R. Lundgren

THERMAL REDUCTION CO.,INC.
WASTE REDUCTION FACILITY

ENGINEERING REPORT

JUNE 28, 1989

LANDFILL CLOSURE
AND
TEMPORARY ASH STORAGE FACILITY
CONSTRUCTION

PREPARED BY:

harper owes
consultants in water & waste management

Thermal Reduction Co.,Inc.
1524 Slater Road
Bellingham, WA 98226

PLAN OF OPERATION

THERMAL REDUCTION CO., INC.
WASTE REDUCTION FACILITY

LANDFILL CLOSURE
AND
TEMPORARY ASH STORAGE FACILITY CONSTRUCTION

Prepared by:

HARPER-OWES

June, 1989

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

The minimum functional standards (MFS) for solid waste handling developed by the Washington State Department of Ecology (WDOE) and set forth in Chapter 173-304 of the Washington Administrative Code (WAC) require a preliminary engineering report to be prepared for new or expanded solid waste facilities. This preliminary engineering report is developed in accordance with the MFS as incorporated in Bellingham/Whatcom County Health Department solid waste regulations and defines improvements to be made to the ash storage and disposal area at the Thermal Reduction Company, Inc. (TRC) in Whatcom County, Washington. This report also addresses closure of an existing landfill and modifications to a previously closed landfill which will be located under the temporary ash storage facility. WDOE and the Health Department have determined that modifications to the TRC ash disposal area fall under regulations for new or expanded piles requiring a permit, and preparation of the engineering report is regulated by WAC 173-304-600(3)(e)(i). Further requirements on the contents of the preliminary engineering report were stated in a letter from WDOE to Mr. Bert Brainard, Director of Environmental Health, Bellingham - Whatcom County District of Public Health, dated December 7, 1988.

Whatcom County does not have a current, approved Comprehensive Solid Work Management Plan. A Draft Update of the Comprehensive Solid Waste Management Plan has been developed, submitted to the Department of Ecology (DOE) for review, and is being revised to reflect DOE review comments. The Draft Plan Update states that the Thermal Reduction Co. (TRC) facility is an integral part of the County's solid waste processing and disposal system, with

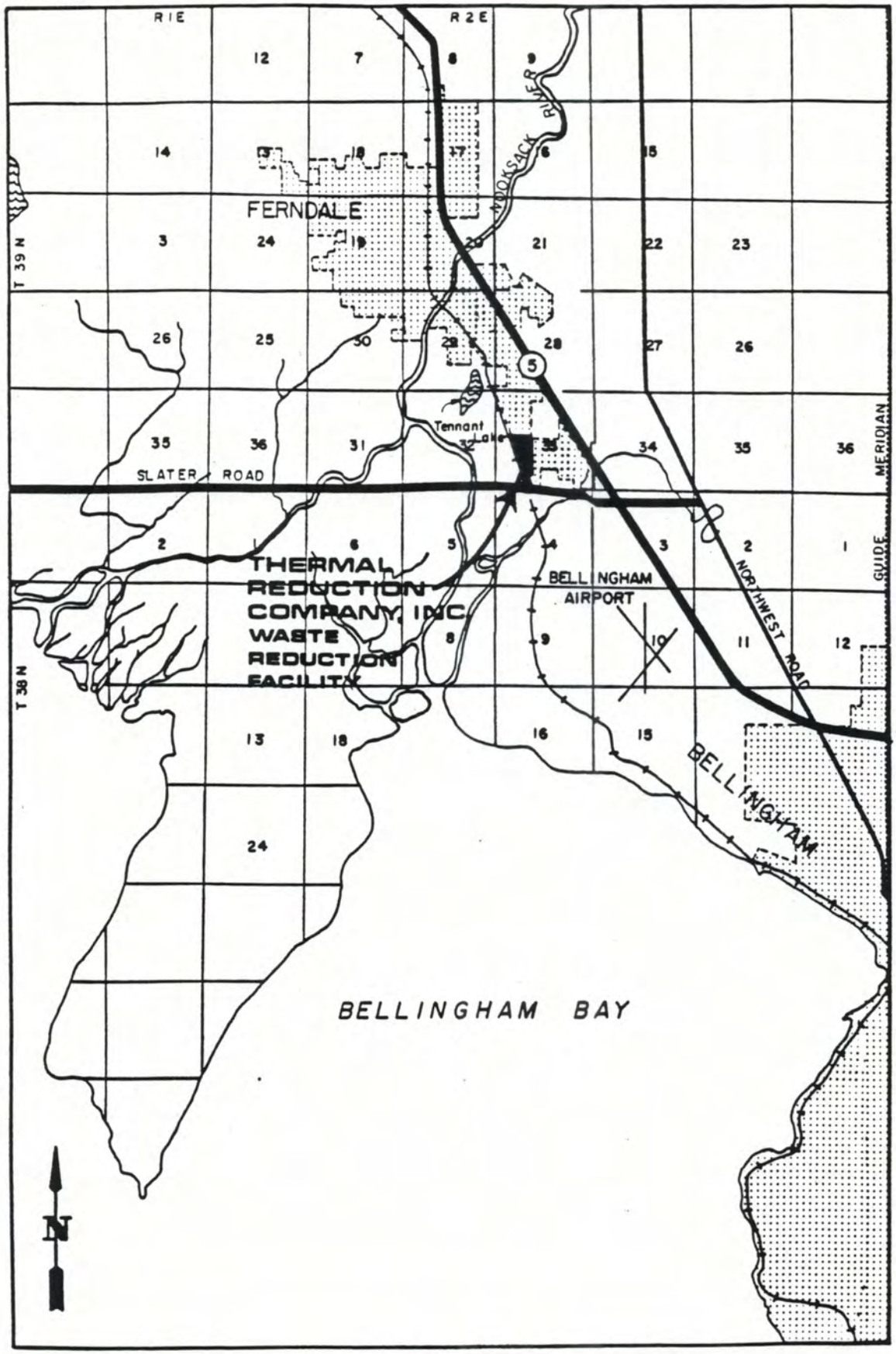
incineration being the preferred method of handling solid waste for disposal. This Draft Plan Update also addresses the importation of medical waste to the TRC facility. In addition, the Draft Plan Update describes a landfill siting process that will result in development of a new landfill facility that will serve as a disposal site for ash. This facility is expected to be implemented within three years which is the projected life of the temporary ash storage facility.

CHAPTER 2

DESCRIPTION OF EXISTING FACILITIES

TRC owns and operates a waste reduction and ash storage and disposal facility located on a 20-acre site within the incorporated limits of the City of Ferndale, Whatcom County, Washington. The address of the facility is 1524 Slater Road, Bellingham, Washington 98226. The site location is shown on Figure 1. The existing layout of the facilities is shown on Figure 2.

The waste reduction facility includes two incinerators manufactured by Consumat, Inc., and equipped with turbines and electrical generators utilized to recover energy in the form of electricity. A cooling tower is located adjacent to the incinerator facility. Each incinerator includes two combustion chambers; a lower combustion chamber where waste is initially burned and an upper combustion chamber for incineration of remaining particles and gases. Each incinerator has a nominal capacity of 50 tons of solid waste per day if operated 24 hours per day.



VICINITY MAP

Figure 1

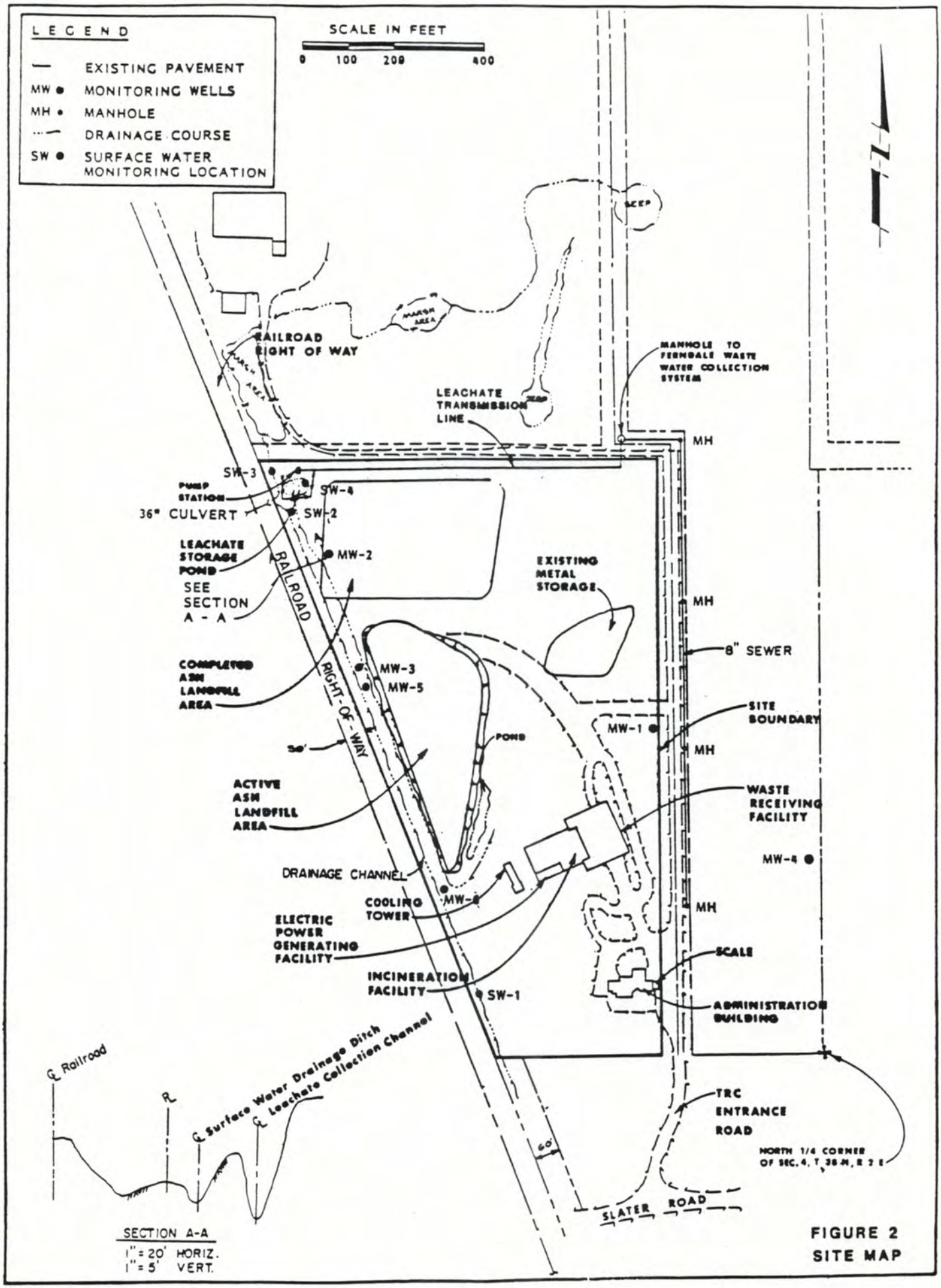


FIGURE 2
SITE MAP

The incinerators are equipped with an electrostatic precipitator which removes particulates from the gases prior to discharge to the atmosphere. The ash remaining from the incineration process in the lower chamber is referred to as bottom ash and is automatically discharged to a quench tank containing water for ash cooling. The particulates collected by the electrostatic precipitator are referred to as fly ash and are automatically combined with bottom ash in the quench tank. The moist bottom/fly ash is then automatically transported to an open dump truck by a conveyor.

The fly ash and bottom ash are disposed of in the ash storage and landfill area. The ash storage and landfill area consists of two parts: a completed and closed ash landfill area and an active ash storage area above an old landfill area. The ash generated presently is disposed of in the active ash storage above a landfill area. The locations of these areas are shown on Figure 2.

The storage and landfill areas are constructed in low permeability clay soils which inhibit the migration of leachate. A containment berm is constructed around the storage and landfill area to control surface water movement and to prevent leachate from migrating off site. Leachate generated at the ash storage and landfill area by precipitation falling directly on the surface is drained to a holding pond at the north end of the closed landfill area. It is then pumped through a force main to a manhole in the City of Ferndale wastewater collection system. The leachate is then treated and disposed of through the City of Ferndale Wastewater Treatment facility.

Ash is transported to and deposited at the landfill with a dump truck. A dozer is used to spread the ash and maintain topographic control at the landfill. The landfill was constructed in cells. The two landfills were constructed by excavating material to form pits. Ash was then deposited into the pits to form the cells. One of the landfills is closed and the other has a temporary ash pile placed on the ash stored in the pit. The proposed improvements include placement of the final cover over the landfill areas consisting of a minimum of two feet of material with 1×10^{-6} cm/sec. or lower permeability to meet present landfill closure standards for the landfill areas.

