automobile salvage yard property should be treated as a separate Site not related to the G & H Landfill.

It was the understanding of the PRP that Shelby Township had ordered the property owner (the Estate) to clean up the automobile salvage yard. This separate cleanup was to be conducted under the direction and supervision of MDNR. Inclusion of the automobile salvage yard as part of the Site is improper and is not consistent with the NCP.

APPENDIX A

SPECIFIC COMMENTS ON THE PROPOSED REMEDIAL ACTION PLAN (PRAP, AUGUST, 1990)

A.1 SPECIFIC COMMENTS

The following provides specific comments on the U.S. EPA PRAP.

Page 3 of the PRAP states: *"The Phase I landfill cover is between 1/2 foot and 3 feet thick and has surface depressions that hold water. The cover soil consists of silty sand, so the potential for water to filter through it and to leach contaminants from the landfill into the ground water is high"*. These statements are contradictory, because if the cover was highly permeable the depressions in the cover would not hold water. Test pits completed in May 1989 indicated that the MSW contained in the Phase I landfill above the water table exists in an unsaturated state. This indicates that although there certainly is a potential for infiltration, the actual field data show that the existing cover is reducing infiltration to a significant degree.

Page 3 of the PRAP states: *"Landfill refuse and the underlying soil are saturated with oil at the Codisposal Area and two former oil ponds"*. The test pit results indicate that this saturation only occurs at depth and is not associated with the upper layers of refuse.

Page 4 of the PRAP lists the pathways of greatest concern for Site visitors and the additional cancer cases that could occur and more specifically states: *"Drinking contaminated ground water (the additional cases vary from 2 per 10,000 people exposed in the industrial area east of the site to 2 per 1,000 people exposed in the area surrounding the Clinton-Kalamazoo Canal)"*. Based upon current and future land uses in this area, it is unlikely that this

land could ever be developed. As a result, the PRAP over estimates the potential risks associated with the groundwater exposure scenario. The risks associated with the more plausible groundwater resource development in the Ryan Road area are in the 2×10^{-4} range and lower. This risk is associated with a 70-year exposure which is only remotely possible given current conditions. The groundwater exposure scenario risks associated with wells located in the Ryan Road area would be significantly less if the exposure assumptions were based on U.S. EPA guidance to develop the reasonable maximum exposure which may be expected to occur (i.e. exposure may reasonably be expected to occur for 9 or 30 years).

Page 7 of the PRAP states: ***"Studying the junkyard area and evaluating additional cleanup measures as need"***. Considering that the junkyard is not part of the Site, its attempted addition is improper.

APPENDIX B

SPECIFIC COMMENTS ON THE FEASIBILITY STUDY REPORT (FS, AUGUST, 1990)

B.1 SPECIFIC COMMENTS ON FS

Chapter 1: Introduction

On page 1-2, in the second paragraph, it states that: *"Although this area was not used for municipal refuse disposal, it may have been used for waste industrial solvent disposal"*. The area referred to is the automobile disposal yard. This information was not presented or substantiated in the RI and this area is not part of the Site.

On page 1-2, in the fourth paragraph, it states that: *"The ditch carries water intermittently"*. The "ditch" which is referred to is the abandoned Clinton-Kalamazoo Canal which was never completed. The fact that the canal is incomplete makes it impossible for it to carry water. The canal may contain water intermittently but flow is not possible.

On page 1-4, in the third paragraph, it states that: *"Personnel familiar with the waste oil recovery operations estimated that approximately 50 percent of the waste oil delivered to the site was recovered in this manner"*. This statement contradicts the statement in the RI that: *"After unsuccessful attempts to recycle the oil it was placed in the ponds and allowed to seep into the ground or evaporate"* found on page 2-3 of the RI. The RI does not indicate that any oil was recovered. The Site history in the RI and FS should be consistent.

On page 1-5, in the first paragraph, it states that: *"From 1965 to the present, six site investigations and reports have been completed"*. Seven Site investigations including the Stage III RI were completed, not six.

Figure 1-8, *"Extent of BETX and Chlorinated Volatiles in Groundwater in the Upper Aquifer"*, is misleading as it does not include the concentration contours that were presented in the RI on Figures 3-21 and 3-22. Also, the areas shown are different than the areas shown in the RI.

Chapter 2: Remedial Goals

On page 2-5, in the second paragraph, it states that: *"An example "hot spot" is the leachate seep located at the south end of the Phase III Landfill."* The example of the leachate seep located at the south end of the Phase III Landfill as a hazardous waste "hot spot" is inappropriate. Leachate seeps are common in municipal solid waste landfills without hazardous waste disposal.

