

4903Permit1992 - Batch No. _____

49031992

IRE DALLAS

28

**Municipal
Services**



**Engineering
Company, P.A.**

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

December 22, 1992

Mr. Carson Fisher
County Engineer
Iredell County
PO Box 788
Statesville, NC 28677



Re: Landfill Submittal

Dear Mr. Fisher:

I am writing to inform you of a meeting held December 21, 1992, between Bobby Lutfy, Wendell Parker and myself concerning the additional subsurface investigations that may be required according to the letter to Joel Mashburn dated December 11, 1992 from the Division of Solid Waste Management. The first item discussed was the Eufola Fault and it was determined that there is no more documentation available; consequently, no further documentation or work will be required.

Item number two was the method by which hydraulic conductivity values for each lithologic unit were obtained. Mr. Lutfy was not familiar with the method that was used and it was decided that Wendell Parker would provide him with all of the field data and computations. Mr. Parker will meet with Mr. Lutfy after the first of the year to walk him through this procedure so that Mr. Lutfy will feel comfortable with this procedure.

Item number three concerns flow characteristics of groundwater and protrusions of rock. It was determined that based on the amount of groundwater data available and the design that no additional probes would have to be made if we showed in the construction drawing submittal that we were monitoring the ground water properly and that our design is conservative and does not infringe upon the required four foot separation between solid waste and groundwater. The groundwater will be the limiting factor; consequently, the rock profile will not affect our design.

OK

Subject to
approval?

>> 4+H

These are the only items that were discussed. If you have any questions, please feel free to call.

Sincerely yours,
MUNICIPAL ENGINEERING SERVICES CO., PA

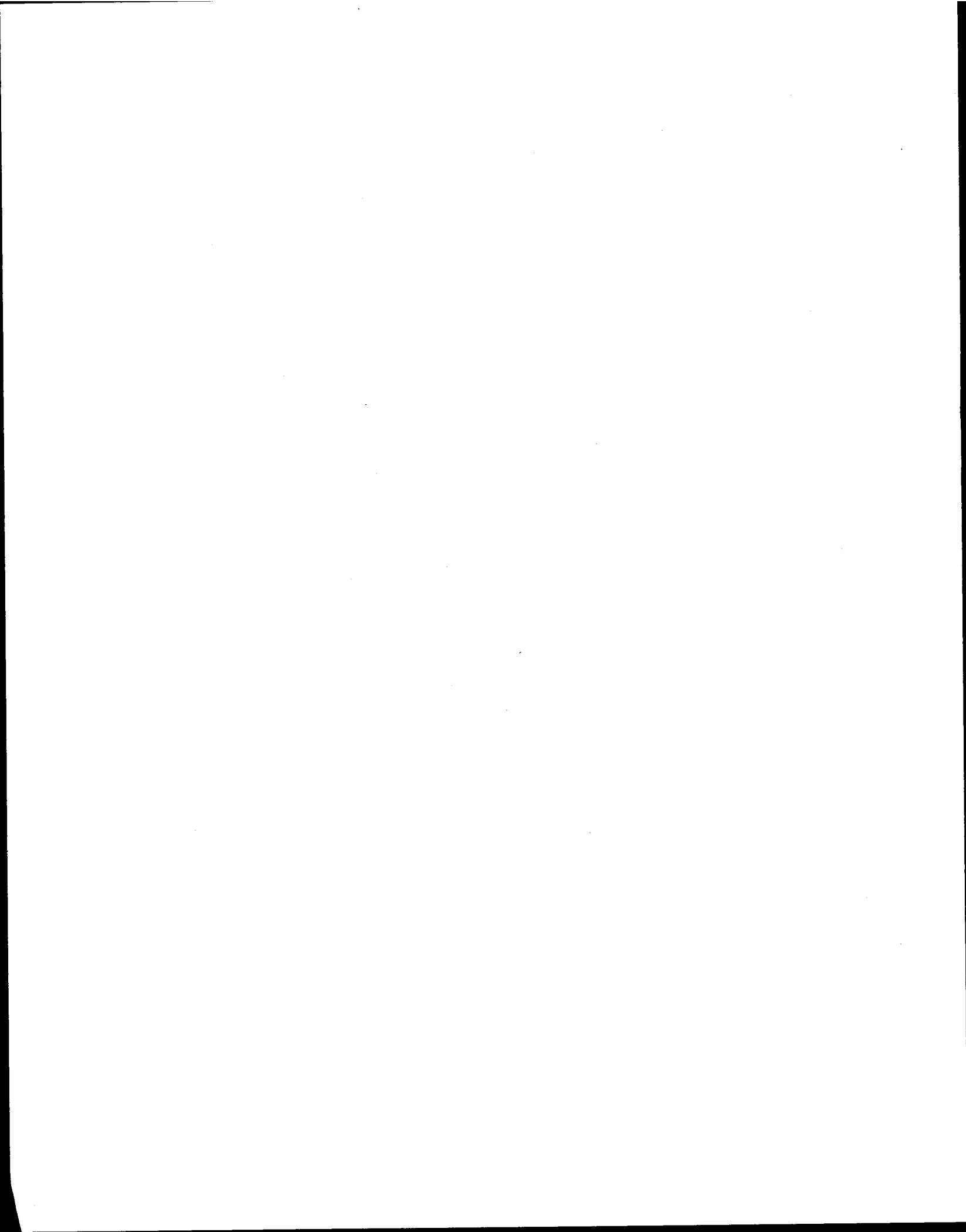
D. Wayne Sullivan

D. Wayne Sullivan

DWS:sw

Copy: Mr. Joel Mashburn
Mr. Ron Weatherman
Mr. Bobby Lutfy
Mr. Wendell Parker
Mr. Jimmy Woodie

H2O level at P-18 ?





State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

December 11, 1992

Mr. Joel Mashburn, County Manager
Iredell County
P.O. Box 788
Statesville, North Carolina 28677

Note: Page 2 . I did not write in
Site Specific Approved Disposal Area
Status to Leachate Treatment Areas.
This should have been covered because
areas under impairments are
important. We do say the Division
must approve these areas so
we are covered. Make sure future
letters address this point.
12/15/92 JEC

Re: General Conditions and Site Specific Municipal Solid Waste Landfill (MSWLF) Design Requirements for the Proposed Iredell County Solid Waste Management Facility

Dear Mr. Mashburn:

The Division of Solid Waste Management recently completed its review of the site plan application for the proposed Iredell County Solid Waste Management Facility located north of U.S. Highway 70 off State Road 2319. Based upon information submitted and revised through November 16, 1992, the Division determined that the applicant may prepare a construction plan application for a specific approved disposal area defined below. The Division requires the submittal of a construction plan application for the proposed MSWLF prior to issuing a Permit To Construct. The construction plan application shall meet the rules and requirements of 15A NCAC 13B and Policy Memorandum No. 18 as well as the specific conditions set forth in this letter. These specific conditions address:

- Additional subsurface investigation requirements to be included in the construction plan for the site specific approved disposal area;
- Design and construction standards for the referenced facility; and
- Other information pertinent to the construction plan and future development of this facility.

Approved Disposal Area

The Section defines a site specific approved disposal area as the area approved for municipal solid waste disposal. For Iredell County's proposed 170 acre facility site, the Section broadly grants site specific approved disposal area status to the area identified on Drawing 4 - Leachate Collection & Removal System And Stormwater Management (Submitted July 23, 1992) as the area contained within the limits of lined area. Drawing 4 labels the area contained within the limits of lined area as Module 1. The Division further limits site specific approved disposal area status to only the area necessary to provide five year's disposal capacity. Accordingly, the applicant shall incorporate into its construction plan application a division of the broad site specific approved disposal area into phases representing five year's disposal capacity. At the termination of five years or exhaustion of the first phase, Iredell County shall submit a new construction plan application which meets all existing rules in effect at that time. However, the Division of Solid Waste Management will not require new site specific approved disposal area status for the second phase of Module 1. Only an updated construction plan application shall be necessary.

The Section shall require additional site characterization and approvals before it grants site specific approved disposal area status to any other area of the site. The Section prohibits disposal in any area prior to designation as a site specific approved disposal area. However, Iredell County may utilize all remaining areas of the site except for streams and their associated buffer areas for other solid waste management activities (such as yard waste composting or recycling) or for landfill support activities (such as leachate management or stockpiling of cover material) provided the county obtains approval from the Division of Solid Waste Management.

Additional Subsurface Investigation

For Module 1, the Division may require additional geological and hydrological information in order to adequately determine the direction and rate of groundwater flow for the site as well as to evaluate the adequacy of subbase grade elevations. The Division may require information which:

- (a) identifies the exact location of the Eufola Fault in respect to the site. Should the fault intersect the property, Iredell County shall provide information which explains:
 - 1) if the fault is open or annealed; and
 - 2) if the fault is more conductive or less conductive hydraulically than surrounding materials.

The information, if requested, shall discuss if the fault creates preferential flow paths for ground water movement or if it in any way disrupts the ground water flow patterns at the site;

- (b) clarifies the direction of groundwater flow for the site including the direction of groundwater flow around the knoll in the site's northwest corner;
- (c) defines the long term seasonal high water table;

- (d) verifies hydraulic conductivity testing values reported in the site plan application for each lithologic unit including the upper fractured bedrock to determine preferential groundwater flow paths; and
- (e) evaluates the subsurface bedrock profile in order to minimize protrusions of rock pinnacles into the design subbase. The Division may require additional subsurface cross sections to assess bedrock trends.

Should boring activities become necessary to support any requested information, the applicant shall consult the Division's Solid Waste Section Hydrogeologist prior to initiating boring operations.