The TRC ash storage area presently receives approximately 30 tons per day of ash weighing approximately one ton per cubic yard. The existing TRC ash storage and landfill facility is in violation of several minimum functional standards (WAC 173-304). This preliminary engineering report describes proposed improvements in order to bring the TRC ash storage facility and landfill in compliance with the Minimum Functional Standards and Health Department regulations.

CHAPTER 3
DESCRIPTION OF IMPROVEMENTS

GENERAL

In order to comply with the Minimum Functional Standards for Solid Waste Handling (WAC 173-304) and Health Department regulations, the existing ash landfill will be closed and a temporary ash storage facility will be

constructed. While ash is being disposed of in the temporary storage facility, efforts will be continued for locating and developing a permanent ash disposal site in accordance with minimum functional standards. After construction of the permanent ash disposal site, the ash in the temporary storage facility will be moved to the permanent ash disposal site.

ASH STORAGE REQUIREMENTS

The TRC incinerator facilities are currently operated on a 7-day week, 24 hour per day operating schedule. The facility operates at the rated capacity of 100 tons per day and is expected to continue to operate at this level for the foreseeable future. The processing of 100 tons of solid waste results in approximately 30 tons of combined bottom and fly ash. The ash has an in-place density in the ash storage facility of about 1 ton per cubic yard. Ash storage requirements are, therefore, about 11,000 cubic yards per year. In addition, about 38,000 cubic yards of ash has been stored at the site atop an existing landfill area. This ash must be moved to a new ash storage facility which meets current Health Department regulations. Storage requirements for a three-year period, including existing stored ash, are about 71,000 cubic yards. The ash storage facility design presented in this Engineering Report will enable an estimated storage volume of 78,812 cubic yards.

PROPOSED FACILITY IMPROVEMENTS

Closure of Existing Landfill and Modifications to Existing Closed Landfill

Two landfills have been constructed at the TRC site by excavating pits in the clay soils and placing ash into the pits. The approximate landfill locations are shown on the Drawings in the Appendix and will be field verified during facilities construction. The landfill located on the northwestern portion of the site has been previously closed. The other landfill, located to the south of that landfill, has not been closed and contains a temporary ash storage pile above the landfill area.

The existing closed landfill will be regraded and the existing final cover will be improved to meet current regulatory requirements of a minimum of two feet of compacted soil with a permeability of $1x10^{-6}$ cm/sec or less. The landfill area south of the existing closed landfill site will be closed by removing ash stored above the landfill area, regrading the landfill area, and covering the landfill with two feet of compacted clay with a permeability of $1x10^{-6}$ cm/sec or less.

Several leachate seeps are present along the west side of the ash landfill areas. It is proposed that a lined cutoff trench with a perforated drainpipe be constructed along the west side of the ash landfill areas in order to collect these seeps. The perforated drain pipe will transport the leachate from the seeps to the leachate storage pond where the leachate will be discharged to the City of Ferndale wastewater collection facilities for transport to the City of Ferndale wastewater treatment facility for final

treatment and disposal.

Development of Temporary Ash Storage Facilities

A temporary ash storage facility will be constructed in an area of the site which has been used for disposal of ash in the past and a part of this area is presently used for ash storage. The facility will be constructed by enhancing the closure of the landfill to the north of the existing ash pile and constructing the temporary ash storage facility in that area. The ash pile will then be moved. The landfill south of this area will be closed and the remaining portion of the temporary ash storage facility will be constructed in the area.

The old closed ash landfill will be regraded and enhanced with a minimum of two feet of re-compacted clay. The temporary storage facility will include adding a flexible membrane liner such as high-density polyethylene (HDPE) atop the clay. Suitable clay is available on-site or on properties adjacent to TRC. The flexible membrane liner will be covered by 18 inches of soil for protection. Four inches of asphalt will be placed on the soil to form a pad for the temporary storage facility. Details of the liner and other features will be discussed in Chapter 4.

The 18 inches of soil will be covered with 4 inches of asphalt in order to direct leachate towards the leachate collection system adjacent to the berm located between Phase I and Phase II of the ash storage facility. The leachate collection system will collect leachate by gravity flow and transmit it by a pipe to a leachate storage lagoon at the northwest corner of the site.

A leachate storage lagoon presently exists at this location. The shape of this lagoon will be modified and it will be lined with a HDPE liner to prevent potential leachate migration to surrounding groundwater. Leachate from the upgraded storage lagoon will be pumped to the City of Ferndale wastewater collection system for treatment at the Ferndale wastewater treatment plant.

A lined berm, two feet in height, will be constructed around the new temporary ash storage facility in order to prevent off-site runoff to the site or potentially polluted on-site runoff to the surrounding area. This will minimize the amount of leachate to be treated as well as prevent pollution by leachate to the surrounding area.

In conjunction with the development of the new temporary ash storage facility, several improvements will be made to the site drainage system. Surface water that may come in contact with ash from paved areas adjacent to the incineration facilities will be collected in a piped drainage system and discharged to the leachate storage lagoon.

One concern raised by WDOE is regarding the integrity of the temporary storage facility because of the potential for settlement of the old ash landfill under the new temporary ash storage facility. Settlement of the old ash landfill could cause damage to the liner under the new temporary ash storage facility, thus allowing leachate to escape the site. An evaluation of potential settlement, foundation strength and biodegradation of the ash material was performed by Golder Associates and is presented in their report appended to this report by reference. Their evaluation resulted in specific recommendations for the maximum height of the temporary ash storage pile and

for monitoring settlement and foundation material strength. The results of this evaluation have been incorporated in the design as discussed in Chapter 4 of this report.

CHAPTER 4
FACILITIES DESIGN

GENERAL

This chapter presents the details of the design for the various portions of this project. Design drawings and specifications are shown in Appendix B of this report.

OLD LANDFILL CLOSURE AND NEW TEMPORARY ASH STORAGE FACILITY BOTTOM LINER

Closure of the old ash landfill will be performed in conjunction with construction of the new temporary ash storage facility. All material (ash or otherwise) above the design grade for the bottom of the liner between the old landfill and the new temporary storage facility will be excavated and stockpiled. The landfill closure cover will form a portion of the subgrade for construction of the new liner. The subgrade will be compacted prior to construction of the liner. Depressions caused by compaction will be filled and re-compacted to obtain final grade. The land closure cover will consist of 24 inches of compacted clay with a permeability of less than 1×10^{-6} cm/sec. An 80-mil HDPE liner covered with eighteen inches of native compacted soil will be constructed to form the subgrade of the temporary ash storage facility. Areas of the temporary ash storage facility outside the limits of

the closed landfill will also be graded and covered with two feet of compacted clay prior to placement of the HDPE liner. Four inches of ATB will be placed above the soil to form a base for the temporary ash storage facility. A cross section of the liner is shown on the drawings in Appendix B of this report.

PERIMETER BERM

The new temporary ash storage area will be enclosed by a perimeter berm. This will prevent precipitation falling on the ash pile from escaping the fill area and polluting the surrounding area. It will also prevent runoff from the surrounding area entering the ash fill area and thus minimizing the generation of leachate.

The berm will be two feet high and two feet wide at the top with 2 horizontal to 1 vertical side slopes. It will be constructed of compacted earth lined with 80 mil HDPE to prevent liquid moving through the berm. Details of berm construction are shown Appendix B.

LEACHATE COLLECTION SYSTEM

The leachate collection system consists of a liner and lined berm on the temporary ash storage facility floor on the west side of the temporary ash storage area and along the center berm of the temporary storage facility. This area is connected from the western corner of the berm to the leachate storage lagoon using drains and PVC pipes. The location of this leachate collection system is shown in Appendix B.

The leachate collection system is designed for a peak hour flow of 2.0 million gallons per day (MGD). This would correspond to the peak hour leachate flow generated during a storm with a recurrence interval of 25 years. This is based on a drainage area of 3.75 acres, a rainfall intensity of 0.79 inches per hour, and assuming that all precipitation becomes leachate.

TEMPORARY ASH STORAGE FACILITY LINER

The liner for the temporary ash storage facility will consist of a 80 mil. high density polyethylene (HDPE). This liner material is resistant to the greatest number of constituents found in leachate and is not susceptible to degradation from ultraviolet light.

The ability of the liner to support the loading from the temporary ash storage pile is dependent on the foundation strength, potential settlement, and ability of the liner to meet elongation requirements associated with potential foundation settlement. An evaluation of liner foundations at the site was conducted by Golder Associates and is presented in their report "Geotechnical Design Report, Proposed Temporary Ash Storage Facility, TRC" which is appended to this design report by reference. The Golder report recommended placing height restrictions on the temporary ash storage facility which are incorporated into the design as shown on the Drawings in Appendix B. The height restrictions which are 60-feet MSL at the west side and 70 feet MSL at the east side of the pile were based on Golder Associates' analysis of foundation strength. Golder Associates also estimated that settlement may occur up to three feet in the center of the pile when maximum loading takes place. The 600 percent elongation to failure of HDPE liner will enable the

liner to maintain its integrity under this settlement. Golder Associates also recommended monitoring settlement and foundation strength as presented in their report to assure that foundation failure does not occur.

SEEPAGE COLLECTION SYSTEM

The seepage collection system will collect seeps from the closed landfills along the west side of the landfill site. The seepage collection system will consist of a cutoff trench parallelling the western side of the temporary storage area site. A typical cross-section of the trench is shown in Appendix B. The flows of the seeps have not been monitored but it is assumed that a 8 inch diameter pipe can accommodate the flows. When the southern ash landfill has been closed, the flows of the seeps should be minimal. The seepage collection system will discharge by gravity to MH-6 and then to the leachate lagoon as shown on the Piping Plan, Sheet G-4 in Appendix B. The depth of the collection pipe is below the elevation of the identified seeps. This system will therefore collect stored water which may be contained in the existing stored ash and discharged via the seeps.

POLLUTED RUNOFF DRAINAGE SYSTEM

The polluted runoff drainage system collects storm drainage from the paved area around the incineration facility and transports it to the leachate storage lagoon. This runoff could potentially be polluted by ash and will be treated as leachate as a precaution. The drainage area for the polluted runoff drainage system is 0.636 acres and the surfacing is asphalt pavement.

Using the rational forming and a storm of a recurrence interval of 25 years and a time of duration of 5 minutes, a stormwater flow of 0.79 MGD results. This is based on a rainfall intensity of 2.75 inches/hour and a "c" factor of 0.7.

The polluted runoff drainage system is shown in Appendix B. It consists of an 10-inch diameter PVC gravity pipe collecting drainage from four catch basins at the northwest side of the incineration facility, transporting the runoff to the leachate storage lagoon. The pipe segment with the limiting capacity, running along the west side of the temporary ash storage area, has a slope of 1.00%. This corresponds to a flow capacity of 0.79 MGD at a Mannings "n" - value of 0.013. This capacity equals the 25-year stormwater flow discussed above.

LEACHATE STORAGE LAGOON

The new leachate storage lagoon at the northwest corner of the site is a modification to the existing leachate storage lagoon. The volume of the lagoon will be increased to approximately 55,000 gallons at 8 feet depth. The total depth of the lagoon is 15 feet, leaving 7 feet of freeboard. The inside dike dimensions at the top (El. 28.00) are 85 feet by 85 feet and the maximum water surface elevation dimensions (El. 21.00) are 48 feet by 48 feet. The inside side slope is 2.5 horizontal to 1 vertical. The new leachate storage lagoon will be lined with an 80-mil HDPE liner over 2 feet of compacted clay.

The volume of the leachate storage lagoon is adequate to store the projected one-hour 25-year leachate and polluted stormwater flow less the volume to be

pumped of 200 gallons per minute or 12,000 gallons per hour. The total flow is estimated to be 116 gallons per minute (gpm) if half the temporary ash storage area is covered with an impervious liner. This is based on an area of 3.2 acres and a design storm of 0.79 inches per hour for the one-hour, 25 year storm event. This results in a total one-hour volume of approximately 67,000 gallons which equals the 55,000 gallons of storage plus the 12,000 gallons pumped to Ferndale during the peak hour.

EFFLUENT PUMP STATION

A new effluent pump station, pumping leachate from the leachate storage lagoon to the Ferndale wastewater collection system will be constructed. This pump station will be a dual pump station equipped with submersible pumps.