On page 4 of Table 2-1, *"Potential ARARs for the G&H Landfill"*, in the bottom righthand corner, it states that: *"Applicable if Fish and Wildlife Service deems area a critical habitat"*. After 7 1/2 years and 3 stages of investigation this should not be an unresolved issue capable of generating additional liability.

Chapter 3: Alternative Array

On page 3-3, under the heading of institutional controls for alternative 2, the second bullet states: *"Deed restrictions on future land and ground water use"*,

and the fourth bullet states: *"Periodic monitoring of commercial or residential water supply wells or installing connections to municipal water in the area along Ryan Road where wells have been contaminated or could be contaminated in the future"*. Restricting the water and land use as well as the possibility of installing municipal water connections depends on the extent of any affected groundwater. Currently, the residences east of the Site are not affected and will not be affected in the future because they are across gradient from the Site and the proposed modified remedy will control groundwater flow from the Site. The number of residences identified should be clearly stated.

On page 3-4, in the fourth paragraph, it states that: *"Alternatives 4A and 4B were developed to provide alternatives of moderately relative cost that include more control of contaminant migration and ground water treatment"*. The term "moderate relative costs" is inappropriate as the estimated cost of 20 to 40 million dollars and annual operating and maintenance cost of 750 thousand to 15 million dollars is excessive for sites of this size and type.

Chapter 4: Technology Screening and Development

On page 4-3, in the fourth paragraph, it states that: *"Some, such as aquifer use restrictions are voluntary and are not enforceable"*. Aquifer use restrictions are enforceable under Michigan Act 307 rules. Moreover, it is logical to assume that if the water was affected, possible users made aware of the dangers would probably choose not to use the water.

On page 4-3, in the sixth paragraph, under the heading "Alternative Water Supplies", it states that: ***"The MDNR currently estimates that 50 to 60 commercial and residential water supply wells are being operated in the area east of the site along Ryan Road"***. Most of the 50 or 60 water supply wells have not been affected by the Site and will never be affected since most are upgradient or across gradient from the landfill and the proposed modified remedy will control groundwater flow from the Site. There is little reason to connect all the wells to the Municipal water lines.

On page 4-4, in the first paragraph, it states that: ***"The cost to connect 60 businesses and residences to the water main would be about $90,000"***. The cost of connecting the businesses and residences to the watermain does not appear to include abandoning the current wells. The Public Health Department - Water Supply Division requires that existing wells must be properly abandoned (ACT 368 of 1978, Part 127) before hook up to the municipal water supply is allowed.

On page 4-5, the first bullet states: ***"The Phase I Landfill is covered by material that is too sandy to limit infiltration and is contaminated by PCBs and pesticides"***. A statement identifying that the PCB concentrations in surface soil is at low levels should be added.

On page 4-7, in the first paragraph, it states that: ***"A downgradient wall would contain contaminated groundwater from discharging to the Clinton River valley, however, excessive pumping would also be needed for it to be effective and prevent overtopping"***. Excessive pumping should be defined.

Water balance calculations indicate that there is only limited water available and "excessive" pumping would not be possible.

On page 4-7, in the third paragraph, it states that: ***"Groundwater levels upgradient from the wall, along 23 Mile Road, would likely rise and diversion or control measures may be needed"***. The expected rise in water elevation should be estimated and measures to prevent flooding included in the PRAP preferred remedy.

On page 4-10, in the fifth paragraph, it states that: ***"Reactor based biological treatment is being studied at the site as part of an EPA research and development program"***. The Reactor based biological treatment study has been cancelled.

<u>Chapter 5: Alternatives Evaluation</u>

On page 5-1, the use of ***"site visitors"*** should be changed to ***"trespassers"*** as discussed on page C-4.

Information concerning principal exposure pathways on page 5-1, in the first bullet-second item, it states that: ***"Inhalation by site visitors of released volatile compounds from Phase I landfill area"*** should not be a principal chemical exposure pathway as releases from the Site cannot be distinguished from background and air quality is monitored while legitimate "visitors" are on site. The current site cap is adequately protecting the atmosphere in and around the Site from the release of VOC.

On page 5-1, the last item on the page states that: ***"Release of contaminants to ground water, and subsequent transport off site and use by residents or workers as a drinking supply source"***, is a principle chemical exposure pathway. The potential for contact through drinking water is low as discussed earlier.