Design and Construction Standards

- (1) The MSWLF cell design shall incorporate the following engineered systems to perform the specified performance functions:
 - (a) A composite liner system designed to prevent migration of leachate into ground water. Minimum design standards shall include a 60-mil high density polyethylene liner overlying a compacted soil liner with a minimum of two-feet of 1×10^{-7} cm/sec permeable soils; Also, the liner system shall maintain a minimum vertical separation of four feet between solid waste and the seasonal high water table.
 - (b) A leachate collection and removal system designed to drain liquids accumulating on the liner. The system shall maintain no greater than one foot of head on the liner system assuming that infiltration into the landfill is equal to the amount of precipitation produced from the 24 hour/25 year storm event;
 - (c) a run-on and run-off control system designed to meet 40 CFR 258.25 assuming a 25 year/24 hour design storm; Precipitation collected in the landfill unit must be managed as either stormwater or leachate in order to meet the design requirements of 15A NCAC 13B Section 0.0503 (2)(c). The engineer must demonstrate that leachate will be contained in an active area and stormwater will be segregated, collected, and removed in an inactive area;
 - (d) a predisposal leachate containment and/or treatment system designed in accordance with a comprehensive leachate management plan. Leachate containment ponds shall be designed in accordance with the minimum design standards for the MSWLF liner system as established in (a) above including the four foot separation between waste (in this case, leachate) and the estimated seasonal high ground water table;
 - (e) A final cover system designed to minimize surface water infiltration, erosion, and further maintenance of the site. The final cover system shall meet the minimum design standards of the revised 40 CFR 258.60 (a) given that the permeability of the bottom liner system is no greater than 1×10^{-7} cm/sec. In conjunction with a Subtitle D bottom liner system, the final cover system must consist of a minimum infiltration layer of 18 inches of 1×10^{-5} cm/sec soil layer overlain by a synthetic liner (EPA recommends minimum 20 mil; if high density polyethylene, then 60 mil) overlain by minimum 6 inch erosion layer.

Also, Section 0.0504 (2) (a) (vi) requires the application to contain information addressing pertinent geological features. The construction plan shall incorporate an analysis of subsurface rock to minimize the extent of bedrock intrusion into the projected subbase. Rock pinnacles found during excavation which protrude into the subbase may require redesign of the landfill's subbase.

- (2) The construction plan application shall incorporate and maintain the following Horizontal and Vertical Buffers:
 - (a) A 500 foot buffer between waste boundaries and all private dwellings and wells.
 - (b) A 50 foot minimum buffer between waste and all streams and disposal areas. However, Drawing 3 - Subbase Grading And Demolition Cut Plan (Submitted July 23, 1992) indicates that the toe of slope for both the landfill and riser basin #2 is within 50 feet of the stream which passes through the property's northwest corner. The construction plan application should provide at least a 50 foot buffer between the stream and the toe of slope for both the landfill and riser basin #2 in order to provide an adequate area to install groundwater monitoring wells.
 - (c) A 50 foot minimum buffer between waste and all wetlands and any facility activities.
 - (d) A 300 foot minimum buffer between all waste boundaries, including supporting activities, and facility boundaries unless other wise approved by the Division.
 - (e) A minimum vertical separation of four feet between waste and the seasonal high water table.

Other Information Pertinent To The Construction Plan And Future Development Of This Facility.

- (1) The construction plan application shall state the design goals (i.e., performance requirements) for the components of the engineered systems. Design calculations and assumptions shall be incorporated for review to verify theoretical system performance under critical conditions and to identify the performance limits of the components.
- (2) The construction plan application shall incorporate a comprehensive leachate management plan which includes all necessary local, state, and federal permits or approvals. The applicant may obtain specific requirements from the Division of Environmental Management. The applicant should also consider the technical and economic factors associated with the available leachate management options.
- (3) The construction plan application shall include an extensive ground and surface water monitoring plan in accordance with 15A NCAC 13B Section 0.0601. The Division's Solid Waste Section shall approve the ground and surface water monitoring plan before it issues a permit to operate the MSWLF to the applicant. Also, the ground and surface water monitoring plan must separately monitor each phase of development including leachate containment ponds.

- (4) The construction plan application shall incorporate a comprehensive Construction Quality Assurance (CQA) plan which outlines the quality assurance measures necessary to implement the design along with plans for developing the CQA Report.

Following construction, the Engineer must submit as-built drawings and a CQA Report which documents the test procedures and results used to verify that the facility was constructed according to the permitted plans. In general a plan is required to monitor construction and provide a structure for the report. The CQA Plan shall define responsibilities, necessary quality control and quality assurance testing, and provide a format for summarizing construction.

Upon completion of construction, the Division's Solid Waste Section shall review and approve the CQA report before it issues a Permit To Operate the MSWLF. The CQA report shall bear the seal of a professional engineer verifying test procedures and results performed by the engineer or his/her agent.

- (5) The construction plan application shall incorporate both a closure plan and a post-closure plan in accordance with revised 40 CFR 258.60. The closure plan shall describes the steps necessary to close the unit at any point during its active life while the post-closure plan gauges the long-term performance of the facility.
- (6) Although the site overlies bedrock, the construction plan application shall also include a settlement analysis for Module 1 to ensure the structural integrity of leachate collection system components.

Please note that 15A NCAC 13B Section 0.0201 requires the Division to issue a Solid Waste Permit in two parts. The first part is a Permit To Construct and the second part is a Permit To Operate. The Division may only issue a Permit To Operate after it determines that the facility has been constructed in accordance with the construction permit and that all pre-operative conditions have been met. Also note that this letter only informs the County that they may proceed with their permit application. The only final action the Division may take on a permit application is the issuance or denial of a permit.

The Division encourages Iredell County to take an aggressive approach to comprehensive solid waste management in order to help the County reach the State's waste reduction goals and lessen dependency upon conventional disposal in a MSWLF. The county should consider utilizing portions of this site for other solid waste management options (recycling, composting, household hazardous waste collection, etc.). The Division will make itself available to discuss these options upon request.

We appreciate your continuing cooperation. If you have any questions, or would like to schedule a meeting to discuss this letter, please contact our office at (919) 733-0692.

Sincerely,



**Bill Meyer, Division Director
Division of Solid Waste Management**

Attachment

**cc: Dexter Matthews
Jim Coffey
Bobby Lutfy
Rick Doby
Julian Foscue
Jim Woodie**

Part 1: Permit To Construct
Permit No. 49-03
Iredell County

provisions referenced in Rule .0503 (2)(d) of 15A NCAC 13B.

4. A closure and post-closure plan must be submitted for approval at least 90 days prior to closure or partial closure of any landfill unit. The plan must include all steps and measures necessary to close and maintain the facility in accordance with all rules in effect at that time. At a minimum, the plan shall address the following:
 - a. Design of a final cover system which meets the requirements of 40 CFR Part 258.60.
 - b. Construction and maintenance/operation of the final cover system, erosion control structures, landfill gas control/recovery systems, and leachate management system.
 - c. Surface water, ground water, and explosive gas monitoring.

MONITORING AND REPORTING REQUIREMENTS

1. Ground-water monitoring wells and monitoring requirements ~~for the landfill unit and the leachate lagoon:~~
 - a. Monitoring well design and construction shall conform to the specifications outlined in Attachment 2, "North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities". ~~The monitoring plan shall be modified as required by the SWS Hydrogeologist.~~
 - b. Monitoring wells shall be located and designed as follows:
 - (1) A total of five locations (MW-1, MW-2, MW-3, MW-4, and MW-5) shall be established in accordance with the approved monitoring plan to monitor Module 1 of the landfill unit. ~~The Solid Waste Section Hydrogeologist reserves the right to require nested monitoring wells should field conditions indicate a need to obtain stratified monitoring information.~~
 - (2) A total of three locations (MW-6, MW-7 and MW-8) shall be established in accordance with the approved monitoring plan to monitor the leachate lagoon. The Solid Waste Section Hydrogeologist reserves the right to require nested monitoring wells ~~should field conditions indicate a need to obtain stratified monitoring information.~~
 - (3) A total of two locations (MW-9 and MW-10) shall be established in accordance with the approved monitoring plan to monitor the Construction Demolition area. ~~Also, MW-1 shall be used as an upgradient monitoring point for the Construction Demolition area in accordance with the~~

Part 1: Permit To Construct
Permit No. 49-03
Iredell County

~~approved plan. The Solid Waste Section Hydrogeologist reserves the right to require nested monitoring wells should field conditions indicate a need to obtain stratified monitoring information.~~

- c. A geologist shall be in the field to supervise well installation. The exact locations, screened intervals, and nesting of the wells shall be established after consultation with the SWS Hydrogeologist at the time of well installation.
 - d. For each monitoring well constructed, a well completion record shall be submitted to DSWM within 30 days upon completion.
 - e. Prior to the acceptance of any waste at the facility, a baseline sampling event shall be completed. This event shall include all groundwater monitoring wells. ~~and~~ shall be consistent with EPA 40 CFR 258.54 (b).
 - f. Sampling equipment and procedures shall conform to specifications outlined in the above-referenced guidance document, (Attachment 2), or the current guidelines established by DSWM at the time of sampling. ~~The required analytical parameters for detection monitoring shall conform to 40 CFR 258.54 (b) references to Appendix I constituents.~~
 - g. The permittee shall sample the monitoring wells semi-annually or as directed by the SWS Hydrogeologist.
 - h. A readily accessible unobstructed path shall be initially cleared and maintained so that four-wheel drive vehicles may access the monitoring wells at all times.
2. The permittee shall establish three (3) locations for surface water sampling as described in the approved plan. SW-1, SW-2 and SW-3 shall be sampled and analyzed semi-annually according to the protocol and parameters required by the ~~SWS Hydrogeologist~~ *Solid Waste Section at the time of sampling.*
 3. The permittee shall maintain a record of all monitoring events and analytical data. Reports of the analytical data for each water quality monitoring sampling event (1.g. and 2.) are to be submitted to DSWM in a timely manner.
 4. The permittee shall maintain a record of the amount of solid waste received at the facility, compiled on a monthly basis. Scales shall be used to weigh the amount of waste received.
 5. On or before 01 Dec 92, and each year thereafter, the permittee shall report the amount of waste received (in tons) at this facility and disposed of in the landfill to the Solid Waste Section, on forms prescribed by the Section. This report shall include the following information:

1.

2.

b.