The pump station will be sized to have a capacity of at least 200 gpm. This corresponds to the combined leachate and polluted stormwater flows resulting from a 24-hour, 25-year storm less the vlome of 55,000 gallons afforded by the leachate lagoon.

The details of construction of the effluent pump station are shown in Appendix B. The pump station will be connected to the existing 4-inch diameter forcemain to the Ferndale wastewater collection system.

Each pump will be sized to accommodate at least 200 gpm. Each pump will serve as a standby for the other and their operation will alternate every pump cycle. The influent pipe to the effluent pump station will be connected to the bottom of the leachate storage lagoon through an 8-inch diameter PVC pipe.

SITE DRAINAGE FACILITIES

Site drainage facilities to be constructed include the polluted storm runoff facilities discussed previously, the ground slopes away from the closed landfill and the new temporary ash storage facility on the north and west side of the storage facility. Therefore, these areas do not need any drainage improvement.

On the east side of the temporary ash storage facility the ground slopes toward the new berm. Runoff from this area will drain towards the two-foot tall berm and eventually will drain out at the northeast corner of the site and drain towards the roadside ditch on the south side of the road at the north side of the temporary storage area.

An analysis has been made in order to determine if the outside northeast corner of the temporary storage area can accommodate the 25-year storm without overtopping the new berm.

A worst case scenario was analyzed, under which the polluted runoff drainage system at the southeast of the temporary storage area is plugged and all the runoff at the east side of the temporary storage area has to pass by the northeast corner of the site. This condition creates a total drainage area of 4.1 acres. By using the rational formula, a 25-year storm will give a flow of 7.9 cfs around the northeast corner of the site. This flow rate is based on the following assumptions:

Time of concentration = 5 minutes

C = 0.7

Intensity = 2.75 inches per hour

The depth of flow around the northeast corner of the site was calculated using the Mannings Formula with the Mannings "n" taken as 0.02 which is typical for firm gravel. Channel cross-section and slope were assumed to be natural and taken from topographical maps. The resulting depth of flow was determined to be 2.5 inches. Thus the 2-foot high berm constructed around the temporary ash storage area should be more than adequate for the 25-year storm.

SETTLEMENT MONITORING DEVICES

As discussed previously, settlement monitoring devices will be installed in order to monitor settlement of the old ash fill under the new temporary ash storage area. Settlement monitoring shall be carried out as follows:

Settlement Monitoring: The settlement of the existing ash and underlying soft clay should be monitored at four to six locations. Although this can be done using a variety of methods, we recommend that remote pneumatic settlement device be used. The cables to read these instruments can be laid in trenches below the liner layers and read at junction boxes off of the ash pile footprint. These instruments should be read monthly in areas where fill is being placed and every other month elsewhere. The details of the monitoring program should be developed prior to start of construction with the instruments installed after the liner subgrade has been prepared.

In addition, we recommend that surface settlement points on about a 50 foot grid be established on completed portions of the ash pile to monitor settlement of the top of the ash pile. This information will verify the design assumptions and assist in determining strength gains in the clay.

Piezometers: We recommend that four to six electrical or pneumatic piezometers be placed near the center of the soft clay layer at selected locations under the proposed ash pile and in the high shear stress area beyond the toe. The cables to read these instruments can be laid in trenches below the liner layers and read at junction boxes off of the ash pile foot print. These instruments will monitor the induced pore pressure in the clay caused by placing the ash fill and will be useful in assessing the rate of consolidation and overall clay stability. These instruments should be read monthly in areas where fill is being placed and every other month elsewhere.

Survey Monitoring: Although the proposed design configuration satisfies stability requirements, it is prudent to monitor ground movements at and beyond the toe of the ash fill to the west. This information would provide an early indication that the clay may be becoming overstressed. In addition, lack of any movement combined with other information may form the basis of increasing the fill heights or modifying the filling sequence. Accordingly we recommend that a series of surface survey points be established extending from the tow of the proposed ash pile to at least the railroad track.

The specific locations of the stakes and spacing depends on the suitability of the area for staking. Currently, the majority of the area west of the

proposed ash pile is an existing drainage swale which limits suitable locations for permanent survey stakes. At a minimum, bench marks should be established on the tracks both to monitor possible movement and/or document that movement has not occurred. To the extent practical, additional monitoring points should be established between the ash pile and the tracks. The monitoring points should be read monthly in areas where fill is being placed and every other month elsewhere. If movement is measured, additional stakes and/or readings should be taken.

RELATION TO 100-YEAR FLOOD PLAIN

The base flood elevation associated with a 100-year flood event has been established on three different occasions for the area in which the TRC site is located. In 1977, a flood insurance rate map (FIRM) was prepared for Whatcom County. At that time, the TRC site was not within the incorporated limits of Ferndale. The 1977 FIRM established the site as Zone C and areas adjacent to the site had a flood elevation of approximately 18 feet NGVD. In 1982, manuscript maps were prepared by the U.S. Soil Conservation Service for the Whatcom County FIRM update and these maps show the base flood elevation to be approximately 20 feet NGVD in the vicinity of the TRC site. In 1983, a FIRM map was prepared for Ferndale which shows the base flood elevation at the TRC site to be 26 feet NGVD. Discrepancies among the three flood elevations have not been resolved, although a written request to resolve them has been made to the U.S. Soil Conservation Service. In any event, the lowest elevations of the temporary ash storage facility and the top of the leachate lagoon are at or above 28 feet which is sufficient for protection from the maximum of the estimates for their 100-year flood event.

CHAPTER 5

IMPLEMENTATION

This project will be constructed by Wilder Construction, Inc. It is anticipated that the construction period will be about 3 months and is expected to begin at the beginning of May 1989.

The construction of the landfill closure and temporary ash storage facilities projects will be monitored and reviewed by the consulting engineering firms of Harper-Owes and Golder Associates, Inc. to assure that facilities construction is carried out as intended in the plans and specifications.

Appendix A

GEOTECHNICAL DESIGN REPORT

PROPOSED TEMPORARY ASH STORAGE FACILITY

THERMAL REDUCTION CO. (TRC)

BELLINGHAM, WASHINGTON

Prepared by:

Golder Associates, Inc.

(Under Separate Cover)

APPENDIX B

DRAWINGS AND SPECIFICATIONS

FOR

TEMPORARY ASH STORAGE FACILITY

FOR

THERMAL REDUCTION CO., INC.

PREPARED BY

harper owes

ABBREVIATIONS

AB	ANCHOR BOLT
AC	ASPHALTIC CONCRETE
AL	ALUMINUM
ALT	ALTERNATE
APPROX	APPROXIMATELY
ATB	ASPHALT TREATED BASE
BEG	BEGIN, BEGINNING
BF	BLIND FLANGE
BHC	BEGINNING OF HORIZONTAL CURVE
BLDG	BUILDING
BM	BENCHMARK
BOT	BOTTOM
BRG	BEARING
BVC	BEGINNING OF VERTICAL CURVE
CAP	CAPACITY
CB	CATCH BASIN
C/C	CENTER TO CENTER
CCP	CONCRETE CYLINDER PIPE
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CI	CAST IRON
CIP	CAST IRON PIPE
CK	CHECKERED
CL	CLEAR, CLEARANCE
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
CONC	CONCRETE
CONN	CONNECT, CONNECTION
CONST	CONSTRUCT, CONSTRUCTION
CONT	CONTINUE, CONTINUATION
CPLG	COUPLING
CTR	CENTER
CY	CUBIC YARD
DET	DETAIL
DIA	DIAMETER
DIAG	DIAGRAM
DIM	DIMENSION
DI	DROP INLET
DISCH	DISCHARGE
DN	DOWN
DR	DRAINAGE, DOOR OR DRAIN ROCK
DWG	DRAWING
E	EAST
EA	EACH
EB	EXPANSION BOLT
ECC	ECCENTRIC
EE	EACH END
EF	EACH FACE
EHC	END OF HORIZONTAL CURVE
EFF	EFFLUENT
EL(ELEV)	ELEVATION
EQ	EQUAL
EQUIP	EQUIPMENT
EVC	END OF VERTICAL CURVE
EW	EACH WAY
EX	EXTRA
EXC	EXCAVATE
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
FAB	FABRICATE, FABRICATED
FB	FLAT BAR, FLOOR BEAM
FIG	FIGURE
FIN	FINISHED
FL	FLOOR, FLOWLINE
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FM	FORCE MAIN
FPC	FLEXIBLE PIPE COUPLING
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FOOT
FTG	FOOTING
FUT	FUTURE
GA	GAGE
GALV	GALVANIZED
GEN	GENERAL
GI	GALVANIZED IRON
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
GR	GRADE
GRD	GROUND
GRTG	GRATING
GSKT	GASKET
H	HORIZONTAL
HC	HORIZONTAL CURVE
HDPE	HIGH DENSITY POLYETHYLENE
HGT	HEIGHT
HOR	HORIZONTAL
HP	HORSEPOWER
HR	HOUR, HANDRAIL
HTR	HEATER
HV	HOSE VALVE, HOSE BIBB
HYD	HYDRAULIC
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IF	INSIDE FACE
IN	INCH
INCL	INCLUDE
INF	INFLUENT
INT	INTERIOR
INV	INVERT
INV EL	INVERT ELEVATION
JCT	JUNCTION
JT	JOINT
LG	LONG, LENGTH
LONGIT	LONGITUDINAL
LWR	LOWER
MAN	MANUAL
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MTR	MOTOR
MW	MONITORING WELL
N	NORTH
NIC	NOT IN CONTRACT
NO	NUMBER
NRS	NON-RISING STEM
NTS	NOT TO SCALE
OC	ON-CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OPP	OPPOSITE
OPNG	OPENING
PC	PIECE
PCT	PIPE COUPLING TO TAKE TENSION
PH	PHASE
PI	POINT OF INTERSECTION
PL, ℄	PROPERTY LINE
PRV	PRESSURE REDUCING (REGULATING) VALVE
PNL	PANEL
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PSL	PIPE SLEEVE
PT	POINT
PVC	POLYVINYL CHLORIDE
PVT	PAVEMENT
PS	PUMP STATION
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
REF	REFERENCE
REINF	REINFORCE
REM	REMOVABLE
REQ'D	REQUIRED
RE-STL	REINFORCED STEEL
RPM	REVOLUTIONS PER MINUTE
R/W	RIGHT-OF-WAY
S	SOUTH, SLOPE
SCH	SCHEDULE
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SL	SLOPE
SP	SPACE, STATIC PRESSURE
SPEC	SPECIFICATIONS
SQ	SQUARE
SS	STAINLESS STEEL
STA	STATION
STD	STANDARD
STL	STEEL
STR	STRONG, STRAIGHT
STRUCT	STRUCTURAL
SURF	SURFACE
SYM	SYMMETRICAL
TB	TOP OF BANK
T&B	TOP AND BOTTOM
TC	TOP OF CURB
TE	TOTALLY ENCLOSED
THD	THREAD
T	TANGENT
TP	TANGENT POINT
TYP	TYPICAL
TOC	TOP OF CONCRETE
UG	UNDERGROUND
U/P	UTILITY POLE
US	UTILITY STATION
V	VALVE, VENT, VOLTS, VERTICAL
VAR	VARIES, VARIABLE
VB	VALVE BOX
VC	VERTICAL CURVE
VERT	VERTICAL
VOL	VOLUME
W	WEST, WIDTH, WIDE
W	WITH
W O	WITHOUT
WP	WORKING POINT
WS	WATER SURFACE
WSTP	WATERSTOP
WT	WEIGHT, WATERTIGHT
YCO	YARD CLEANOUT

NOTES

1. ADDITIONAL ABBREVIATIONS CONFORM TO ANSI Y1.1-A72 AND AISC STANDARD ABBREVIATIONS.
2. NOT ALL ABBREVIATIONS SHOWN ON THIS SHEET HAVE BEEN USED IN THIS SET OF DRAWINGS.