On page 5-2, the second item on the page states that: ***"Release of contaminants to ground water and surface water and subsequent transport off site, and direct contact by aquatic organisms in the Clinton River and Clinton-Kalamazoo Canal".*** is a principle chemical exposure pathway. The canal is not able to sustain aquatic life and therefore there is no direct contact.

On page 5-2, in the sixth paragraph, it states that: ***"Groundwater use restrictions in the area would be implemented in conjunction with public water supply connections; however, enforcement of such restrictions is likely to be difficult".*** Hooking up to the municipal water supply will require that the existing wells be abandoned unless used for monitoring. This would eliminate access to possibly affected groundwater. Furthermore, new wells could be restricted by current public statutes.

On page 5-4, in the last paragraph, it states that: ***"Additional slurry walls, grouting or other methods may be necessary to isolate these utilities"***. (The utilities are the water main and sewer interceptor crossings). The "other methods" should be specified.

On page 5-5, in the seventh paragraph, it states that: *"Carbon from the vessels will need to be periodically replaced and regenerated"*. The expected frequency of carbon changeout should be estimated.

On page 5-6, in the second paragraph, it states that: *"Ground water would be extracted from areas with contaminant levels greater than the most stringent concentration from established MCLs or non-zero MCLGs or Act 307 type B criteria"*. The acceptable concentrations have not been determined in this document.

On page 5-12, in the second paragraph, it states that: *"Wetlands that cannot be maintained during the implementation of any alternative will be replaced."*. It should be noted that wetlands that may be affected by remedy implementation were man made and include gravel mining trenches and canals.

Appendix A: Initial Technology Screening

On page A-1, the third bullet is referring to detailed screening which is provided in Appendix B, C and D, and should not be included in Appendix A under "Initial Technology Screening".

Appendix B: Containment Analysis

On page B-6, in the first paragraph, it states that: *"All three multilayer caps would have a gas venting system to prevent pressure from landfill gas from*

damaging the cap". Gas pressure is an overrated concern as the refuse is only about 20 feet thick and at least 17 years old.

On page B-6, in the second paragraph, it states that: *"It was assumed that the site would require grading to minimum 3 percent slopes before installation of a multilayer cap"*. The rational for choosing a 3% slope over a 2% slope is not defined.

On page B-7, in the last bullet, it states that: *"Increased truck traffic will cause traffic problems in the area; Ryan Road and 23 Mile Road are 2-lane streets"*. The amount of traffic currently using the roads has not been established and thus the potential traffic problems cannot be adequately identified.

On Table B-2, *"Summary of Capping Options"*, page 1, in the first row under the heading *"Effectiveness for soil capping option"*, it states that: *"Based on water balance model, would reduce leachate by an estimated 60%"*. The amount of leachate production has not been given and thus a 60% reduction has little meaning. If the leachate production is low then a 60% reduction is not much, but if the production is high then 60% is a significant number.

On Table 7(b), *"Summary of Generated Leachate"*,the area of the Phase II and III Landfills combined is 25 acres (page 2-2, RI) not 14 acres as shown.

APPENDIX C: GROUNDWATER EXTRACTION ANALYSIS

On page C-3, the first paragraph does not completely describe how the 140 to 180 gpm of groundwater moving through the upper aquifer beneath the site

was calculated. Values that were used for the hydraulic gradient, width of the aquifer and hydraulic conductivity should be stated. A table summarizing the calculations would provide the necessary information to verify the results.

On page C-7, the quantities of groundwater for hydraulic gradient control and extraction presented in the first paragraph are not consistent with estimates presented on Pages 5-5 and 5-6 of the FS. The RI/FS water balance is incomplete and incorrect.

APPENDIX D: TREATMENT SYSTEMS ANALYSIS

The first and fifth bullets on the page say basically the same thing.

On Table D-3, ***"Comparison of Maximum and Mean Groundwater Concentrations to State and Federal Guidelines or Criteria, No Action Alternative"***, there are many more relevant "conventional parameters" such as TDS, phenols, and pH that should be looked at for discharge criteria.

APPENDIX F: DETAILED COST ANALYSIS

Under the heading of "Leachate Collection" on page F-4, in the last paragraph, it states that: ***"It was assumed that leachate would be collected in a sump, pumped to a storage tank on the railroad grade, and periodically hauled to an industrial treatment facility using a 6,000-gallon vacuum tanker truck"***. Leachate will not be trucked away as a treatment plant will be part of the total remedy. This further illustrates the inefficiency of evaluating remedy components independently.