(1)

The monitoring plan shall be modified as follows:

- (A) Monitoring well MW-5 shall be relocated to a point no more than 250 feet from the waste boundary. The location shall be approved by the Solid Waste Hydrogeologist prior to well installation.
- (B) Well nests shall be required at monitoring well locations MW-1, MW-3, and MW-4.
- (C) In order to determine ground-water flow directions and rates, each monitoring well shall be surveyed, and hydraulic conductivity values and effective porosity values shall be established for the screened intervals of each monitoring well.

(D) The sampling and analyses of MW-9 and MW-10 (Construction condition Area) shall be done according to Solid Waste Section requirements at the time of sampling.

(2)

based upon the hydrogeologic conditions encountered during well installation.

(3)

c.

d.

e.

Sampling and analyses for monitoring wells MW-1 through MW-8

...

f.

MEMORANDUM

Discussion of Issues
Site Plan Application
Iredell County Landfill Expansion

Introduction

Mr. Ellis Cayton, P.E., Solid Waste Section, State of North Carolina, Department of Environment, Health, and Natural Resources, Raleigh, North Carolina in a letter dated November 5, 1992 listed four issues that need to be resolved concerning the site plan application for the Iredell County Landfill Expansion. This memorandum addresses these four issues which are as follows:

- o relative location of the Eufola Fault,
- o groundwater potentiometric data,
- o water table information in the northern areas of the site bordering the stream and near the knoll in the site's northwest corner, and
- o hydraulic conductivity tests and values.

Eufola Fault

Ms. Joanna Michie did a master's thesis dated May 1985 at Texas A and M, College Station, Texas on the geology of a portion of the northern Kings Mountain Belt in Catawba and Iredell Counties, North Carolina. This work was the first detailed mapping and description of definite Kings Mountain Belt Rock this far north according to the thesis. This investigation revealed evidence that the Eufola Fault is a lithological, structural, and metamorphic discontinuity between two distinct lithotectonic terranes. The width of the fault is stated to be approximately two kilometers (km) wide, trends northeasterly and is subparallel to the regional strike of Kings Mountain Belt Rocks. The fault zone is marked by cataclastic rocks, high angle, low angle, and contorted fault planes, disrupted lithologies, and retrograde metamorphism. The core of the fault zone is intruded by a garnetiferous granite pluton, informally named the Reeper Creek Granite.

The thesis contains maps showing the location of the Eufola Fault in the area of the Iredell County Sanitary Landfill Expansion. The location of the Statesville East Quadrangle (USGS) is plotted on Figure 4 from the thesis showing the location of the Eufola Fault (copy enclosed). In addition, the Eufola Fault has been plotted on the USGS Statesville East Quadrangle (copy enclosed). As shown on the Statesville East Quadrangle, the Eufola Fault zone (± 2 km wide) is located south of the planned location for the Iredell County Sanitation Landfill Expansion. A portion of the 2 km wide zone of the Eufola Fault touches the buffer zone of the planned location of the Iredell County Sanitary Landfill Expansion. The Eufola Fault does not straddle or intersect the site based on the location presented in the master's thesis (a detailed mapping and description of definite Kings Mountain Belt Rocks in this area). In addition, as stated in the Geological and Hydrological Study report dated August 25, 1992, no evidence of fault-related detrimental conditions was detected in the borings or rock cores made at the site. Consequently, the Eufola Fault is considered not to impact development of the landfill.

Groundwater Potentiometric Data and Water Table Information for the Site

Additional groundwater potentiometric data has been submitted recently along with additional groundwater table information for the northern areas of the site bordering the stream. These data should be sufficient

to allow these two issues to be resolved. Groundwater table levels have been monitored with time and these data used to prepare a revised groundwater potentiometric map. Single-level groundwater monitoring wells are considered suitable to monitor the groundwater. Nesting of groundwater monitoring wells is not considered necessary.

Hydraulic Conductivity Tests and Results

Field testing of hydraulic conductivities of subsurface soil strata at the site for the planned Iredell County Landfill Expansion was conducted in accordance with ASTM Standard Guide D 5126-90. This ASTM standard guide is designated for measuring hydraulic conductivities above the water table. The borehole permeameter test method used at the Iredell County Landfill Expansion Site is a part of this standard guide.

The borehole permeameter is an accepted method for measuring hydraulic conductivity of subsurface strata. Field hydraulic conductivity tests above the water table were conducted for Formations I, II, III, IV, and VI. Tests for Formations V, VII, and VIII were made below the water table.

Standard text references for the borehole permeameter test method used are presented in the Geological and Hydrological Study Report for the Iredell County Landfill Expansion. These references include the use of the borehole permeameter test method below the water table. The text "Fundamentals of Geotechnical Analysis by Dunn, Anderson, and Kiefer, John Wiley & Sons, New York, New York, copyright 1981" reference the use of borehole permeameter tests only below the water table. The only difference between testing below and above the water table is the use of a differential pressure head between the test water in the borehole and the groundwater table. Laws of Physics indicate the test method should technically be acceptable below the water table if it is acceptable above the water table. Actually, the use of the test method above the water table is based on flow caused by a differential head.

In summary, approval of the hydraulic conductivity tests and resulting values is clearly warranted based on the information above and from the Geological and Hydrological Study Report as follows:

- o ASTM Standard Testing Guide recognizes the applicability of the method used. Standard text references have been previously provided that document the borehole permeameter method as an acceptable method for testing for hydraulic conductivities above or below the water table. Several of the texts are references of renown in the field of geotechnical engineering. The method has survived several editions of the texts.
- o Soil classifications and test results of hydraulic conductivities are in agreement with reported normal hydraulic conductivities as demonstrated in the Geologic and Hydrologic Study Report for the Iredell County Sanitation Landfill Expansion. The hydraulic conductivity data plot on the less permeable side of the normal range for the soil classifications. Grain size distribution curves for these soils show that the fines content (clay and silt) is generally above 30 percent. As stated in the dewatering text, "Construction Dewatering; A Guide To Theory & Practice By Patrick Powers, P.E., John Wiley & Sons, Inc., New York, New York, copyright 1981, pg 58", sands containing more than 10% fines do not yield high volumes of water. That is, the permeability of sands are drastically decreased with fines in excess of 10%. If the hydraulic conductivity test values reported plotted in the more pervious part of the range of typical values for the soil descriptions, the accuracy of the data could possibly be questioned.

- A general classification of the formation soils is presented in Table 3 of the Geological and Hydrological Study Report where the hydraulic conductivity values are presented. A review of the boring logs, which contain appropriate modifiers for the formation descriptions, shows a significant amount of fines in the formations.
- The hydraulic conductivity test method was directed and resulting data reviewed by a registered professional engineer experienced and qualified in testing hydraulic conductivities, computation of groundwater flow and seepage, soil classifications, and overall geotechnical engineering. The testing was done in accordance with normal engineering care, practice, and standards.

The hydraulic conductivity test method and results are hereby requested to be approved and not arbitrarily questioned or rejected. If rejected (not approved), factual and site specific evidence that these data and the test method are in error or wrong should be provided. As shown by the range of permeabilities for the general soil classifications presented in the Geologic and Hydrologic Study Report, a wide variation of hydraulic conductivities exist for that general classification. Critical comments on hydraulic conductivity, therefore, should be site specific; data from elsewhere that are not site specific should not be used to approve or disapprove site specific results that fall within normal published ranges. In particular, this should not be done when a clear, rational review of other site specific characteristics, conditions, data and information support the site specific data.

Respectfully submitted,
GAI Consultants-NC, Inc.



Wendell W. Parker, Ph.D., P.E.
Vice President

WWP/taw



Iredell

② Additional information needed on Eufola Fault
 exact location
 contact
 different characteristics of various rock types
 preferential flow paths

④ Insitu testing for hyd. cond. using "uncased test interval"

⑤ Weathered Quartzite seams

9 Only 3 Total Porosity Tests + pg 7 ?
 need at least one per each formation.

- Soils Analyses Limited ... soils analyses not done for each distinct formation material
- Soils Analyses not coordinated w/ hyd. conductivity testing
- Only 2 cross-sections
- Soils Testing

Formation	I	X	
	II	X	
	II/III	2	silty sand/ silty silt, sand
	III	1	silty sand, silty silt
	IV	2 1/2	silty sand, silty silt, silt, sand
	V	X	
	VI	1 1/2	silt sand

9-29-92

7-29-92

through

7-30-92

Page

Iredell County

2 - Eufola Fault - contact between Inner Piedmont Belt and Charlotte Belt

✓ - exact location in relationship to landfill

✓ - strike + dip

X - significance ✓ seismic

X hydrologic

4 * In-situ permeability Testing using a split-spoon sampler X

- explain

- re-test using approved techniques + equipment

5 X In-situ permeabilities

± not generally consistent with soils described

6 - only 3 atterberg tests run, limited data on proposed cover soils

* Need additional presentation on soil analysis testing data - moisture content - porosity

7 ✓ desired permeability $5/6$ $1-10^{-7}$
liner 10^{-7} , cover 10^{-5}

8 ✓ Ground water surface "slopes"
slopes ? , gradients ...

Vol. % water
porosity

9 - X Conclusion 5 - permeability data suspect

10 ✓ * No P.G. Seal

Table 1

✓ - minor differences in Surface Elevations between table 1 and the boring logs for:

P-1, P-5, P-19, P-22, P-29, P-34, P-36, B-2 elevations on boring logs was changed (?)

± - Water Table Data

P-11, P-14, P-21, P-22, (P-36), P-39, P-55, P-73

Xx Water Table measurements only to nearest 1/2 foot

? - Table 2 Basis of formation breakdown, avg K, avg N (porosity)

- vol. % H₂O
? - Porosity for each formation
?