SYMBOLS

- NEW CONSTRUCTION
- EXISTING FEATURE OR PIPE
- TO BE REMOVED
- PROPERTY LINE
- MATCH LINE
- CENTERLINE
- FENCE
- EXISTING GRADE COUTOUR
- FINISH GRADE COUTOUR
- FINISH GRADE SPOT ELEVATION
- SWALE OR DITCH
- 3 1 — SLOPE (3 HORIZ TO 1 VERT)
- BALL VALVE
- CHECK VALVE
- FLEXIBLE PIPE COUPLING
- FLANGED COUPLING ADAPTER
- UNION
- PIPE CAP OR BLIND FLANGE
- PIPE ANCHOR OR SUPPORT
- DIRECTION OF FLOW
- HOSE RACK
- UTILITY STATION
- MANHOLE
- VAULT
- CATCH BASIN OR INLET
- OIL/WATER SEPARATOR
- CONNECTING LINES
- NON-CONNECTING LINES
- @ AT
- & AND
- ϕ ROUND OR DIAMETER
- △ DELTA (ANGLE)
- ℄ PLATE OR PROPERTY LINE
- ℄ CENTERLINE
- BURIED PLUG VALVE
- (TOP) EMBANKMENT
- NATURAL GROUND OR GRADE
- CHECKER PLATE
- NEW CONCRETE
- EXISTING CONCRETE
- PRECAST CONCRETE
- MORTAR GROUT

INDEX OF DRAWINGS

CONSTRUCTION SEQUENCE

1. CONSTRUCT ENHANCED FINAL COVER ON THE EXISTING CLOSED ASH LANDFILL IN THAT PORTION NORTH OF TEMPORARY ASH STORAGE FACILITY CENTER BERM. CONSTRUCT LEACHATE LAGOON, PUMP STATION, PIPING, CATCH BASINS 1-5 & 8, MANHOLES AND INLETS.
2. MOVE EXISTING ASH STORAGE TO NEW TEMPORARY ASH STORAGE FACILITY.
3. CONSTRUCT ENHANCED CLOSURE COVER OVER REMAINDER OF CLOSED LANDFILL AREA.
4. CONSTRUCT CLOSURE COVER OVER EXISTING ASH LANDFILL AREA.
5. CONSTRUCT SOUTHERN REMAINING PORTION OF TEMPORARY ASH STORAGE FACILITY, CATCH BASIN 6 AND 7.

TYPICAL SECTION AND DETAIL REFERENCE SYSTEM

SECTION CUT ON DWG C1 AND SHOWN ON DWG C2 — (A / C2) — SECTION LETTER; DWG ON WHICH SECTION APPEARS

ON DWG C2 THIS SECTION IS IDENTIFIED AS: — (A / C1) — SECTION LETTER; DWG FROM WHICH SECTION WAS TAKEN

DETAILS ARE REFERENCED IN A SIMILAR MANNER EXCEPT NUMBERS ARE USED INSTEAD OF LETTERS

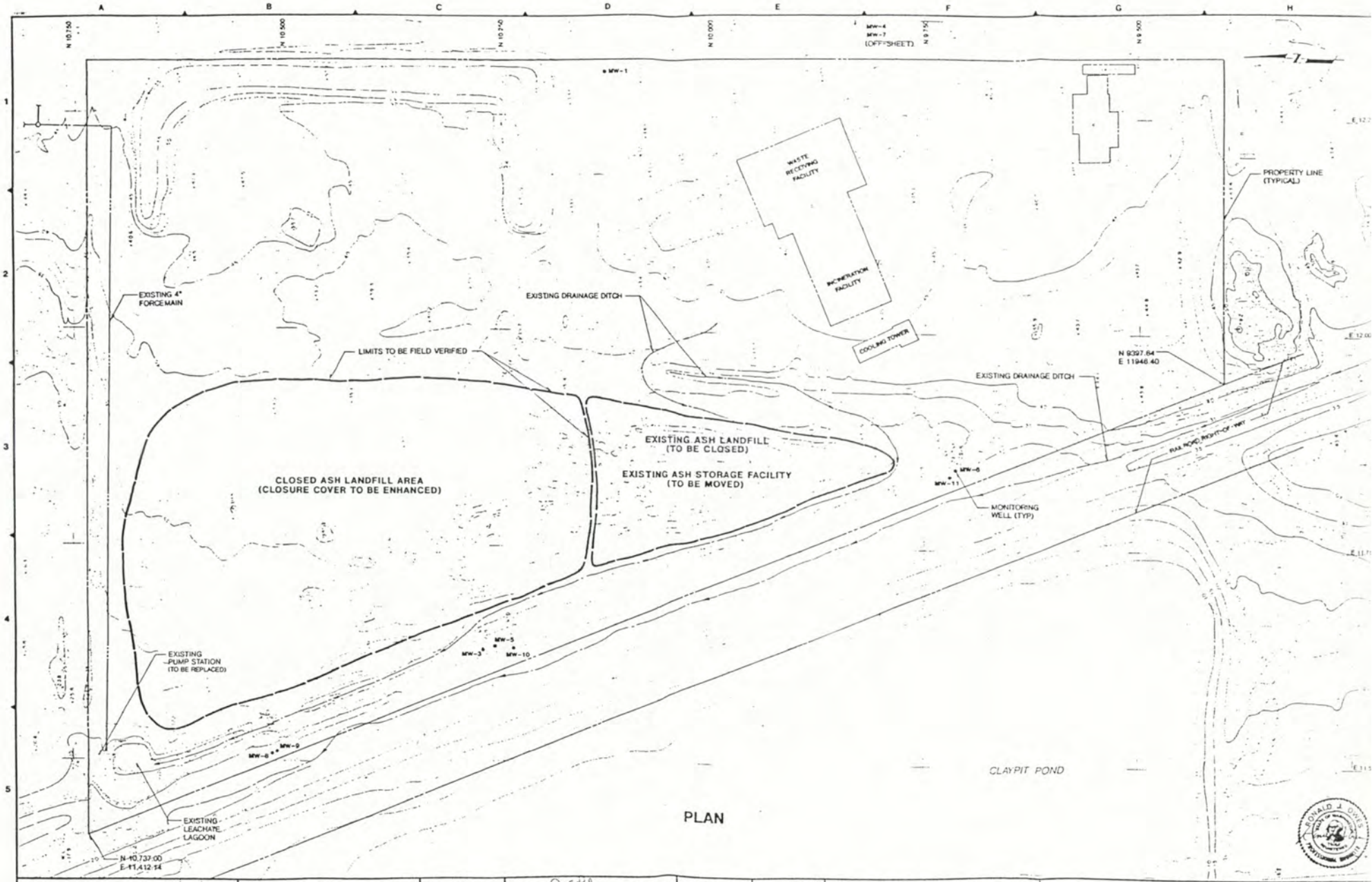
harper owes CONSULTING ENGINEERS

DESIGNED DA | DRAWN BS | SUBMITTED [signature] DATE 5-26-89 | APPROVED ______ DATE ______ | SCALE NO SCALE | DATE JUNE 28 1989 | ONE INCH AT FULL SIZE

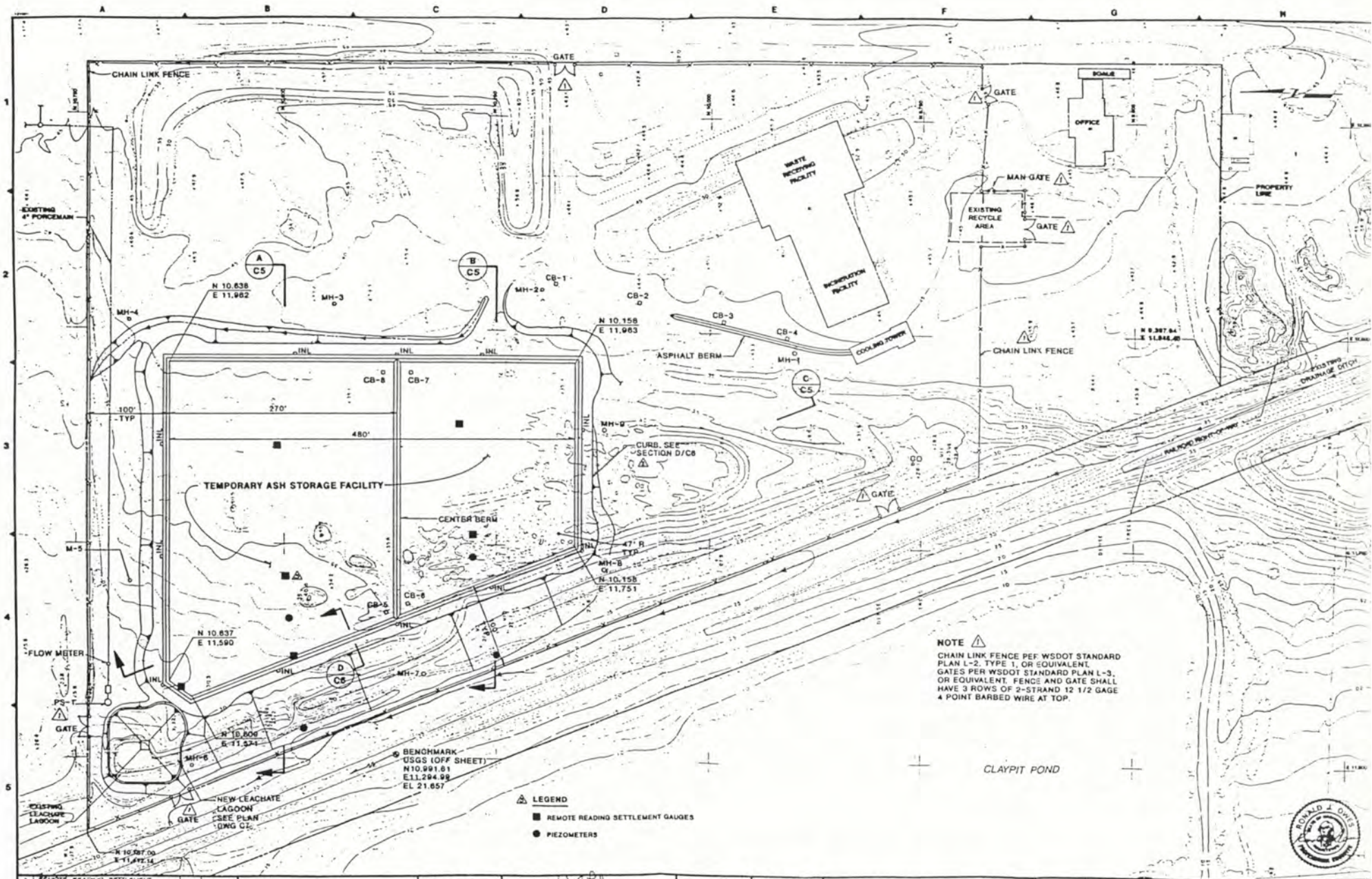
THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

GENERAL NOTES, SYMBOLS AND ABBREVIATIONS, INDEX OF DRAWINGS

DRAWING G1



	harper plus	DESIGNED CO	SUBMITTED	DATE 5-24-89	SCALE 1"=50'-0"	THERMAL REDUCTION CO., INC. TEMPORARY ASH STORAGE FACILITY	EXISTING SITE PLAN
		DRAWN BB	APPROVED	DATE	DATE JUNE 28,1989		DRAWING G2