APPENDIX C

SPECIFIC COMMENTS ON THE REMEDIAL INVESTIGATION REPORT (RI, AUGUST, 1990)

C.1 SPECIFIC COMMENTS ON THE RI

C.1.1 Executive Summary

On page 1, in the second paragraph, it states that: ***"An inactive automobile disposal yard is located directly north of the industrial area and is considered part of the site".*** The automobile disposal yard or junk yard (as described in previous reports) was never considered in the discussion of the remedial measures of the landfill and should not be included in Site. As discussed in the Executive Summary, the auto disposal yard was never properly investigated during the RI suggesting that it was never properly considered to be part of the Site. It is also very likely a separate source of groundwater contamination unrelated to the G & H Landfill.

On page 1, in the third paragraph, it states that: ***" The site accepted municipal refuse and liquid and solid industrial wastes including oils, solvents, paint residues, and industrial process muds".*** This sentence is misleading since it is not true for the total operational time frame for the landfill from the mid-1950s to 1973. In 1966 a Consent Order was issued by the Macomb County Circuit Court prohibiting the disposal of paints, varnishes, paint thinners, and lacquer. In 1967 another Consent Order was issued banning the disposal of any liquid industrial wastes, muds, or sludges. This is explained in Chapter 2 of the RI but should be included in the executive summary (page 1).

On page 2, in the first paragraph, *"Clinton-Kalamazoo Canal" should read "abandoned Clinton-Kalamazoo Canal"*. The canal was never completed and used. Further reference to the canal should also have the same format.

Under the heading "EPA Remedial Actions" on page 3, in the seventh paragraph, it states that: ***"In 1987, Action No 4 resulted in the construction of a 3-mile-long chain-link fence around the site perimeter, installing a temporary treatment system at the discharge point of oil seeps, and collecting and transporting approximately 2,400 gallons of oil to a thermal destruction facility in Chicago"***. The word ***"oil"*** should correctly read "an oil and water mixture".

On page 3, in the eighth paragraph, it states that: ***"The upper sand unit is 7 to 46 feet thick, but may be absent in some areas"***. The absence of the upper sand unit in some areas is due to the local mining of sand and gravel. This information should be added to clarify the statement.

On page 4, in the second paragraph, it states that: ***" Soils in the industrial area to the east show that contamination extends offsite"***. The contamination in the industrial area may be due to the industries themselves. The type and amount of waste that the industries produce may be a contributing factor to the contamination in the area.

On page 4, in the third paragraph, the acronym ***"PAH"*** has been incorrectly used. Polynuclear aromatic hydrocarbons should have **PNA** as the acronym. This should be made consistent throughout the RI report.

On page 4, in the fifth paragraph, it states that: *"BETX and chlorinated VOCs were detected in residential and commercial well water in the vicinity of the site"*. This statement is incorrect as VOC was not reported in residential wells during Stage III. The general location of the wells sampled should be noted.

On page 5, the fifth paragraph on the page is misleading. It states: *"BETX and chlorinated VOCs were detected in residential and commercial well water in the vicinity of the site. The waste types are consistent with wastes detected onsite. Contamination in the industrial area appears to be site related because the waste types are consistent with wastes detected onsite and the contamination was detected upgradient in the auto disposal yard. Based on the fact that the types of contaminants found east of Ryan Road are consistent with those found onsite, it is believed that the contamination east of Ryan Road may be site related. However, no contamination was detected upgradient of this area at this time"*. The groundwater flow is generally towards the south-west making it virtually impossible for groundwater to migrate directly east of Ryan Road in the residential area. This is consistent with the fact that the residential wells directly east of the auto-disposal yard have not been affected by the site. Some contamination, in only one industrial well, east of Ryan Road and south of the railroad tracks was found. This is probably not Site-related since wells not on the landfill, north of this well, are clean. Industrial wells on the east and west side of Ryan Road probably have been contaminated by the industries themselves. This has never been properly investigated. Therefore, no conclusion can be made that

the contamination is site related. (In fact, based upon the groundwater flow, the contamination is not likely Site related).

On page 5, in the second paragraph, the words ***"site visitors"*** should be restated as***"trespassers"***. A ***"site visitor"*** to an area has been properly approved by the owner to access the property and would be protected by the rules governing the property only. A ***"trespasser"*** who accesses the property without permission, arguably may not be aware of the danger.