Plate 1 Boring Locations

X - NW corner of site not characterized
X - NE corner of site not characterized

- Rock cores all from locations near streams or drainage features

X - Permeability tests
none in drainage features
none in fractured bedrock

Plates 2 + 3 Subsurface Profiles

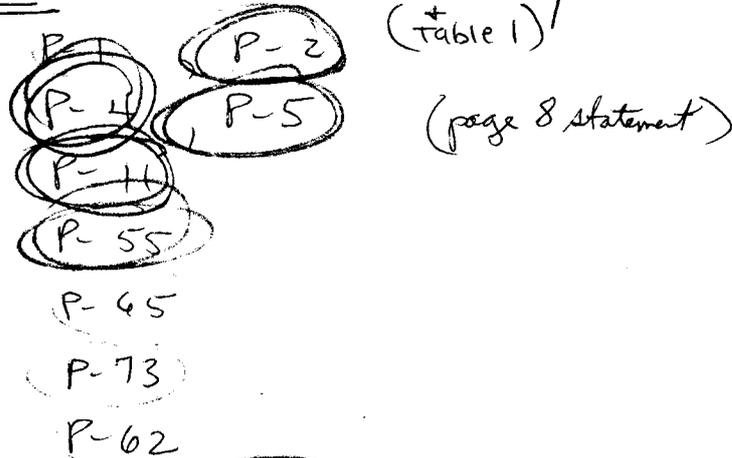
- Only 2 profiles Need (N-S) profiles thru proposed cell
- Basis of breakdown for soil formations for profiles + table 2

Plate 4

Potentiometric Map
(Table 1)

5/6 revised based on additional data being measured

X



X*

+ especially P-59

X P-18, P-19, P-28 dry GW flow around knoll

X No data for lower part of site P-17, P-27, P-50, P-51, ~~P-54~~, P-66,

X Incomplete Data ? → P-67, P-68

X Deleted borings ? pg 3

BORING LOGS

undisturbed + remolded samples

X - location of boring P-70
surface elevation vs. map on boring log

P-15
P-49
P-53

? * Vol. % H₂O + Porosity for each lithologic Unit

X * No Monitoring Plan

Do not pipe spring. Buffer this drainage.

- * Determination of long-term seasonal high water table

WATER TABLE ELEVATIONS
 IREDELL COUNTY LANDFILL
 GAI Consultants-NC
 Project No. 92101.02

Piezometer Number	Date Drilled	Surface Elevation	Water Table Elevations - After Drilling					3-25-92	Depth to H ₂ O
			0 hrs	24 hrs	* Date	*Elevation			
P-1	2-12-92	(819.6).1	802.0	804.5			804.5	15.1	
P-2	4-09-92	820.9	815.0	-----	4-20-92	815.5	-----	5.4	
P-3	4-15-92	841.5	820.5	-----	4-20-92	822.0	-----	19.5	
Rock	4-13-92	849.9	842.0	842.0			-----	7.9	
P-5	4-15-92	(870.2).1	847.0	847.0			-----	23.2	
P-6	2-07-92	797.8	791.5	-----	3-25-92	795.5	795.5	2.3	
P-7	4-16-92	832.5	805.5	-----	4-20-92	806.5	-----	26.0	
P-8	1-30-92	856.2	825.0	826.0			827.5	28.7	
P-10	1-30-92	872.8	836.5	838.5			838.0	34.8	
P-11	6-26-90	875.0	840.0	-----	7-03-90	(846.5)	Dry ?	28.5	
P-12	2-06-92	875.8	828.0	844.0			844.0	31.8	
P-13	1-07-92	883.2	846.0	853.0			853.5	29.7	
P-14	6-26-90	884.0	(875.0)?	-----	7-03-90	(878.0)	Dry	6.0	
P-15	2-14-92	834.7	817.5	-----	2-17-92	819.0	820.0	14.7	
P-16	2-06-92	873.0	827.0	839.0			841.0	32.0	
Rock	4-01-92	787.1	780.5	-----	4-20-92	782.0	-----	5.1	
P-18	4-16-92	828.9	Dry	-----	4-20-92	Dry	-----	DRY	
P-19	6-25-90	(820.6).1	799.5	-----	7-03-90	Dry	Dry	DRY	
P-20	2-07-92	814.4	801.5	-----	2-11-92	799.5	800.5	13.9	
P-21	6-25-90	820.0	792.0	-----	7-03-90	(793.0)	(812.0)?	8.0	
P-22	6-25-90	(855.7).2	830.5	-----	7-03-90	830.5	833.5	22.2	
P-23	1-27-92	861.4	836.5	836.5			836.5	24.9	
P-24	2-06-92	842.4	821.5	825.5			827.0	15.4	
P-25	1-08-92	835.9	814.0	817.5			819.5	16.4	
P-26	2-06-92	831.5	806.5	807.5			809.5	22.0	
P-27	4-01-92	785.6	779.5	-----	4-17-92	781.0	-----	4.6	
P-28	4-16-92	804.6	Dry	-----	4-20-92	Dry	-----	DRY	
Rock	2-20-92	(829.2).1	814.5	814.0			817.0	12.2	
P-30	2-05-92	831.7	815.0	815.5			817.5	14.2	
P-31	1-09-92	835.3	825.5	826.5			827.0	8.3	
P-32	4-09-92	838.1	829.5	-----	4-21-92	832.0	-----	6.1	
P-33	2-05-92	842.3	831.0	834.0			835.5	6.8	
P-34	1-08-92	(846.8).1	840.0	841.0			841.0	5.8	
P-35	2-05-92	849.5	832.5	842.5			844.0	5.5	
P-36	1-09-92	(852.0).1	848.5	(848.5)			(847.0)	5.0(3.5)	
P-37	2-05-92	857.8	845.0	849.0			850.5	7.3	
P-38	1-16-92	861.6	849.0	850.5			852.0	9.6	
P-39	2-05-92	867.1	849.0	851.0			? 852.0	15.1	

* Date and Elevation of second reading later than 24 hours after drilling; 24 hr reading not available

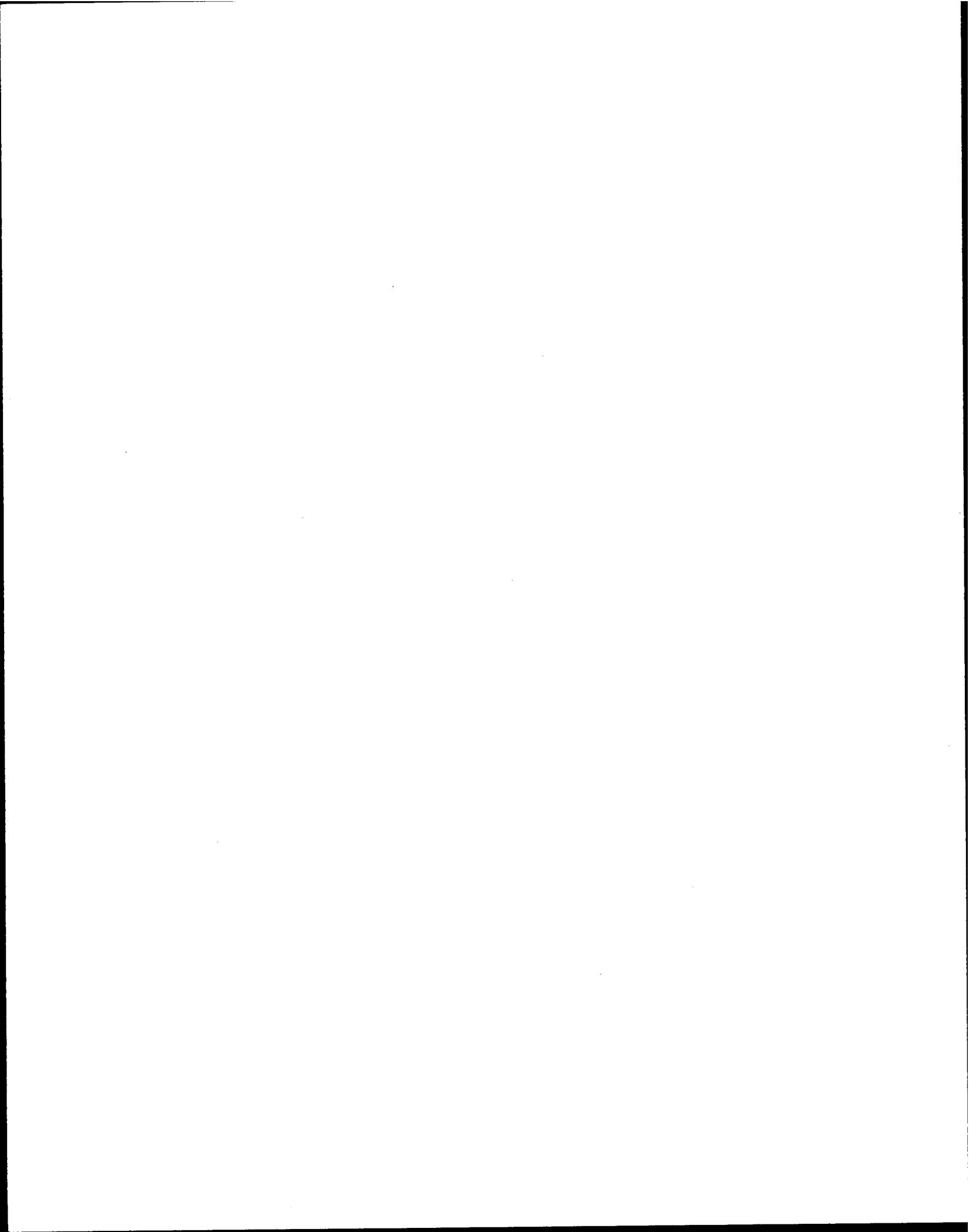
Measured to nearest 1/2 ft.