NO	REVISION	BY	DATE
3	REMOTE READING SETTLEMENT GAUGES, PIEZOMETERS ADDED	PS	06-26-89
2	CURB ADDED	PS	06-26-89
1	FENCE, GATES, ADDED	BB	06-09-89

harper dines CONSULTING ENGINEERS

DESIGNED RO
DRAWN PS
CHECKED

SUBMITTED DATE
APPROVED DATE
APPROVED DATE

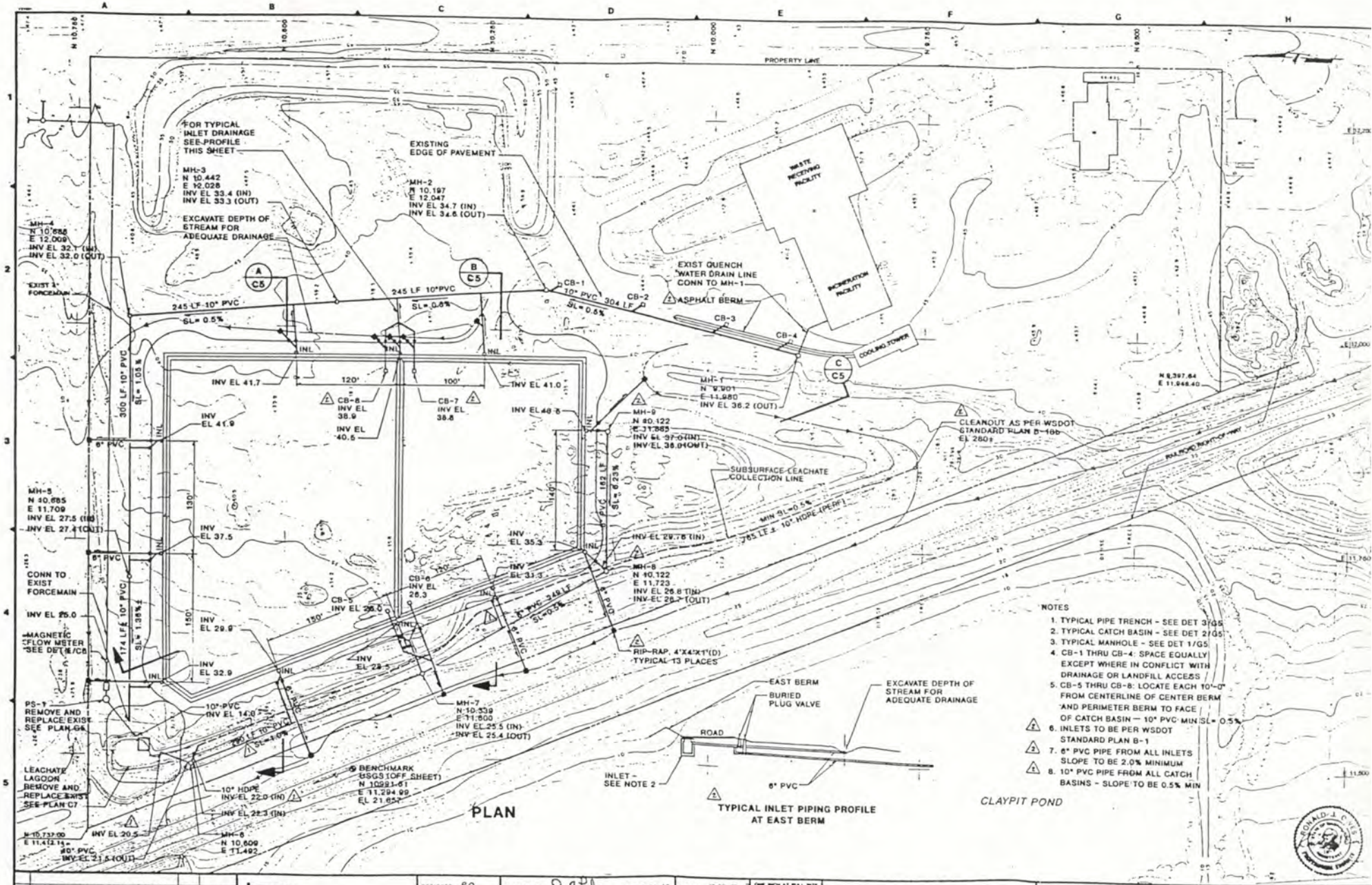
SCALE 1"=60'-0"
DATE JUNE 26,1989
JOB NO. TRLA 1088

IF NOT ONE INCH SCALE ACCORDINGLY

THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

TEMPORARY ASH STORAGE FACILITY
NEW SITE PLAN

DWG NO. G3
SHEET 3 OF 13



NO	REVISION	BY	DATE
2	PIPING, MH 3, & EXIST PIPE LENGTHS ADDED	DB	06-05-89
1	PIPING, MH'S, BERM, ALL INLETS, CB'S 7&8, MH'S 8&9, AND CLEAN OUT	DB	06-27-89

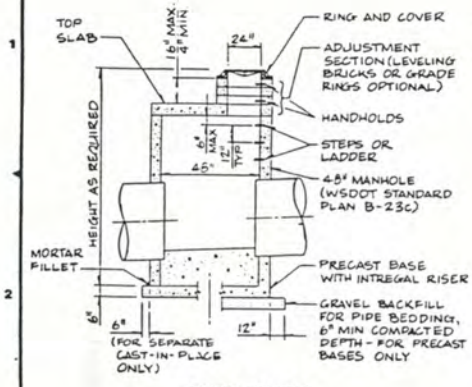
harper owes CONSULTING ENGINEERS

DESIGNED RO
DRAWN BB
CHECKED
SUBMITTED
APPROVED
APPROVED
DATE
DATE
DATE
SCALE 1"=50'-0"
DATE JUNE 28, 1989
JOB NO TRLA 1008

THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

TEMPORARY ASH STORAGE FACILITY
PIPING PLAN

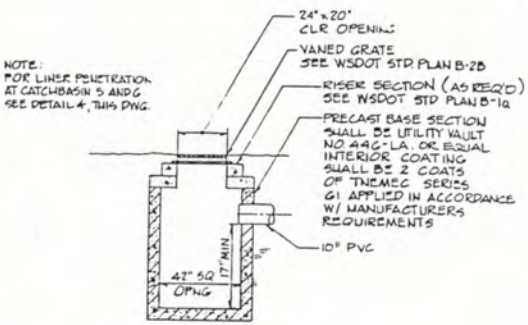
DRAWING G4



TYPICAL MANHOLE

DETAIL 1/G4

NO SCALE



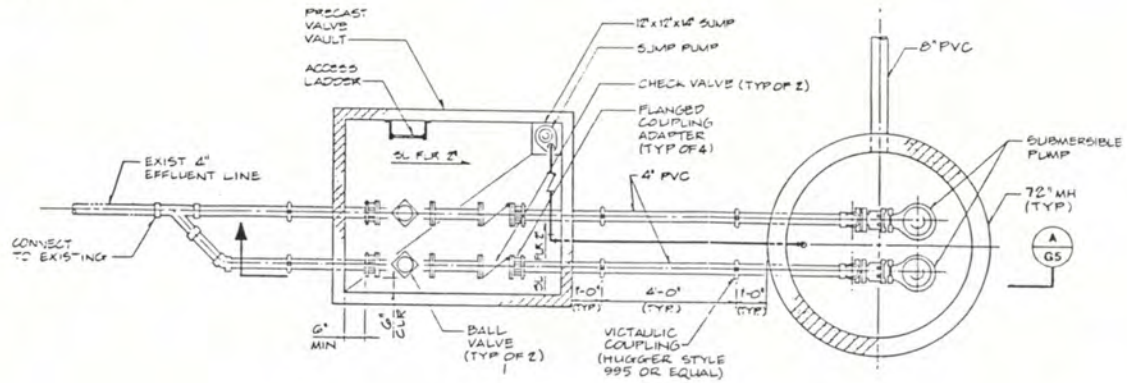
NOTE:
FOR LINER PENETRATION AT CATCHBASIN 5 AND 6 SEE DETAIL 4, THIS DWG.

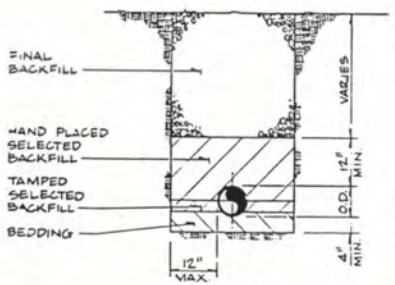
TYPICAL CATCH BASIN

DETAIL 2/G4

NO SCALE

PUMP STATION DATA	
ITEM	PS-1
INFLUENT LINE INV EL	13.80
FLOAT LEVEL SENSOR-HIGH WATER ALARM	22.00
FLOAT LEVEL SENSOR-LAG PUMP ON	21.00
FLOAT LEVEL SENSOR-LEAD PUMP ON	15.00
FLOAT LEVEL SENSOR-PUMP OFF	14.00
FLOAT LEVEL SENSOR-LOW WATER ALARM	13.50
DISCHARGE LINE INV EL	MATCH EXIST
FLYGT PUMP MODEL (SEE SPECS)	CP-3127-462
MOTOR HORSEPOWER	7 1/2