On Table 1, ***"Summary of Risks, G&H Landfill Site"***, page 2, under "Exposure Pathway", last entry on the page states that: ***"Volatilization and release of volatile chemicals from subsurface with subsequent release to nearby residents and businesses."*** This exposure is unsubstantiated, since as stated in the RI measured air concentrations: ***"... between upwind and downwind samples during either sampling event do not show a wide enough variance to statistically determine the landfill's effect on ambient air quality"***. (page 3-27, RI). In other words, a release from the landfill could not be measured.

Chapter 2: Site Background

On page 2-1, in the fourth paragraph, it states that: ***"An inactive automobile salvage yard, located directly north of the light industrial area, is considered to be part of the site"***. The automobile salvage yard is not part of the Site as described in the Executive Summary of this report.

On page 2-2, in the second paragraph, it states that: *"All three areas have some exposed refuse at the surface"*. In most cases the exposed refuse was disposed after the soil cover was constructed. Having exposed refuse may be a potential exposure pathway but, in all cases above, there is a protective silty sand soil layer at or near the surface.

On page 2-3, in the sixth paragraph, it states that: *"After unsuccessful attempts to recycle the oil, it was placed in the ponds and allowed to seep into the ground or evaporate"*. This statement conflicts with paragraph 4 on page 1-4 of the FS which states approximately 50% of the oil was recycled.

On page 2-4, in the second paragraph, it states that: *"Drums were also accepted at the Site, and three distinct ponds in the southern portion of the Phase III Landfill for the disposal of paints, varnishes, and chemical solvents were noted at that time (see Figure 2-2)"*. In this sentence the reference to *"Phase III"* should be *"Phase I"*.

On page 2-4, in the seventh paragraph, the statement that: *"The landfill apparently operated under various State of Michigan permits from 1967 until its closure in 1973"* is incorrect. The Site did operate under State of Michigan permits.

Table 2-1, *"Summary of Stage I and II RI Activities, G&H Landfill Phase III RI"*, would be more valuable if the Stage III RI activities were included to show the entire scope of the RI investigations.

On page 2-8, in the first paragraph, it states that: ***"Some of the data collected for the SI have been used in this report to evaluate the site"***. This indicates that the data collected by MDNR was not useful or needed. The amount of data used has not been stated.

On page 2-9, the second bullet states: ***"A metal storage building as constructed to store PCB-contaminated wastes recovered during this action and anticipated future oil-recovery actions (Figure 2-3). The storage bu.lding is 40 to 80 feet, has a concrete floor with 6-inch curbing all around, and contains three 5,800-gallon tanks"***. The tank volume is 3 x 5,800 gallons or 17,400 gallons. Only 2,400 gallons were transported. The volume of material originally in the tanks and the volume remaining should be stated.

On page 2-9, the sixth bullet states: ***"Sludges and solids that accumulated were stockpiled on the west side of the collector trench and covered with a tarp"***. The paragraph does not indicate what happened to the sludges and solids or if they are still in the stockpiles.

On page 2-9, the seventh bullet states: ***"In April 1989, approximately 2,400 gallons of collected oil were transported to a thermal destruction facility in Chicago"***. It should be noted that the collected "oil" which was stored in the U.S. EPA storage shed was mostly water.

Chapter 3: Investigation Results

On page 3-1, in the fourth paragraph, it states that: ***"The Phase I Landfill is characterized by hummocky terrain, caused by improperly grading the site when it was closed, or by differential settling of the waste"***. The word "or" should be more correctly stated as "and/or" since both causes are suspected and could conceivably have happened.

Figure 3-1, ***"Site Topography"***, is missing the locations of the Paint, Varnish & Solvent Ponds.

On page 3-2, the second bullet states: ***"Soils at the site are sandy, and display high infiltration capacities, which result in small runoff volumes"***. The type of soil is not consistent over the entire sight and it is noted later on pages 3-7 and 3-8 that portions of the landfill have a low to moderate infiltration capacity. Moreover, data collected during test pitting conducted in May 1989

suggested minimal infiltration, as much of the refuse existed in a dry unsaturated state.

On Figure 3-2, *"Geologic Fence Diagram"*, the scale and bedrock elevations are given, but the top elevations of the bore holes and other stratographic layers is not. The inclusion of the top elevations would make this figure more useful and accurate in determining the depths to each soil layer.

On Figure 3-3, *"Surface Geology of Macomb and Oakland Counties"*, the dark horizontal shading is not defined on the figure.