**WATER TABLE ELEVATIONS
IREDELL COUNTY LANDFILL
GAI Consultants-NC
Project No. 92101.02**

Depth
to H₂O

Piezometer Number	Date Drilled	Surface Elevation	Water Table Elevations - After Drilling					3-25-92	
			0 hrs	24 hrs	* Date	*Elevation			
P-40	1-29-92	875.0	846.0	848.5				848.5	26.5
P-41	2-07-92	877.0	849.0	-----	2-11-92	847.5		848.0	29.0
P-42	1-28-92	876.7	847.5	847.5				848.0	28.7
P-43	2-04-92	874.5	842.0	844.5				845.5	29.0
P-44	2-07-92	876.9	839.0	-----	2-13-92	840.0		840.5	36.4
P-45	1-14-92	870.3	830.5	833.5				833.5	36.8
P-46	2-07-92	862.2	831.0	-----	2-11-92	830.5		830.5	31.7
P-47	1-15-92	854.9	811.5	818.5				818.5	36.4
P-48	2-05-92	851.3	812.0	812.5				812.5	38.8
P-49	1-15-92	842.2	808.5	809.0				809.0	33.2
P-50	? incomplete	818.7						-----	
52	Rock	3-30-92	780.8	777.0	-----	4-20-92	776.0	-----	4.8
54		1-16-92	830.4	788.5	790.5			790.5	39.9
56		2-10-92	791.7	775.5	777.5			776.5	15.2(14.2)
	? incomplete	798.9						-----	
		4-09-92	816.9	809.0	-----	4-21-92	810.0	-----	6.9
		4-16-92	841.6	832.5	-----	4-20-92	832.5	-----	9.1
60		4-16-92	858.9	819.5	-----	4-20-92	820.0	-----	38.9
61		1-17-92	850.5	813.5	-----	2-11-92	816.5	817.0	33.5
64		4-08-92	815.2	787.0	-----	4-16-92	787.5	-----	27.7
		4-16-92	805.0	774.0	-----	4-20-92	774.0	-----	31.0
67	Rock	4-07-92	780.5	775.5	-----	4-20-92	774.5	-----	6.0
69		4-07-92	795.8	781.0	-----	4-20-92	780.0	-----	15.8
		2-12-92	803.0	784.0	786.0			789.0	14.0
	? incomplete	796.6						-----	
		2-12-92	825.3	806.5	812.5			813.5	11.8
	? incomplete	861.4						-----	
		1-29-92	857.0	828.0	831.0			831.5	25.5
B-1	8-5-86	828.5	793.5	788.5				802.0	26.5
B-2	8-5-86	858.8, 2	818.0	826.0				836.5	22.3
B-4	8-7-86	875.0	831.0	837.5				842.0	33.0

* Date and Elevation of second reading later than 24 hours after drilling; 24 hr reading not available



OPERATION/CONSTRUCTION MANAGERS

CIVIL/SANITARY ENGINEERS

**Municipal
Services**



**Engineering
Company, P.A.**

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

November 13, 1992

Mr. Ellis Cayton
Environmental Engineer
Solid Waste Section
401 Oberlin Road

Re: Iredell County Site Suitability

Dear Mr. Cayton:

Please find enclosed the original and three copies of the response to a draft letter dated November 5, 1992 from Bobby Lufty. This response was prepared by Wendell Parker of GAI Consultants addressing the concerns that Mr. Lufty outlined in his letter.

If you have any questions, please do not hesitate to call.

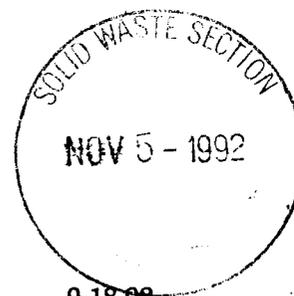
Sincerely yours,
MUNICIPAL ENGINEERING SERVICES CO., PA

D. Wayne Sullivan

DWS:sw

Enclosure

TABLE 2
GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA



<u>Piezometer Number</u>	<u>Reading Date</u>				
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>	<u>6-25-92</u>	<u>9-18-92</u>
P-1	804.5	805.0	804.5	804.9	803.2
P-2	----	813.5	813.5	813.6	811.6
P-3	----	822.5	821.5	823.0	819.0
P-4	----	840.0	839.5	840.2	837.5
P-5	----	846.0	847.0	847.8	845.4
P-6	795.5	795.5	795.0	795.0	790.9
P-7	----	809.0	809.5	810.2	807.6
P-8	827.5	828.5	828.5	829.5	828.4
P-10	838.0	838.5	839.0	839.3	839.5
P-11	Dry	Dry	Dry	Dry	Dry
P-12	844.0	845.0	845.5	846.0	845.3
P-13	853.5	854.5	854.5	855.4	854.4
P-14	Dry	855.5	Dry	856.2	854.7
P-15	820.0	819.0	818.5	819.2	818.3
P-16	841.0	841.5	841.5	842.8	841.8
P-17	----	781.0	781.0	781.1	781.1
P-18	----	816.5	815.5	816.4	814.5
P-19	Dry	798.0	798.0	797.9	797.9
P-20	800.5	800.5	798.0	801.2	797.9
P-21	812.0	811.5	808.5	812.2	807.7
P-22	833.5	832.5	832.0	832.6	832.9
P-23	836.5	837.0	837.0	837.7	836.4
P-24	827.0	827.0	826.5	827.4	824.1
P-25	819.5	819.5	819.0	820.4	817.5
P-26	809.5	810.0	807.0	811.7	808.0
P-27	----	780.5	780.0	781.1	780.0
P-28	----	798.0	797.5	797.9	796.8
P-29	817.0	817.5	816.5	817.5	813.8

TABLE 2
GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA

<u>Piezometer Number</u>	<u>Reading Date</u>				
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>	<u>6-25-92</u>	<u>9-18-92</u>
P-30	817.5	818.0	817.5	819.0	816.3
P-31	827.0	827.0	824.0	826.6	819.9
P-32	----	831.5	829.0	831.2	827.9
P-33	835.5	835.0	833.5	835.3	832.1
P-34	841.0	841.0	839.0	840.5	837.5
P-35	844.0	844.5	841.5	844.1	840.6
P-36	847.0	847.5	846.0	846.7	844.9
P-37	850.5	850.5	849.5	850.5	848.4
P-38	852.0	854.5	850.0	851.3	849.8
P-39	852.0	852.5	852.0	852.7	850.7
P-40	848.5	849.0	849.0	849.1	848.2
P-41	848.0	848.5	848.5	848.8	848.0
P-42	848.0	848.0	848.0	848.4	847.6
P-43	845.5	845.0	845.0	845.2	844.4
P-44	840.5	840.5	840.5	840.8	839.6
P-45	833.5	832.5	832.0	832.4	832.4
P-46	830.5	830.5	830.0	----	829.7
P-47	818.5	819.0	819.0	819.6	818.5
P-48	812.5	813.0	813.0	813.4	813.8
P-49	809.0	809.0	809.0	810.0	810.3
P-50	----	789.5	789.5	790.6	790.4
P-51	----	776.0	776.0	775.5	775.4
P-53	790.5	790.5	790.5	790.8	791.7
P-55	776.5	776.5	776.5	776.9	775.5
P-57	----	793.5	793.0	793.2	792.0
P-58	----	811.0	811.0	811.0	810.1
P-59	----	831.5	832.0	832.4	831.3

TABLE 2
GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA

<u>Piezometer Number</u>	<u>Reading Date</u>				
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>	<u>6-25-92</u>	<u>9-18-92</u>
P-62	----	824.0	823.5	823.8	823.6
P-63	817.0	816.0	816.0	816.1	815.8
P-65	----	786.0	786.0	786.8	785.9
P-66	----	778.5	772.0	772.5	778.2
P-68	----	775.0	774.5	775.0	774.5
P-70	----	780.0	780.0	780.3	780.4
P-71	789.0	789.0	788.0	788.8	787.3
P-72	----	----	794.0	794.0	793.6
P-73	813.5	814.0	813.5	814.3	812.0
P-74	----	834.5	834.5	835.4	834.2
P-75	831.5	821.5	832.0	832.6	831.2
B-1	802.0	803.0	803.0	803.9	802.2
B-2	836.5	837.0	837.0	837.2	835.4
B-4	842.0	842.0	841.5	841.8	840.5



DRAFT 11-5-92
1:30 PM

Meeting w/ Jim Woodie
& Wendell Parker

State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

November 5, 1992

Mr. Wayne Sullivan
Municipal Engineering Services Company
P.O. Box 97
Garner, North Carolina 27529

Letter not sent

Re: Revised Geological And Hydrogeological Study Report For The
Proposed Iredell County Sanitary Landfill

Dear Mr. Sullivan,

The revised subsurface investigation report for the proposed Iredell County Landfill is still in need of some revisions and amendments to provide additional and more accurate information for the site. It is important that several issues be resolved prior to site suitability approval.

The most critical issue is the exact location of the Eufola Fault and its impact on ground water flow direction and rate. While the fault is not a holocene fault and is therefore assumed not to present a problem for seismic considerations in the landfill design, the fault could alter the ground water flow patterns for the site. Therefore it is important to identify the exact location of the fault, determine if the fault is open or annealed, and determine if the fault is more conductive or less conductive hydraulically than surrounding materials. It is important to determine if the fault creates a preferential flow path for ground water movement or if it in any other way disrupts the ground water flow patterns at the site. A more extensive literature search may provide some or all of the information needed to answer these questions. However if the fault does indeed intersect the site to be developed, further field investigation may be necessary.

The second important issue is the potentiometric data for the site. No water table data has been incorporated into the potentiometric map for the lower (northern) portion of the site. Additional water table data should be presented and incorporated into a revised ground water contour map. The present potentiometric map has some discrepancies in water table data and the ground water contours for some areas of the site. There appears to be an absence of data or an inaccurate portrayal of the data for a number of borings as indicated on the copy of Table 1, attached with this letter.

Additional concerns are the absence of a discussion of long-term seasonal high water table, the direction of ground water flow around the knoll at the northwest corner of the site, and the absence of a discussion of monitoring at the site. The conceptual design needs to allow sufficient buffer between the waste boundary and streams to allow for effective monitoring of the site. Additional cross-sections illustrating the subsurface profiles in the area of initial cell development would also assist in the evaluation of the site.

Another concern is the hydraulic conductivity testing values. The tests were conducted using a method that is not standardized or generally practiced in the evaluation of solid waste management sites. The values reported appear to be one to two orders of magnitudes less permeable than is common for the materials as described in the boring logs. Since GAI has certified that these are representative values, the Solid Waste Section will not delay review of the Site Application in order to obtain data from a more standardized testing method. However during the next phase of field investigation, additional hydraulic conductivity testing should be conducted using standardized testing methods. Hydraulic conductivity values should be provided for each lithologic unit including the upper fractured bedrock. It will also be useful to obtain hydraulic conductivity values along drainage features and the fault zone.