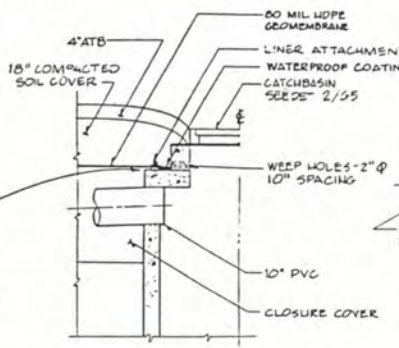




TYPICAL TRENCH

DETAIL 3/G4

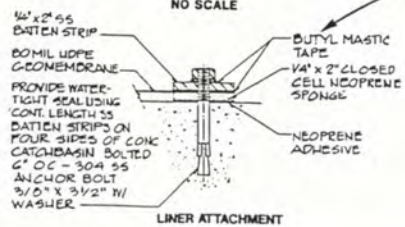
NO SCALE



CATCH BASINS 5-8

DETAIL 4/G5

NO SCALE

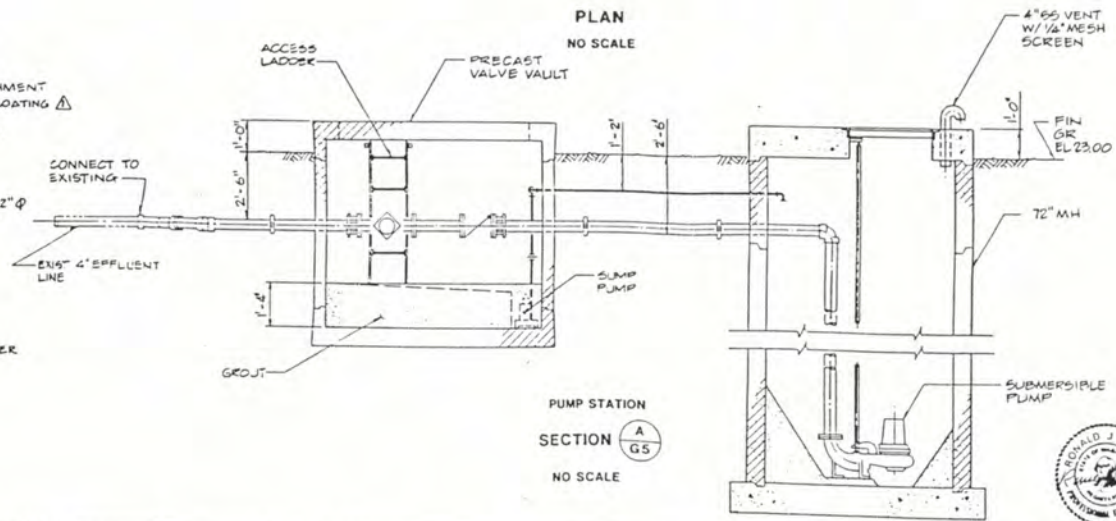


LINER ATTACHMENT

NO SCALE

PLAN

NO SCALE



PUMP STATION

SECTION A/G5

NO SCALE

NO	REVISION	BY	DATE
⚠	WATERPROOF COATING ADDED DTL 4	PS	06.12.89

harper owes CONSULTING ENGINEERS

DESIGNED SC
DRAWN DA VIP
CHECKED

SUBMITTED DATE 6-23-89
APPROVED DATE
APPROVED DATE

SCALE NO SCALE
DATE JUNE 28, 1989
JOB NO TRA 1068

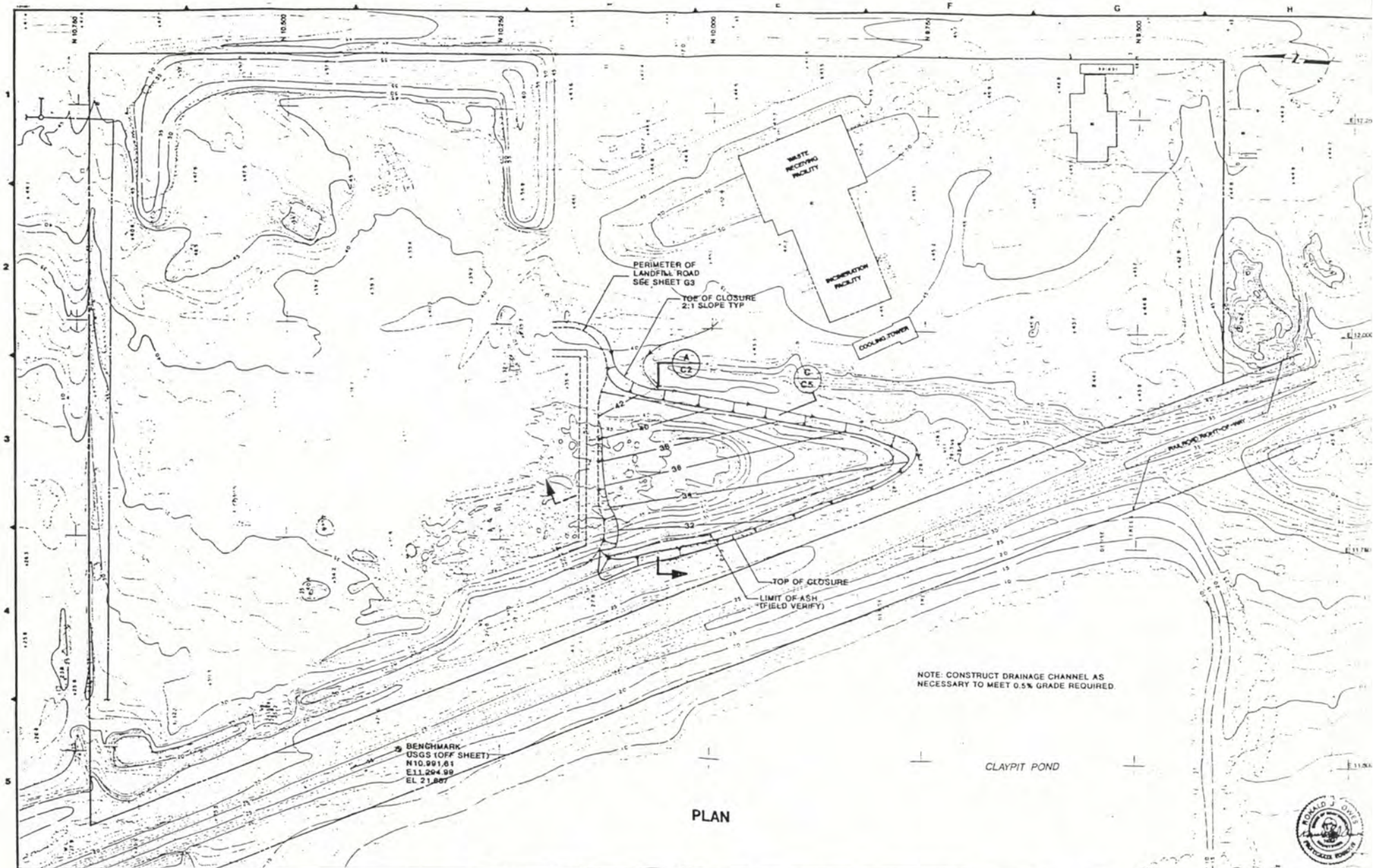
ONE INCH AT FULL SIZE
IF NOT ONE INCH SCALE ACCORDINGLY

THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

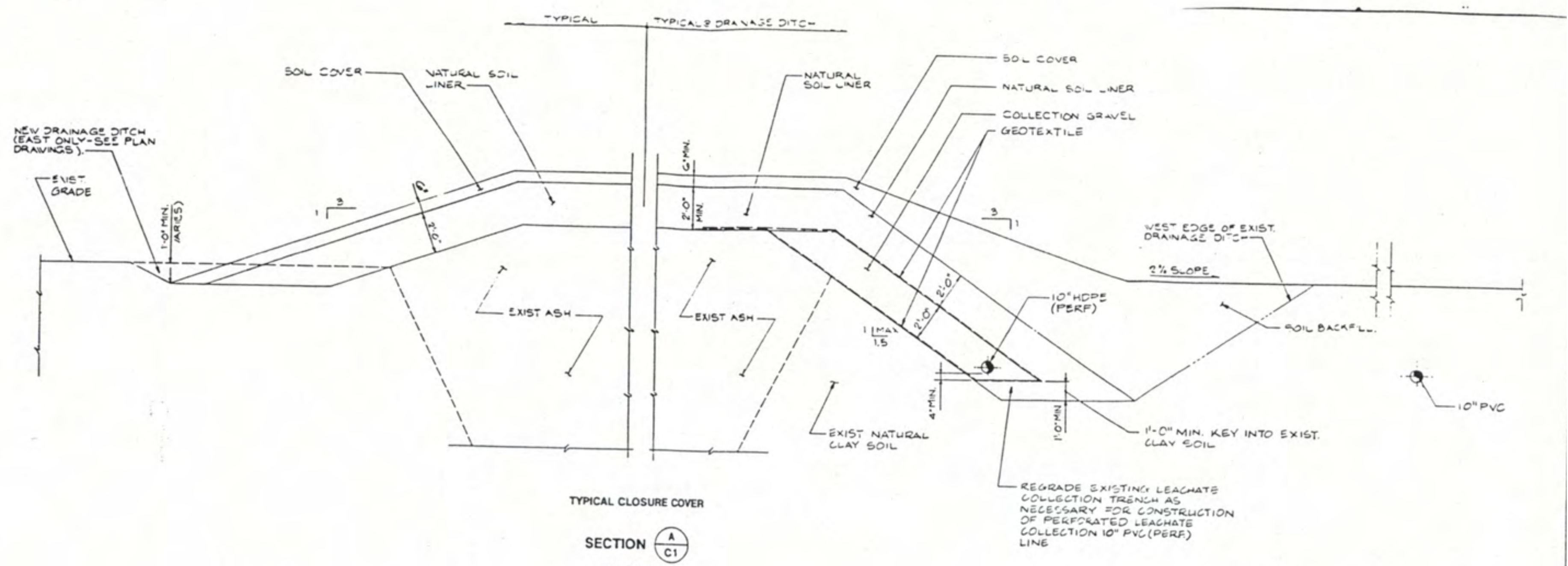
TEMPORARY ASH STORAGE FACILITY
PIPING DETAILS

DRAWING G5

SHEET 5 OF 11



NO.	REVISION	BY	DATE	harper owes CONSULTING ENGINEERS	DESIGNED BC DRAWN DM CHECKED	SUBMITTED APPROVED APPROVED	DATE DATE DATE	SCALE 1"=50'-0" DATE JUNE 26,1989 JOB NO. TRA.1066	ONE INCH AT FULL SIZE IF NOT ONE INCH SCALE ACCORDINGLY	THERMAL REDUCTION CO., INC. TEMPORARY ASH STORAGE FACILITY	EXISTING ASH LANDFILL CLOSURE COVER PLAN	DRAWING C1 SHEET



TYPICAL CLOSURE COVER

SECTION A/C1

NO SCALE

NOTE:

SOIL COVER TO BE ADDED AFTER REMOVAL OF TEMPORARY ASH STORAGE FACILITY AT LATER DATE EXCEPT IN AREAS OUTSIDE OF LIMITS OF TEMPORARY STORAGE FACILITY.

NO	REVISION	BY	DATE

harper owes CONSULTING ENGINEERS

DESIGNED: 20
DRAWN: DM
CHECKED:

SUBMITTED: [signature] DATE: 1-26-89
APPROVED: ___ DATE: ___
APPROVED: ___ DATE: ___

SCALE: AS SHOWN
DATE: JUNE 28, 1989
JOB NO: TRLA 1088

ONE INCH AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

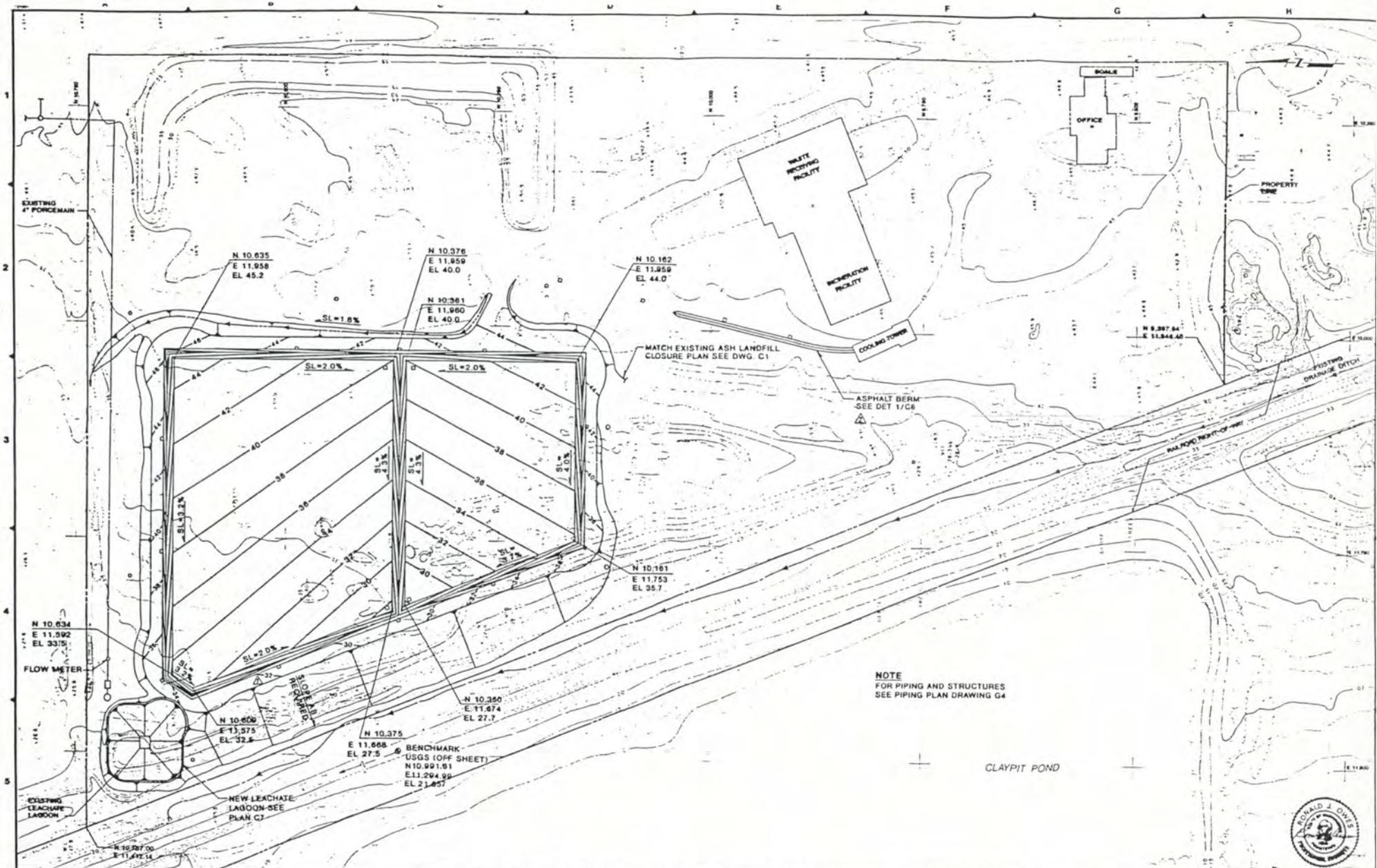
THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