On page 3-5, in the fourth paragraph, the description of the water budget does not balance. The amount of groundwater going in is 35 to 40 gpm and the amount going out is 11 gpm. This is not consistent with water balances presented in the FS. U.S. EPA should re-evaluate the Site water balance.

On page 3-5, in the seventh paragraph, it states that: *"Laboratory results estimated a vertical hydraulic conductivity range of 1.9 x 10^{-7} to 1.7 x 10^{-6} cm/s with a logarithmic average of 4.9 x 10^{-8} cm/s"*. There is no description of the laboratory procedure used to obtain these results. The validity of the numbers is subject to the methods used to obtain them.

On page 3-5, in the seventh paragraph, it states that: *"The in-situ values are two to three orders of magnitude above the laboratory values"*. The fact that insitu values of the till conductivity are 2 or 3 orders of magnitude higher than the laboratory results does not indicate that the till is 2 or 3 orders of magnitude more permeable. Insitu tests may be affected by borehole construction and may be governed by a thin horizontal layer of more permeable material which in no way affects the bulk vertical conductivity of the till.

On page 3-6, in the sixth paragraph, it states that: *"The site is defined as the area bounded by the fence erected by the U.S. EPA in 1987"*. This is the third and largest definition of Site used in the report. Consistent definition of the Site boundaries should be used and should not include the auto salvage yard.

On page 3-7, in the second paragraph, it states that: *"In addition, drum disposal areas were identified in the southwestern portion of Oil Pond No. 1 and between Oil Pond No. 1 and the unloading areas on the railroad grade"*. A large effort was made to identify the location of buried drums and thus these two areas should be shown on a Site map to pinpoint their location. However, these two areas could be argued as having little significance in terms of specifically locating them since it was discovered that in fact buried drums can be found throughout the landfill. The time and money spent to identify drum areas was not of any consequence and did not affect the final selected remedy.

On page 3-7, the third and fourth paragraphs discuss the Phase I Landfill present cover. Ponded water in the surface depressions in the Phase I Landfill was observed during field investigations which would indicate that the cover soil does not have a high permeability or potential for infiltration. Therefore the statement: ***"The potential for infiltration of surface water through the Phase I Landfill cover is high based on soil types and cover conditions (ie., sandy soil with many surface depressions)"***, is contradictory to the field observations. Additionally, test pitting results indicated that a majority of the refuse exists in a dry unsaturated state.

On page 3-8, in the fourth paragraph, it states that: ***"The correlation between interpreted zones of buried metal and buried drums is affected by the presence of other metallic objects in the landfill refuse"***. The Phase I Landfill has buried metal and drums throughout its area and thus an attempt to qualify zones of metal and drums has little relevance to the remedial measures.

On page 3-8, in the sixth paragraph, the elevation of the bottom of the refuse is given. The location of the water table is also an important consideration and should been stated to relate it to the level of the bottom of the refuse.

On Figure 3-12, ***"Source Area Boring and Test Pit Locations"***, in the Legend the word ***"Phase"*** should be changed to ***"Stage"*** in all cases (4 times). In the last line of the "Note" the ***"I"*** should be a ***"III"***. The figure does not identify

any anomalies or drum areas which the test pit investigation was designed to do in the first place. The test pits simply reconfirm the existence of a wide range of refuse and the source areas shown on the diagram.

On page 3-9, in the second paragraph, it states that: ***"Buried drums are scattered throughout the Phase I Landfill, and it is not possible to define a discrete area of the landfill as a "drum disposal area"***. CRA agrees with this statement. Contradictory earlier discussions on page 3.7 and 3.8 should be corrected. The conclusion is consistent with CRA's conclusions concerning buried drums prior to the Stage III remedial investigation.

On page 3-9, the seventh bullet states: ***"In some areas, landfill refuse and soil is stained dark gray or black but not saturated with oil. This indicates that oily soils may have been mixed with nonoily soil and refuse, or that the materials may have been burned"***. The discussion of the possibility of materials being burned on the site is not supported in the report.

On page 3-12, in the third paragraph, it states that: ***"PNA contamination was detected in sample LO3. This indicates that the Phase III Landfill is a source of PNA contamination because no other soil samples between the Phase III landfill and this location show PNA contamination"***. This conclusion is based on only one sampling location. A general designation of the PNA compounds in the Phase III Landfill area is difficult to support based on the evidence. In addition, the groundwater flow from the north-western side of

the Phase I Landfill is in the direction of the sampled well and may be the source of the reported concentration. However, the results do not rule out the possibility of the Phase III landfill as being the source of the PNA.