If sufficient information can be provided concerning the location and influence of the Eufola Fault on the basis of a desk study, then most of the water table data and other information can be submitted and the Solid Waste Section can continue with our review of the Site Application. However, if mobilization for additional field investigation is required to provide the additional information on the Eufola Fault, then additional subsurface investigation, including hydraulic conductivity testing, should be done at this time.

If you have any questions regarding the content of this letter, please contact the Solid Waste Section at (919) 733-0692.

Sincerely,

Bobby Lutfy
Bobby Lutfy
Hydrogeologist
Solid Waste Section

cc: Joel Mashburn
Ron Weatherman
Carson Fisher
Wendell Parker
Jim Coffey
Ellis Cayton

Attachments

11-5-92

The Eutola Fault

Seismic OK

Hydrologic

exact location

open or annealed

more conductive or less conductive

preferential flow

disruption of g.w. flow patterns

random fracture patterns

literature +/or field investigation

4 In situ permeability testing
method
results

No W.T. readings for Potentiometric Map

P-2, P-3, P-4, P-5, P-7, P-17, P-18, P-27, P-28,
P-32, P-50, P-51, P-57, P-58, P-59, P-62, P-65, P-66,
P-68, P-70, P-72, P-74

No discussion of long-term seasonal high water tables

WATER TABLE ELEVATIONS
IREDELL COUNTY LANDFILL
 GAI Consultants-NC
 Project No. 92101.02

Piezometer Number	Date Drilled	Surface Elevation	Water Table Elevations - After Drilling				
			0 hrs	24 hrs	* Date	*Elevation	3-25-92
P-1	2-12-92	819.6	802.0	804.5			804.5
P-2	4-09-92	820.9	815.0	-----	4-20-92	815.5	-----
P-3	4-15-92	841.5	820.5	-----	4-20-92	822.0	-----
P-4	4-13-92	849.9	842.0	-----			-----
P-5	4-15-92	870.2	847.0	-----			-----
P-6	2-07-92	797.8	791.5	-----	3-25-92	795.5	795.5
P-7	4-16-92	832.5	805.5	-----	4-20-92	806.5	-----
P-8	1-30-92	856.2	825.0	826.0			827.5
P-10	1-30-92	872.8	836.5	838.5			838.0
	6-26-90	875.0	840.0	-----	7-03-90		
P-12	2-06-92	875.8	828.0	844.0			844.0
P-13	1-07-92	883.2	846.0	853.0			853.5
	6-26-90	884.0	875.0	-----	7-03-90		
P-15	2-14-92	834.7	817.5	-----	2-17-92	819.0	820.0
P-16	2-06-92	873.0	827.0	839.0			841.0
P-17	4-01-92	787.1	780.5	-----	4-20-92	782.0	-----
P-18	4-16-92	828.9	Dry	-----	4-20-92	Dry	-----
P-19	6-25-90	820.6	799.5	-----	7-03-90	Dry	Dry
P-20	2-07-92	814.4	801.5	-----	2-11-92	799.5	800.5
	6-25-90	820.0	792.0	-----	7-03-90		
P-22	6-25-90	855.7	830.5	-----	7-03-90	830.5	836.5
P-23	1-27-92	861.4	836.5	836.5			836.5
P-24	2-06-92	842.4	821.5	825.5			827.0
P-25	1-08-92	835.9	814.0	817.5			819.5
P-26	2-06-92	831.5	806.5	807.5			809.5
P-27	4-01-92	785.6	779.5	-----	4-17-92	781.0	-----
P-28	4-16-92	804.6	Dry	-----	4-20-92	Dry	-----
P-29	2-20-92	829.2	814.5	814.0			817.0
P-30	2-05-92	831.7	815.0	815.5			817.5
P-31	1-09-92	835.3	825.5	826.5			827.0
P-32	4-09-92	838.1	829.5	-----	4-21-92	832.0	-----
P-33	2-05-92	842.3	831.0	834.0			835.5
P-34	1-08-92	846.8	840.0	841.0			841.0
P-35	2-05-92	849.5	832.5	842.5			844.0
P-36	1-09-92	852.0	848.5	848.5			847.0
P-37	2-05-92	857.8	845.0	849.0			850.5
P-38	1-16-92	861.6	849.0	850.5			-----
P-39	2-05-92	867.1	849.0	851.0			-----

* Date and Elevation of second reading later than 24 hours after drilling; 24 hr reading not available

 No data on 3-25-92.

 Variable data

 Discrepancy between Table + Map, water Table
 " , Surface Elevation

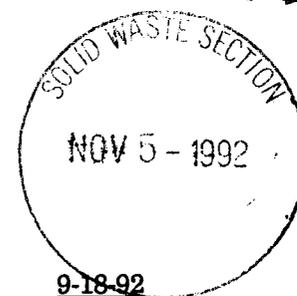
TABLE 1

**WATER TABLE ELEVATIONS
IREDELL COUNTY LANDFILL
GAI Consultants-NC
Project No. 92101.02**

Piezometer Number	Date Drilled	Surface Elevation	Water Table Elevations - After Drilling				
			0 hrs	24 hrs	* Date	*Elevation	3-25-92
P-40	1-29-92	875.0	846.0	848.5			848.5
P-41	2-07-92	877.0	849.0	-----	2-11-92	847.5	848.0 *
P-42	1-28-92	876.7	847.5	847.5			848.0
P-43	2-04-92	874.5	842.0	844.5			845.5
P-44	2-07-92	876.9	839.0	-----	2-13-92	840.0	840.5
P-45	1-14-92	870.3	830.5	833.5			833.5
P-46	2-07-92	862.2	831.0	-----	2-11-92	830.5	830.5
P-47	1-15-92	854.9	811.5	818.5			818.5
P-48	2-05-92	851.3	812.0	812.5			812.5
P-49	1-15-92	842.2	808.5	809.0			809.0
P-50	4-23-92	818.7	Dry	-----	4-27-92	789.0	-----
P-51	3-30-92	780.8	777.0	-----	4-20-92	776.0	-----
P-53	1-16-92	830.4	788.5	790.5			790.5
	2-10-92	791.7	775.5	777.5			777.5
P-57	4-23-92	798.9	786.0	-----	4-27-92	784.0	-----
P-58	4-09-92	816.9	809.0	-----	4-21-92	810.0	-----
P-59	4-16-92	841.6	832.5	-----	4-20-92	-----	-----
P-62	4-16-92	858.9	819.5	-----	4-20-92	800.0	-----
P-63	1-17-92	850.5	813.5	-----	2-11-92	816.5	817.0
P-65	4-08-92	815.2	787.0	-----	4-16-92	787.6	-----
P-66	4-16-92	805.0	774.0	-----	4-20-92	774.0	-----
P-68	4-07-92	780.5	775.5	-----	4-20-92	774.5	-----
P-70	4-07-92	795.8	781.0	-----	4-20-92	780.0	-----
P-71	2-12-92	803.0	784.0	786.0			789.0
P-72	4-28-92	796.6	793.5	-----	5-28-92	-----	-----
	2-12-92	825.3	806.5	812.5			-----
P-74	4-23-92	861.4	835.5	-----	4-27-92	805.0	-----
P-75	1-29-92	857.0	828.0	831.0			831.5
	8-5-86	828.5	793.5	-----			-----
	8-5-86	858.8	818.0	-----			-----
	8-7-86	875.0	831.0	-----			-----

* Date and Elevation of second reading later than 24 hours after drilling; 24 hr reading not available

TABLE 2
GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA



Piezometer Number	Reading Date				
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>	<u>6-25-92</u>	<u>9-18-92</u>
P-1	804.5	805.0	804.5	804.9	803.2
P-2	----	813.5	813.5	813.6	811.6
P-3	----	822.5	821.5	823.0	819.0
P-4	----	840.0	839.5	840.2	837.5
P-5	----	846.0	847.0	847.8	845.4
P-6	795.5	795.5	795.0	795.0	790.9
P-7	----	809.0	809.5	810.2	807.6
P-8	827.5	828.5	828.5	829.5	828.4
P-10	838.0	838.5	839.0	839.3	839.5
P-11	Dry	Dry	Dry	Dry	Dry
P-12	844.0	845.0	845.5	846.0	845.3
P-13	853.5	854.5	854.5	855.4	854.4
P-14	Dry	855.5	Dry	856.2	854.7
P-15	820.0	819.0	818.5	819.2	818.3
P-16	841.0	841.5	841.5	842.8	841.8
P-17	----	781.0	781.0	781.1	781.1
— P-18 WT	----	816.5	815.5	816.4	814.5
P-19	Dry	798.0	798.0	797.9	797.9
P-20	800.5	800.5	798.0	801.2	797.9
P-21	812.0	811.5	808.5	812.2	807.7
P-22	833.5	832.5	832.0	832.6	832.9
P-23	836.5	837.0	837.0	837.7	836.4
P-24	827.0	827.0	826.5	827.4	824.1
P-25	819.5	819.5	819.0	820.4	817.5
P-26	809.5	810.0	807.0	811.7	808.0
P-27	----	780.5	780.0	781.1	780.0
P-28	----	798.0	797.5	797.9	796.8
P-29	817.0	817.5	816.5	817.5	813.8