EXISTING ASH LANDFILL CLOSURE SECTION

DRAWING C2

SHEET 7 OF 13

RONALD J. OWES — PROFESSIONAL ENGINEER



NO	REVISION	BY	DATE
1	ASPHALT BERM ADDED	RS	06-26-09
2	REVISED ROADWAY CROSS SLOPE	RS	08 12 09

harper owes CONSULTING ENGINEERS

DESIGNED RO
DRAWN RS
CHECKED

SUBMITTED DATE 5-14-09
APPROVED DATE
APPROVED DATE

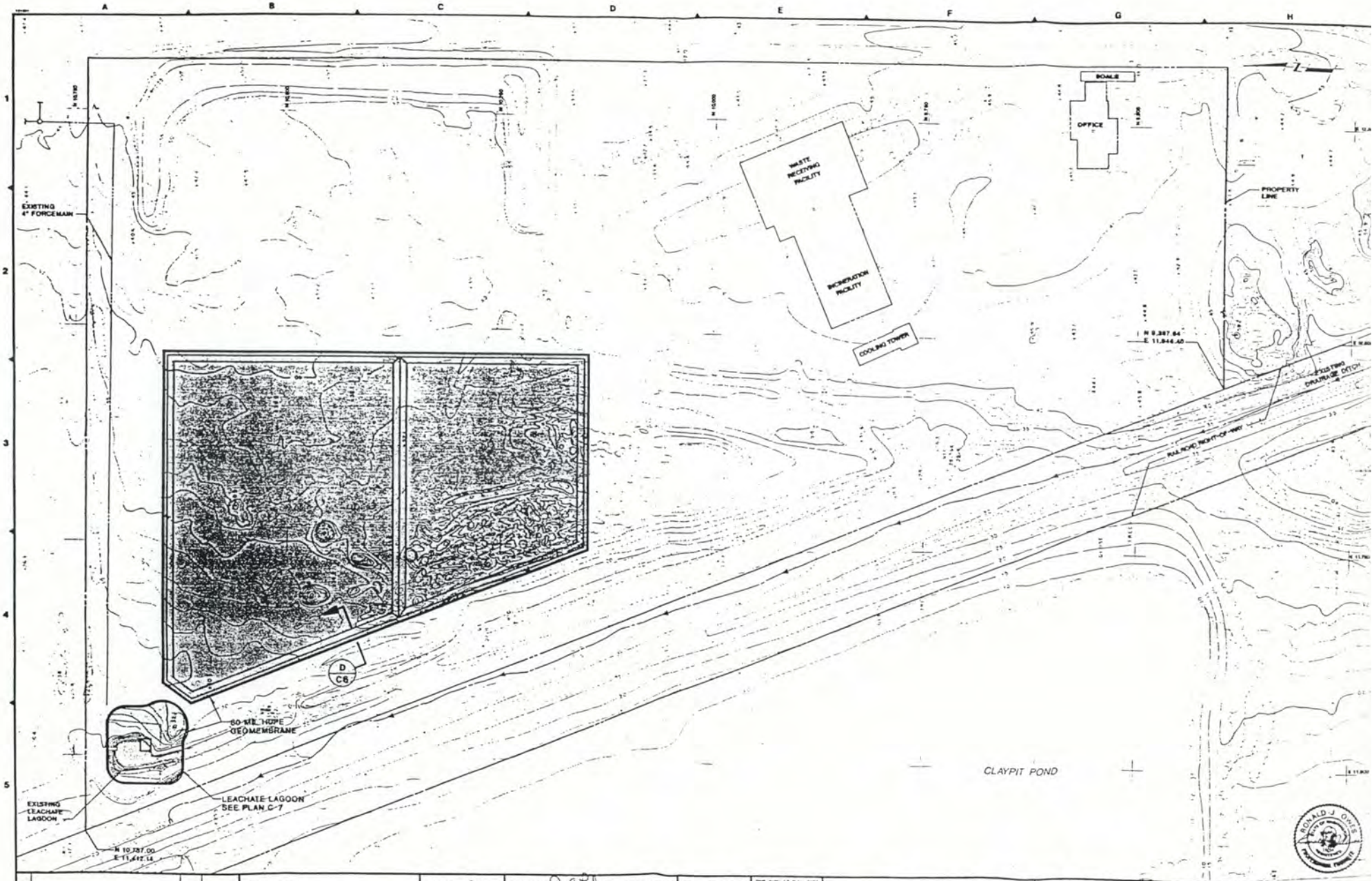
SCALE 1"=50'-0"
DATE JUNE 28,1989
JOB NO TRLA 1088

ONE INCH AT FULL SIZE
IF NOT ONE INCH, SCALE ACCORDINGLY

THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

TEMPORARY ASH STORAGE FACILITY GRADING PLAN

DRAWING C3
SHEET 8 OF 13



harper owes CONSULTING ENGINEERS

DESIGNED RO
DRAWN PA
CHECKED

SUBMITTED DATE 5-24-89
APPROVED DATE
APPROVED DATE

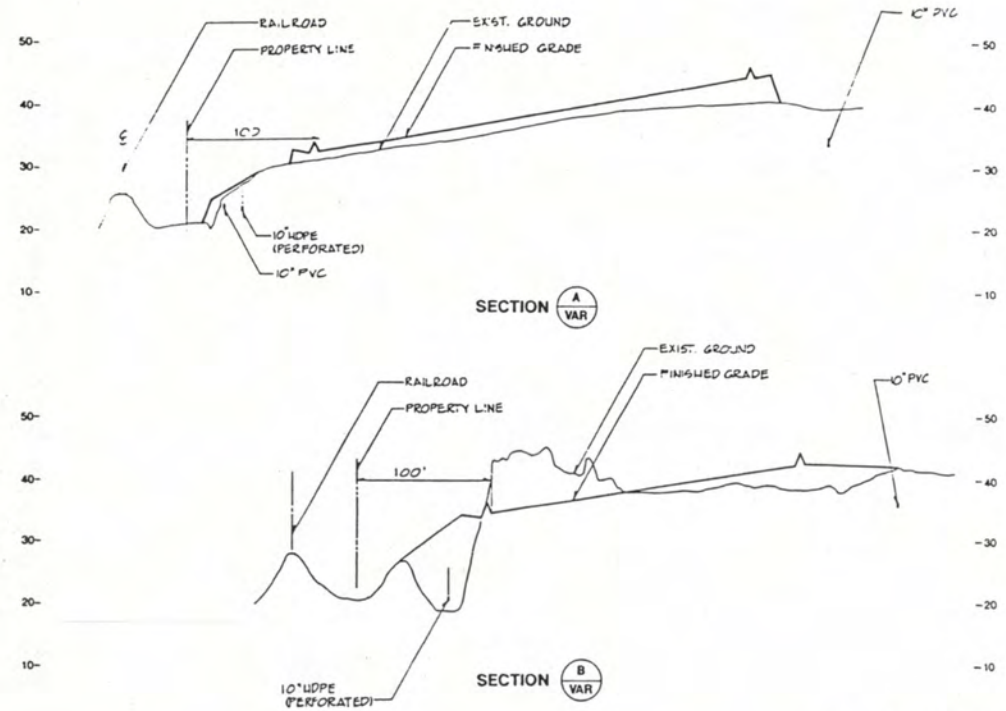
SCALE 1"=60'-0"
DATE JUNE 28,1989
JOB NO. TRLA 1068

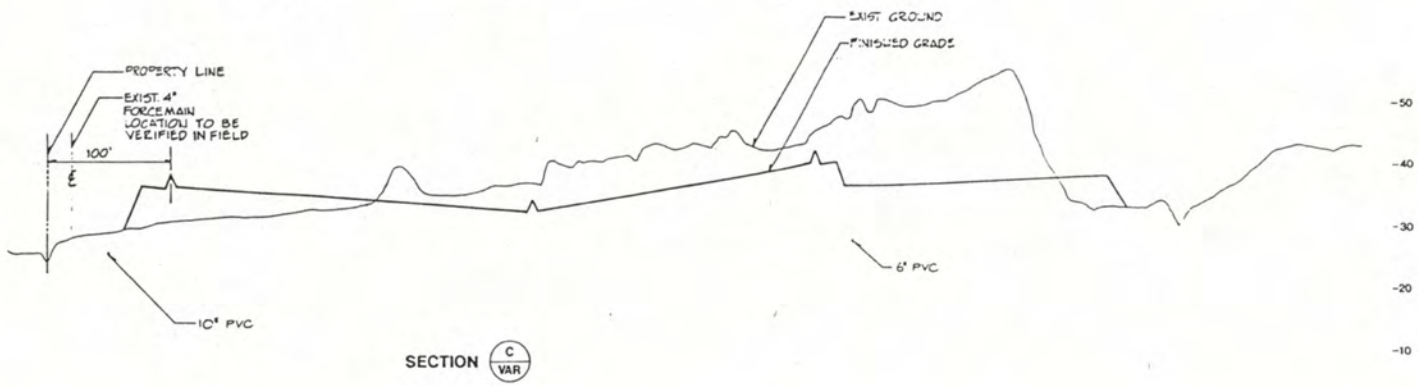
ONE INCH AT FULL SIZE
IF NOT ONE INCH SCALE ACCORDINGLY

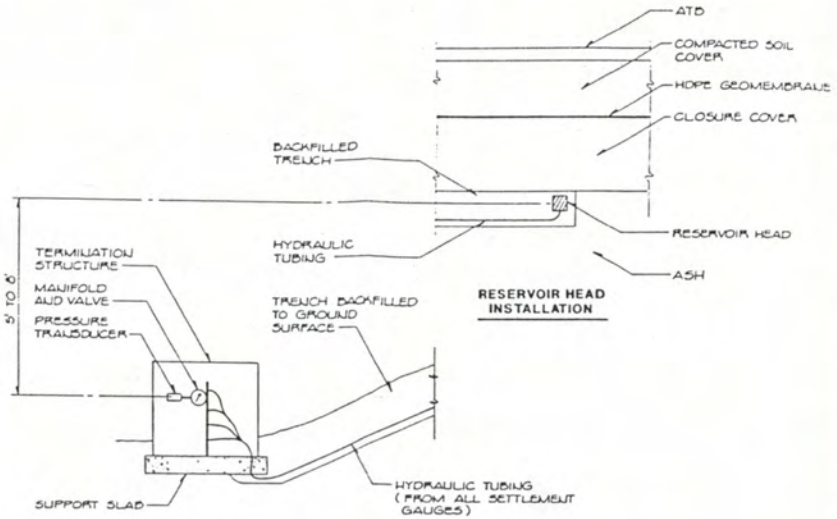
THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

TEMPORARY ASH STORAGE FACILITY LINING PLAN

DRAWING C4
SHEET 9 OF 11





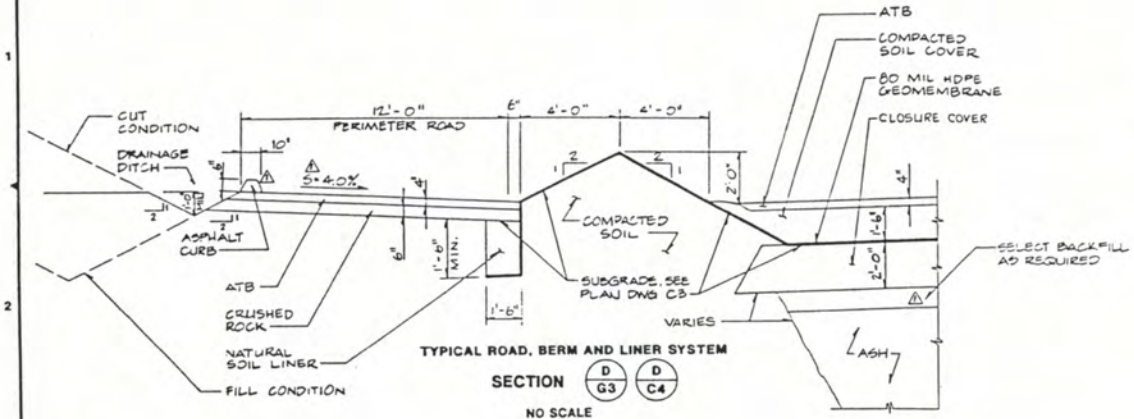


REMOTE READING SETTLEMENT GAUGE SYSTEM

⚠ DETAIL 1/G3

NO SCALE

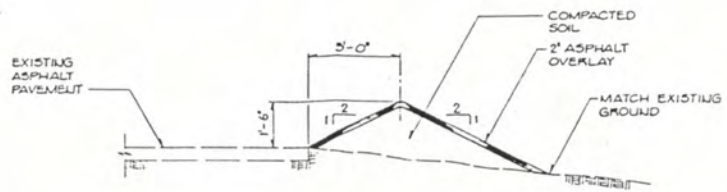
⚠ REMOTE READING SETTLEMENT GAUGE SYSTEM DETAIL ADDED	PB	06-28-89	harper ones CONSULTING ENGINEERS	DESIGNED RO	SUBMITTED	DATE 6-29-89	VERT 1" = 10'-0" HORZ 1" = 10'-0"	ONE INCH AT FULL SIZE	THERMAL REDUCTION CO., INC. TEMPORARY ASH STORAGE FACILITY	TEMPORARY ASH STORAGE FACILITY SECTIONS	DRAWING C5
NO. REVISION	BY	DATE		DRAWN PB	APPROVED	DATE	SCALE				
				CHECKED	APPROVED	DATE	DATE JUNE 28 1989	IF NOT ONE INCH SCALE ACCORDINGLY			SHEET 10 OF 13
							JOB NO TRLA 1068				