On page 3-14, in the first paragraph, the conclusions are similar to that of page 3-12 discussed above but for BETX, PCB and PNA. A general designation of the affects in this area is difficult to support based on the evidence.

On page 3-14, in the sixth paragraph, it states that: ***"The samples collected from the industrial area are outside the site fence, indicating that contamination extends offsite".*** This statement suggests that the contamination in the industrial areas is due to the Site without providing any support for this conclusion. The industries themselves may have been responsible for the contamination in this area.

On page 3-15, the statements, ***"PCBs were not detected outside of the source areas"*** *and* ***"PCB contamination was detected in the automobile disposal yard"*** (in the summary), contradict each other. The automobile disposal yard was never identified as a source area as it properly should be.

On Figure 3-19, ***"Contaminants in Stage II & III RI Surface Soil Samples"***, in the Legend the word ***"Phase"*** should be ***"Stage"*** in two cases.

On page 3-16, the second paragraph, it states that: *"Dioxins and furans were analyzed for during the Stage III investigation because fires onsite may have caused the formation and subsequent migration of these contaminants".* There is no information presented in the report to support this theory. It is also stated in paragraph three that dioxins on-Site and off-Site appear to be unrelated to Site activities.

On page 3-16, in the fourth paragraph, the indicated *"10"* onsite location of pesticide detection should be *"11"* according to figure 3-19.

On page 3-16, in the fourth paragraph, it states that: *"Because pesticide contamination was found in 3 offsite samples and 4 samples near site boundaries (Ryan Road), it is concluded that pesticide contamination is not related to site activities".* CRA agrees that the pesticide concentrations are not Site related. It should be noted that pesticides were absent in the subsurface soil and groundwater which further indicates that the problem is not Site related.

On page 3-17, in the second and third paragraphs, it appears that the reference to Figure 3-12 is incorrect. There are only 44 monitoring wells on the figure not 51 (Round 1) or 74 (Round 2). Also, no dates and sampling round numbers are provided to indicate which wells are part of the Round 1, Round 2 and Round 3 sampling.

On page 3-17, in the fourth paragraph, the reference to Figure 3-11 is incorrect. Figure 3-11 shows the wells in the Lower Aquifer sampled for water elevation on the 24 of July, 1989 not groundwater samples of October 16 and October 19, 1989 as indicated in the text.

On page 3-17, in the fifth paragraph, the *"15"* should be a *"17"* for Round 1 sampling and a *"16"* for Round 2 sampling. Table 3-5 (Round 1) lists 17 and Table 3-6 (Round 2) lists 16 volatile organic compounds.

On page 3-19, in the fifth paragraph, six wells were sampled and analyzed for a nonaqueous phase liquid (NAPL). This contradicts previous discussion, in paragraph two of page 3-19, which stated that only two wells were sampled for NAPL.

On Figure 3-24, ***"Residential and Industrial Well Sampling Locations and Results"***, the residential and industrial wells should be shown in different symbols.

The text from the last paragraph on Page 3-20 to the second paragraph on page 3-21, concerning the residential and industrial contamination, is not clear and contradicts itself and an earlier conclusion. The contamination was found in the industrial wells, not in the residential wells. This should be clearly identified. Also the contamination in the industrial wells may have originated from the industries themselves. The first sentence in the second

paragraph states that the organic contamination appears to be Site related and the last sentence of the same paragraph contradicts this by stating that: *"It is **unclear whether this contamination is site related based on known source areas and groundwater flow directions**"*. These sentences contradict each other and the last one contradicts earlier conclusions. The last sentence is the correct conclusion. The contamination is not Site related based on groundwater contours presented on Figure 3.10 of the RI.

On page 3-4, in the last paragraph, the background concentrations of BOD, COD and TOC are not given, but should be, to compare with the maximum values given.

On page 3-22, in the first paragraph, it states that: *"**Elevated levels of chloride are most apparent in the auto-disposal yard along the northeastern boundary of the site**"*. Based on the groundwater flow presented on Figure 3.10 of the RI and the location of other compounds on the Site, the chloride concentrations are not Site related.

On page 3-22, in the second paragraph, it states that: *"**The vertical extent of groundwater contamination is indicated by chloride and total dissolved solids (TDS)**"*. Chloride and TDS are usually good indicator parameters but are not always reliable. They may be unreliable at this Site as there appears to be another source of chloride in the area east of the Site.