TABLE 2
GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA

Piezometer Number	Reading Date				
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>	<u>6-25-92</u>	<u>9-18-92</u>
P-30	817.5	818.0	817.5	819.0	816.3
P-31	827.0	827.0	824.0	826.6	819.9
P-32	----	831.5	829.0	831.2	827.9
P-33	835.5	835.0	833.5	835.3	832.1
P-34	841.0	841.0	839.0	840.5	837.5
P-35	844.0	844.5	841.5	844.1	840.6
P-36	847.0	847.5	846.0	846.7	844.9
P-37	850.5	850.5	849.5	850.5	848.4
P-38	852.0	854.5	850.0	851.3	849.8
P-39	852.0	852.5	852.0	852.7	850.7
P-40	848.5	849.0	849.0	849.1	848.2
P-41	848.0	848.5	848.5	848.8	848.0
P-42	848.0	848.0	848.0	848.4	847.6
P-43	845.5	845.0	845.0	845.2	844.4
P-44	840.5	840.5	840.5	840.8	839.6
P-45	833.5	832.5	832.0	832.4	832.4
P-46	830.5	830.5	830.0	----	829.7
P-47	818.5	819.0	819.0	819.6	818.5
P-48	812.5	813.0	813.0	813.4	813.8
P-49	809.0	809.0	809.0	810.0	810.3
P-50	----	789.5	789.5	790.6	790.4
P-51	----	776.0	776.0	775.5	775.4
P-53	790.5	790.5	790.5	790.8	791.7
P-55	776.5	776.5	776.5	776.9	775.5
P-57	----	793.5	793.0	793.2	792.0
P-58	----	811.0	811.0	811.0	810.1
 GS	----	831.5	832.0	832.4	831.3

TABLE 2
GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA

Piezometer Number	Reading Date				
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>	<u>6-25-92</u>	<u>9-18-92</u>
P-62	----	824.0	823.5	823.8	823.6
P-63	817.0	816.0	816.0	816.1	815.8
P-65	----	786.0	786.0	786.8	785.9
P-66	----	778.5	772.0	772.5	778.2
P-68	----	775.0	774.5	775.0	774.5
P-69 GS	----	780.0	780.0	780.8	780.4
P-71	789.0	789.0	788.0	788.8	787.3
P-72	----	----	794.0	794.0	793.6
P-73	813.5	814.0	813.5	814.3	812.0
P-74	----	834.5	834.5	835.4	834.2
P-75 (GS)	831.5	<u>821.5</u>	832.0	832.6	831.2
B-1	802.0	803.0	803.0	803.9	802.2
B-2	836.5	837.0	837.0	837.2	835.4
B-4	842.0	842.0	841.5	841.8	840.5

Contours for Eastern side of site ... stream

OPERATION/CONSTRUCTION MANAGERS

CIVIL/SANITARY ENGINEERS

Municipal Services



Engineering Company, P.A.

P.O. Box 97, Garner, North Carolina 27027 (704)262-1767

P.O. Box 97, Garner, North Carolina 27027 (704)262-1767

November 5, 1992

Mr. Bobby Lutfy
NC DEHNR
Solid Waste Section
401 Oberlin Road, Suite 305
Raleigh NC 27605

Re: Fredell County

Dear Bobby:

I appreciated your phone call to discuss your concerns about Fredell's site suitability. Fredell Parker and I will meet with you this afternoon to discuss geohydrological concerns relating to the facility. We are also submitting a revised ground water contour map that covers the northern area of the site.

The permeability testing was performed under job # 763125-00

We look forward to meeting with you this afternoon to discuss your final concerns.

Very truly yours,
MUNICIPAL ENGINEERING COMPANY, P.A.

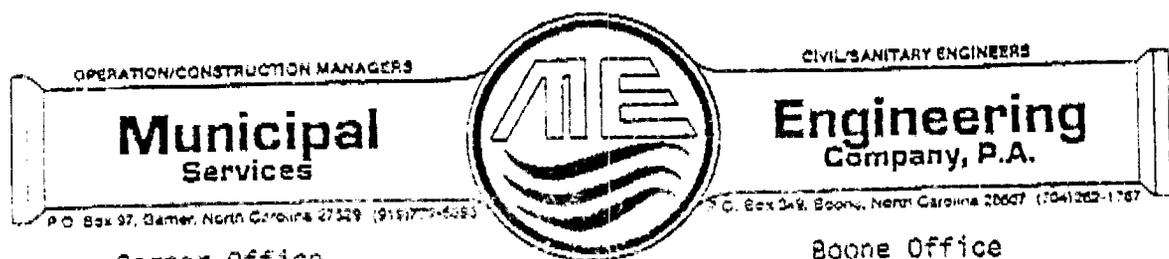
Jimmy J. Woods
Jimmy J. Woods, PE, PLS

JDW:cw

Copy: Mr. Joel Smith
Mr. Carson Fisher, PE
Mr. Ronald Wainwright

Vadose Zone
Monitoring Technique
ASTM Vol. 04.08
pg-1204

* Refer to D4043-91 (pg 604) for
Aquifer Test Methods



Garner Office
 Fax # (919)772-1175

Boone Office
 Fax # (704)265-2601

Date 11-5-92

To Bobby Wafford

in Iredell County

Remarks

Letter follows.

From Jim Weadie
 Garner, NC Office

2 # of Pages Transmitting (Including this Sheet)

(If copy is illegible or incomplete, pls. call immediately for retransmission.)

OPERATION/CONSTRUCTION MANAGERS

CIVIL/SANITARY ENGINEERS

**Municipal
Services**



**Engineering
Company, P.A.**

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

November 5, 1992

FAXED
11-5-92

Mr. Bobby Lutfy
NC DEHNR
Solid Waste Section
401 Oberlin Road, Suite 105
Raleigh NC 27605

Re: Iredell County

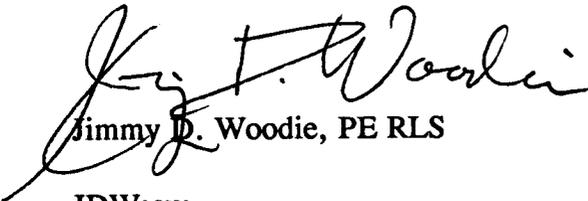
Dear Bobby:

I appreciated your phone call to discuss your concerns about Iredell's site suitability. Wendell Parker and I will meet with you this afternoon to discuss geohydrological concerns relating to the fault. We are also submitting a revised ground water contour map that covers the northern area near the stream.

The permeability testing was performed under ASTM D5126-90.

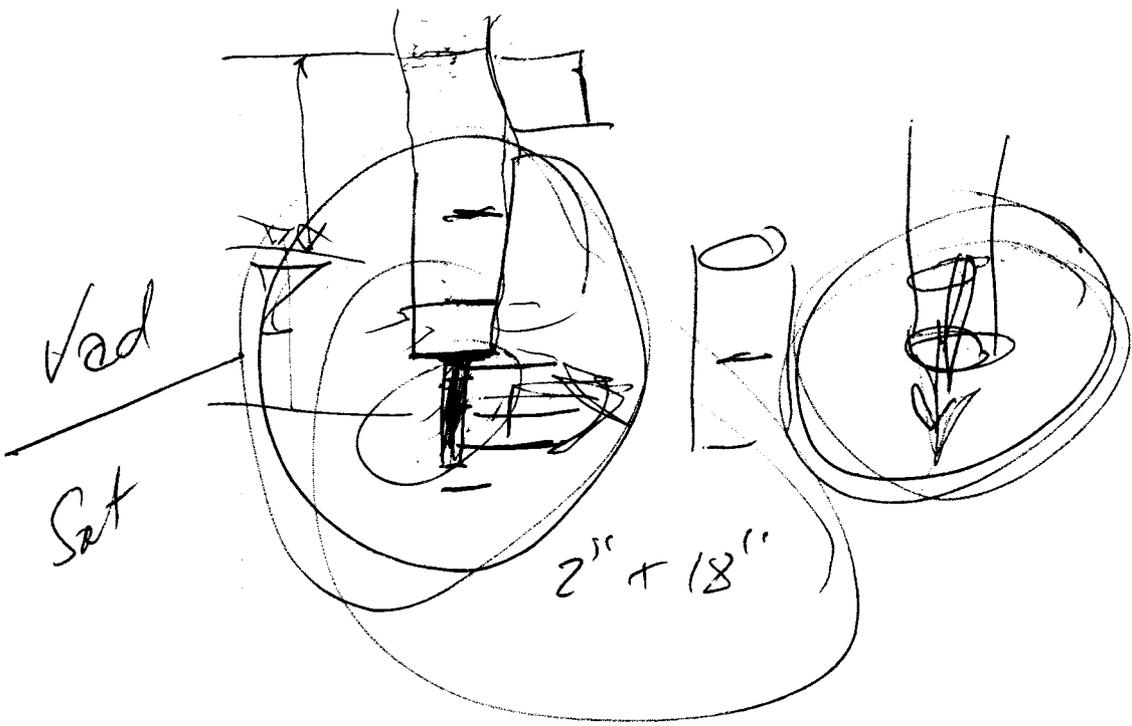
We look forward to meeting with you this afternoon to discuss your final concerns.

Very truly yours,
MUNICIPAL ENGINEERING SERVICES CO, PA


Jimmy D. Woodie, PE RLS

JDW:cw

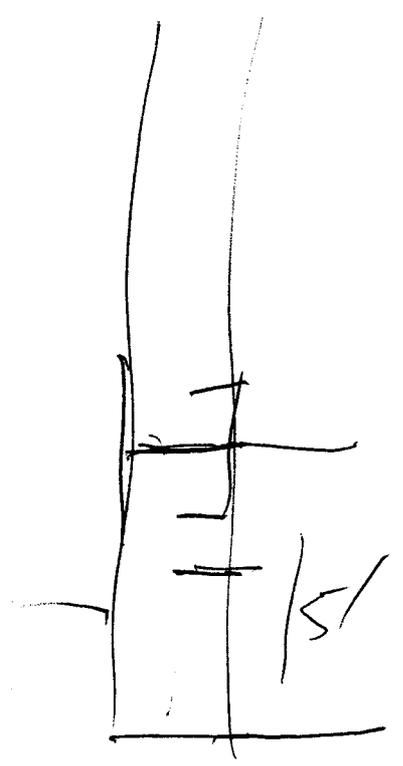
Copy: Mr. Joel Mashburn
Mr. Carson Fisher, PE
Mr. Ronald Weatherman



2" + 18"

Stangfest

4044 - 91



6" - 60"



State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

November 5, 1992

Mr. Carson Fisher, P.E.
County Engineer, Iredell County
P.O. Box 788
Statesville, North Carolina 28677

Re: Status Of Site Plan Application For Proposed Iredell County Lined Landfill

Dear Carson:

As discussed yesterday in our conversation, the Solid Waste Section has delayed issuing site plan approval for the proposed Iredell County Landfill in its entirety until one major and several smaller issues are resolved in the site plan application. The primary issue which the Section needs to resolve concerns:

Further Characterization/Identification Of The Eufola Fault

The site plan application needs to be revised to show the exact location of the Eufola Fault. If the fault actually straddles the site, then the application needs to discuss the fault's impact on ground water flow direction and rate. A more extensive literature search may provide some or all of the information needed to answer these questions. However, if the fault does intersect the site to be developed, further field investigation may be necessary.