TYPICAL ROAD, BERM AND LINER SYSTEM

SECTION D/G3 D/C4

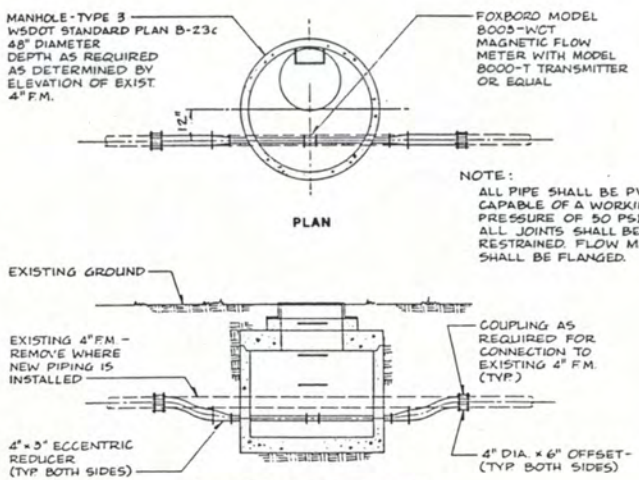
NO SCALE



ASPHALT BERM

DETAIL 1/C3

NO SCALE

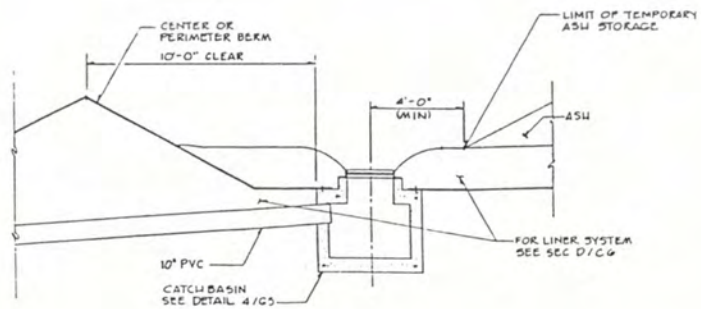


PLAN

MAGNETIC FLOW METER INSTALLATION

SECTION E/G4

NO SCALE



TOE OF TEMPORARY ASH STORAGE AT CATCH BASINS 5-8

DETAIL 2/C6

NO SCALE

NO	REVISION	BY	DATE
1	DETAIL 2 ADDED	BD	06 27 89
2	ASPHALT BERM DETAIL ADDED	PJS	06 28 89
3	REVISED ROADWAY SLOPE, ADD CURB, SELECT BACKFILL	PJS	10 6 12 89

harper owes CONSULTING ENGINEERS

DESIGNED R.O. DRAWN M.F. CHECKED

SUBMITTED DATE 7-26-89 APPROVED DATE APPROVED DATE

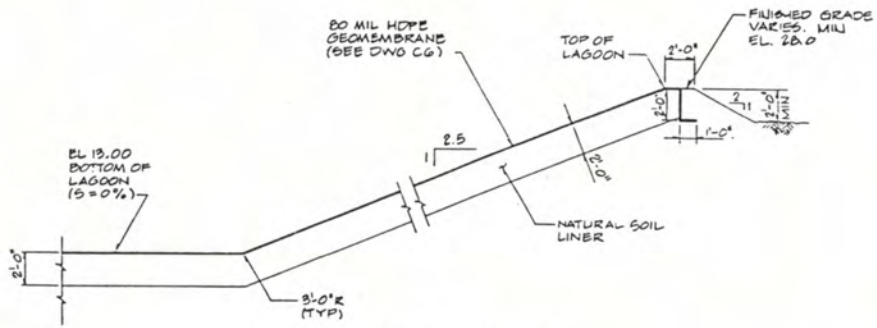
SCALE AS SHOWN DATE JUNE 28, 1989 JOB NO TRLA 1058

IF NOT ONE INCH SCALE ACCORDINGLY

THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

TEMPORARY ASH STORAGE FACILITY
SECTIONS AND DETAILS

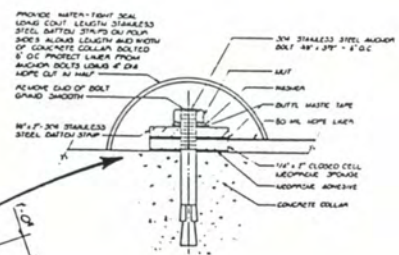
DRAWING C6 SHEET 11 OF



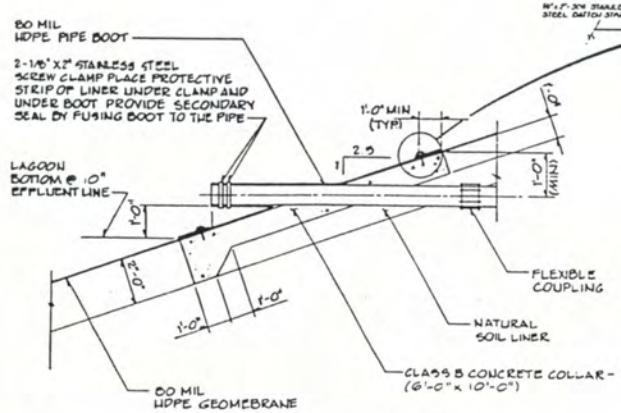
TYPICAL LEACHATE STORAGE LAGOON SECTION

DETAIL 1/C7

NO SCALE



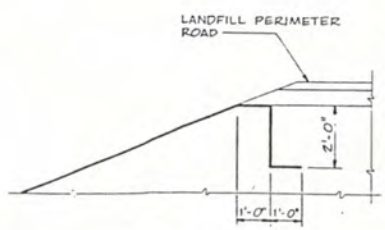
NO SCALE



TYPICAL LEACHATE STORAGE LAGOON LINER PENETRATION

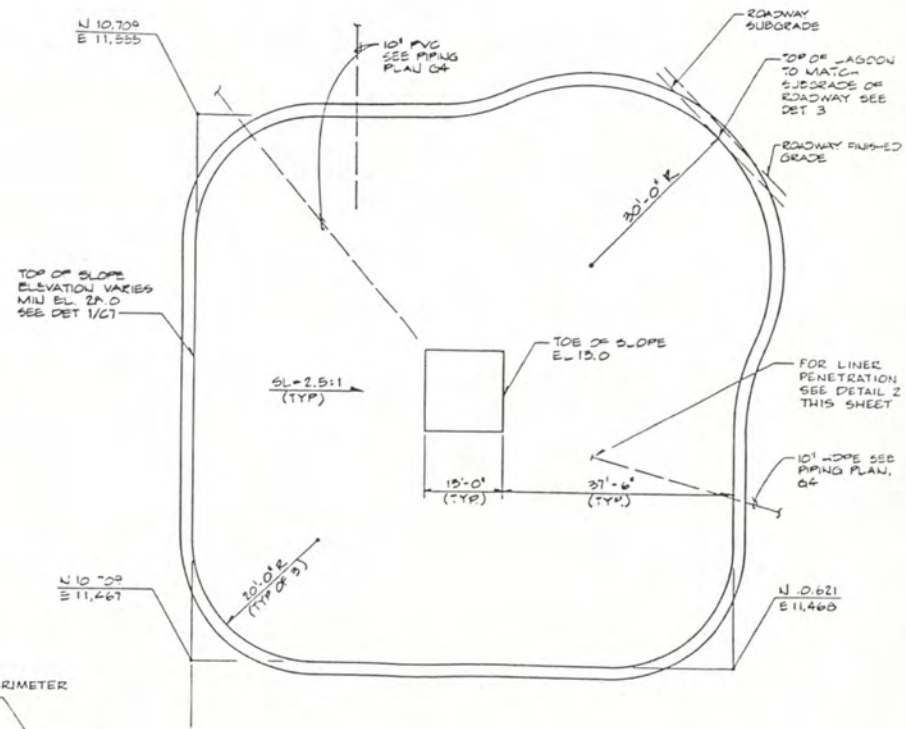
DETAIL 2/G4 2/C7

NO SCALE



PLAN 3/C7

NO SCALE



LEACHATE LAGOON

DETAIL

SCALE: 1" = 10' - 0"

NO	REVISION	BY	DATE

harper owes CONSULTING ENGINEERS

DESIGNED RO
DRAWN TEAM
CHECKED

SUBMITTED Oct 25 DATE 7-25-88
APPROVED DATE
APPROVED DATE

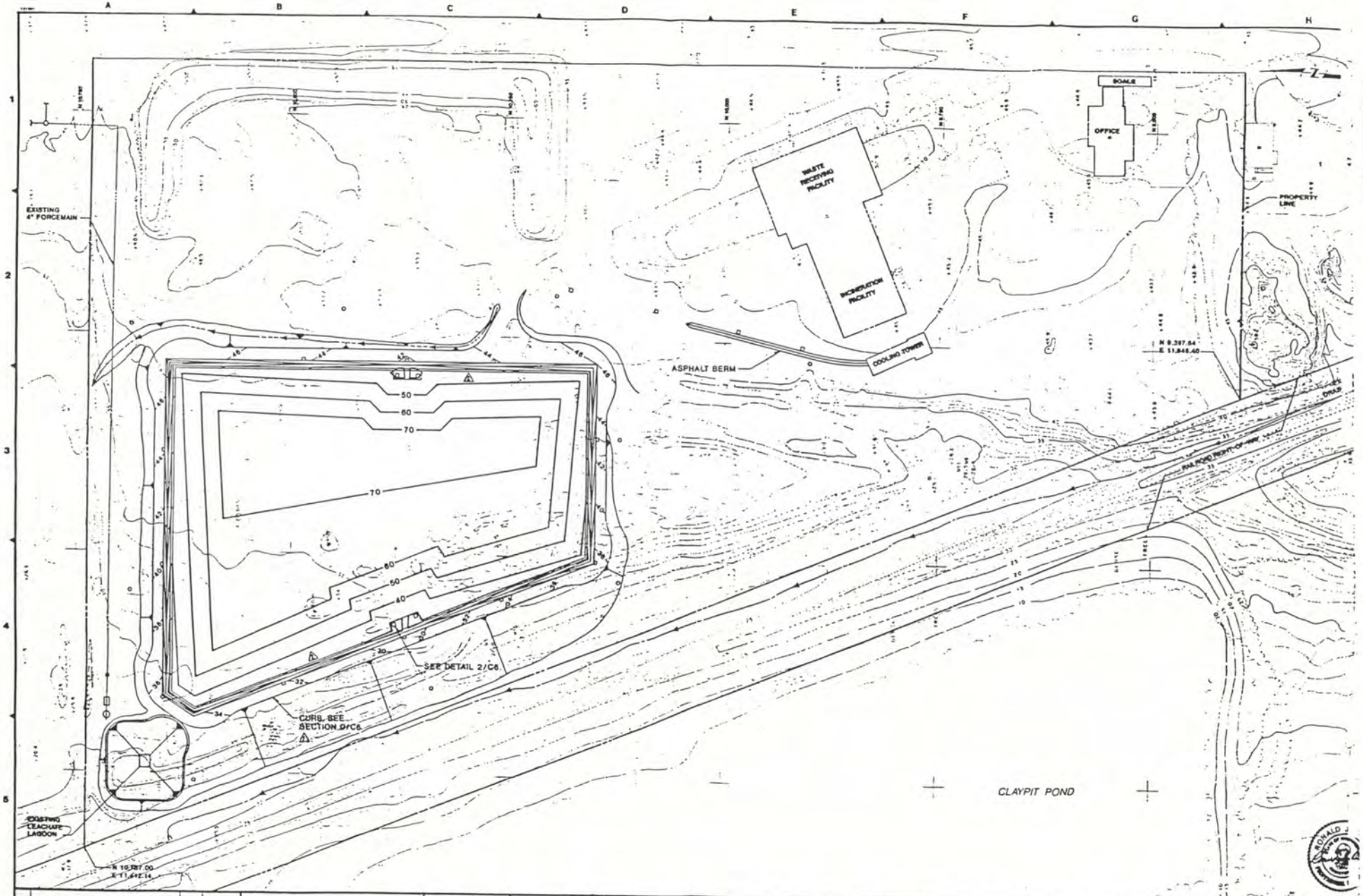
SCALE AS SHOWN
DATE JUNE 28 1989
JOB NO TRLA 1088

ONE INCH AT FULL SIZE
IF NOT ONE INCH SCALE ACCORDINGLY

THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

TEMPORARY ASH STORAGE FACILITY
LEACHATE LAGOON
PLAN, SECTIONS AND DETAILS

DRAWING C7
SHEET 37 OF 53



NO	REVISION	BY	DATE
2	ADJUST FINAL TOPOGRAPHY	PS	06-28-89
1	REVISED ROAD CROSS SLOPES CURB ADDED	PS	06-12-89

harper ches CONSULTING ENGINEERS

DESIGNED RO
DRAWN RB
CHECKED
APPROVED
APPROVED

SUBMITTED DATE 7-14-89
APPROVED DATE
APPROVED DATE

SCALE 1"=50'-0"
DATE JUNE 28, 1989
JOB NO. TRLA 1088

ONE INCH AT FULL SIZE
IF NOT ONE INCH ADJUST ACCORDINGLY

THERMAL REDUCTION CO., INC.
TEMPORARY ASH STORAGE FACILITY

TEMPORARY ASH STORAGE FACILITY
FINAL TOPOGRAPHY
OF TEMPORARY

DRAWING