On page 3-24, in the first paragraph, it states that: ***"Stage I surface water sample results for chlorinated VOC at SW-001, 28 µg/l, and SW-002, 21 µg/l indicate contamination in the Clinton River"***. The source of these concentrations has not been identified. The location of the samples has not been identified on a Site map. It is unlikely that the Landfill is the source of these concentrations.

On page 3-24, when discussing the samples taken from the Clinton River, a Site map should show the location or it should be explained. This is important since the river comes within 150-200 feet of the landfill in the west but is very distant in the south.

On page 3-25, in the fifth paragraph, it states that: ***"Arsenic was also found at concentrations ranging from 0.64 to 3.4 mg/kg in the 5 sediment samples from the Clinton River (see Interim RI)"***. The location of the five sediment samples that had arsenic contamination should be identified in this report and not referenced to the interim RI. The RI should be a complete report encompassing the information of all three stages.

On page 3-28, the last conclusion states: ***"Chlorinated VOC contamination is present in the automobile disposal yard and appears to be migrating south into the industrial area where it was detected in the industrial wells"***. The possibility that the industries themselves may be the source was not developed in the RI but should have been considered.

Chapter 4: Contaminant Fate And Transport

On Table 4.2, ***"Physical and Chemical Properties of Selected Representative Chemicals"***, in the left hand column under "Chemical", the reference ***"(1)"*** on PCBs is incorrect.

On page 4-6, in the sixth paragraph, it states that: ***"Portions of the Phase I Landfill are beneath the water table (see Figure 3-17)"***. The reference to Figure 3-17 is incorrect.

On page 4-7, in the fifth paragraph, it states that: ***"Estimated contaminant velocities through the till are listed in Table 4-4"***. The fact that there are VOCs in the till has not been previouslv established in the RI. Concluding that VOC are migrating through the till is not correct based on the fact none have been found in the till unit. In the fourth paragraph on page 3-22 it is stated that: ***"The vertical extent of the organic contamination appears to be limited to the upper aquifer"***, and on page 1-9 of the FS it is stated that: ***"Contamination from the site has not been detected within or below the lacustrine/till unit"***. These statements exclude the idea of any current migration of VOC in the till unit.

On page 4-8, in the fifth paragraph, it states that: *"In the past, however, runoff from the Oil Seep Area may have flowed along the south side of the railroad grade to Ryan Road and then south to the wetlands near the Ryan Road bridge over the Clinton River".* This statement is pure speculation. There are no records describing such a flow pattern and the current flow pattern does not follow this path.

On page 4-8, in the sixth paragraph, it states that:*"Runoff from the site is minimal because the soil cover over the landfills and because the precipitation tends to infiltrate into the porous soils on the site".* Earlier statements indicated that the Phase II and III Landfills have moderate infiltration rates and thus runoff would seem probable. Also visual evidence of ponded water in the depressions over all the landfills indicates that the infiltration rate is slow and that runoff is possible, especially in heavy rains.

On page 4-9, in the fourth paragraph, it states that: *"VOCs in the source areas may volatilize, rise through the refuse and escape to the atmosphere, although air sampling has not quantified differences in VOC concentrations upwind and downwind of the site".* The air monitoring results suggest that the present cover is containing the volatilization of VOCs from the Landfills.

On page 5-4, the reference to *"site visitors"* or *"people"* on the Site should be changed to *"trespassers"* as any person on the property without the permission of the owners and the U.S. EPA are doing so illegally.

Under the heading of potential human exposure pathways off site, on page 5-4, in the first bullet states: ***"Exposure (ingestion, dermal adsorption, or inhalation) to chemicals released from the site to the shallow groundwater used as a water supply source"***. Exposure is not possible through shallow groundwater as it is not currently being used for a water supply. The second bullet states: ***"Inhalation by off site residents of volatile compounds released from the Phase I Landfill and transported offsite"***. VOC release from the landfill has not been measured to any significant degree and thus the offsite residence are in no danger. The sixth bullet states: ***"Consumption of wildlife contaminated by the site"***. Wildlife affects can not be linked to the Site.

On page 5-9, in the sixth paragraph, the information concerning the potential of the off-Site residential wells being affected has not considered the fact that these wells are upgradient or across gradient of the Site and will not be affected by the Site as the proposed modified remedy will control groundwater flow from the Site.

On page 5-9, in the seventh paragraph, it states that: ***"Because of geotechnical consideration (subsidence and landfill gas generation), the site is unlikely to be developed into a residential community or for industrial use"***. Geotechnical considerations do not include landfill gas generation.