There are also three smaller issues which the Section would like to resolve. These issues concern incomplete potentiometric data for the site; incomplete water table information in the northern areas of the site bordering the stream, especially near the knoll in the site's northwest corner; and discrepancies in hydraulic conductivity testing values.

The Section met with the project engineer and geologist today to discuss these issues. At this meeting, the project engineer submitted data addressing many of the above concerns, and the

Section conveyed its concerns about investigating in further detail the Eufola Fault's impact on the site and revising the application to show the investigation's findings.

The Section recognizes that Iredell County has limited life available in its existing landfill and believes that steps are being taken on all fronts to expeditiously address the Section's concerns which will subsequently allow Iredell County to move forward into the construction plan approval process. Should you have specific questions concerning the issues discussed in this letter, please contact Bobby Lutfy, Solid Waste Section Hydrogeologist at (919) 733-0692.

Respectfully,



Ellis Cayton, P.E.
Solid Waste Section

cc: Joel Mashburn
Bobby Lutfy
Julian Foscue
Jim Woodie
Wendell Parker



State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

November 5, 1992

Mr. Wayne Sullivan
Municipal Engineering Services Company
P.O. Box 97
Garner, North Carolina 27529

Draft

Re: Revised Geological And Hydrogeological Study Report For The
Proposed Iredell County Sanitary Landfill

Dear Mr. Sullivan,

The revised subsurface investigation report for the proposed Iredell County Landfill is still in need of some revisions and amendments to provide additional and more accurate information for the site. It is important that several issues be resolved prior to site suitability approval.

The most critical issue is the exact location of the Eufola Fault and its impact on ground water flow direction and rate. While the fault is not a holocene fault and is therefore assumed not to present a problem for seismic considerations in the landfill design, the fault could alter the ground water flow patterns for the site. Therefore it is important to identify the exact location of the fault, determine if the fault is open or annealed, and determine if the fault is more conductive or less conductive hydraulically than surrounding materials. It is important to determine if the fault creates a preferential flow path for ground water movement or if it in any other way disrupts the ground water flow patterns at the site. A more extensive literature search may provide some or all of the information needed to answer these questions. However if the fault does indeed intersect the site to be developed, further field investigation may be necessary.

The second important issue is the potentiometric data for the site. No water table data has been incorporated into the potentiometric map for the lower (northern) portion of the site. Additional water table data should be presented and incorporated into a revised ground water contour map. The present potentiometric map has some discrepancies in water table data and the ground water contours for some areas of the site. There appears to be an absence of data or an inaccurate portrayal of the data for a number of borings as indicated on the copy of Table 1, attached with this letter.

Additional concerns are the absence of a discussion of long-term seasonal high water table, the direction of ground water flow around the knoll at the northwest corner of the site, and the absence of a discussion of monitoring at the site. The conceptual design needs to allow sufficient buffer between the waste boundary and streams to allow for effective monitoring of the site. Additional cross-sections illustrating the subsurface profiles in the area of initial cell development would also assist in the evaluation of the site.

Another concern is the hydraulic conductivity testing values. The tests were conducted using a method that is not standardized or generally practiced in the evaluation of solid waste management sites. The values reported appear to be one to two orders of magnitudes less permeable than is common for the materials as described in the boring logs. Since GAI has certified that these are representative values, the Solid Waste Section will not delay review of the Site Application in order to obtain data from a more standardized testing method. However during the next phase of field investigation, additional hydraulic conductivity testing should be conducted using standardized testing methods. Hydraulic conductivity values should be provided for each lithologic unit including the upper fractured bedrock. It will also be useful to obtain hydraulic conductivity values along drainage features and the fault zone.

If sufficient information can be provided concerning the location and influence of the Eufola Fault on the basis of a desk study, then most of the water table data and other information can be submitted and the Solid Waste Section can continue with our review of the Site Application. However, if mobilization for additional field investigation is required to provide the additional information on the Eufola Fault, then additional subsurface investigation, including hydraulic conductivity testing, should be done at this time.

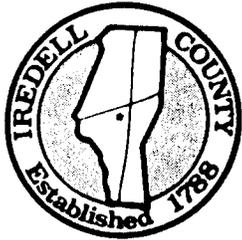
If you have any questions regarding the content of this letter, please contact the Solid Waste Section at (919) 733-0692.

Sincerely,

Bobby Lutfy
Bobby Lutfy
Hydrogeologist
Solid Waste Section

cc: Joel Mashburn
Ron Weatherman
Carson Fisher
Wendell Parker
Jim Coffey
Ellis Cayton

Attachments



IREDELL COUNTY

Post Office Box 788
Statesville, North Carolina 28677



October 21, 1992

Division of Solid Waste Management
P. O. Box 27687
Raleigh, NC 27611-7687

Attn: Mr. Jim Coffey, Supervisor
RE: Iredell County Lined Landfill

Dear Mr. Coffey:

Almost two months ago, Ron Weatherman and myself, Jim Woodie and Ron Sullivan of Municipal Engineering Services met with you and Ellis Cayton concerning the approval of our site suitability application and the submittal of the operational plans for the first lined cell in Iredell County. At that time, and at various times prior to that meeting, we had indicated our need to move on with this project so that we will be prepared to stop receiving waste at our existing landfill prior to October 9, 1993. Our available space will run out close to (if not before) that date and therefore, there is no reason to continue the use of that site after that date. We will need a great deal of luck, with both contractors and the weather, to be ready with this cell by October 9, 1993.

Jim, we need the cooperation of the Solid Waste Section to get this project going. In our August 27th meeting, you were in agreement with us that if we were not ready to begin bidding and construction by the 1st of November, we would be hard-pressed to complete construction by next October. Ron Weatherman and myself attended a seminar this past Monday in Raleigh that reviewed the design and construction process of the lined cells that have been constructed in the state. The main point emphasized by each of the speakers was to give yourself as much time as possible to get the approvals and construction completed. Rowan County initially allowed 5 months for construction; it took them 10 months to complete. We have got to get on with the review process if we're going to be anywhere close to being ready next October.

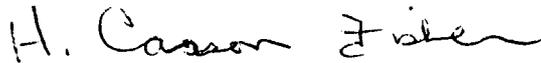
My understanding is that Municipal Engineering Services has submitted all requested information on the site. If your review indicates more information is needed, we will work with MES to get that information. But unless the review is progressing, we have no way of knowing whether additional information is needed or not.

Ron and I spoke with Bill Meyer at this past Monday's meeting and expressed our concern about being able to complete construction by October 9th. Mr. Meyer assured us he would discuss our project with you and have you call Jim Woodie with the status.

Page Two

Iredell County has had a good relationship with the Solid Waste Section to date. I hope that the relationship does not deteriorate when we need it the most.

Sincerely,

A handwritten signature in cursive script that reads "H. Carson Fisher".

H. Carson Fisher, P. E.
County Engineer

cc: Mr. Joel Mashburn, County Manager
Mr. Ron Weatherman, Solid Waste Director
Mr. Bill Pope, County Attorney
Mr. Jim Woodie, Municipal Engineering Services
Mr. Bill Meyer, Director, Solid Waste Management
Mr. Dexter Matthews, Chief, Solid Waste Section

MEMORANDUM

Discussion of Issues
Site Plan Application
Iredell County Landfill Expansion

Introduction

Mr. Ellis Cayton, P.E., Solid Waste Section, State of North Carolina, Department of Environment, Health, and Natural Resources, Raleigh, North Carolina in a letter dated November 5, 1992 listed four issues that need to be resolved concerning the site plan application for the Iredell County Landfill Expansion. This memorandum addresses these four issues which are as follows:

- o relative location of the Eufola Fault,
- o groundwater potentiometric data,
- o water table information in the northern areas of the site bordering the stream and near the knoll in the site's northwest corner, and
- o hydraulic conductivity tests and values.

Eufola Fault

Ms. Joanna Michie did a master's thesis dated May 1985 at Texas A and M, College Station, Texas on the geology of a portion of the northern Kings Mountain Belt in Catawba and Iredell Counties, North Carolina. This work was the first detailed mapping and description of definite Kings Mountain Belt Rock this far north according to the thesis. This investigation revealed evidence that the Eufola Fault is a lithological, structural, and metamorphic discontinuity between two distinct lithotectonic terranes. The width of the fault is stated to be approximately two kilometers (km) wide, trends northeasterly and is subparallel to the regional strike of Kings Mountain Belt Rocks. The fault zone is marked by cataclastic rocks, high angle, low angle, and contorted fault planes, disrupted lithologies, and retrograde metamorphism. The core of the fault zone is intruded by a garnetiferous granite pluton, informally named the Reeper Creek Granite.

The thesis contains maps showing the location of the Eufola Fault in the area of the Iredell County Sanitary Landfill Expansion. The location of the Statesville East Quadrangle (USGS) is plotted on Figure 4 from the thesis showing the location of the Eufola Fault (copy enclosed). In addition, the Eufola Fault has been plotted on the USGS Statesville East Quadrangle (copy enclosed). As shown on the Statesville East Quadrangle, the Eufola Fault zone (± 2 km wide) is located south of the planned location for the Iredell County Sanitation Landfill Expansion. A portion of the 2 km wide zone of the Eufola Fault touches the buffer zone of the planned location of the Iredell County Sanitary Landfill Expansion. The Eufola Fault does not straddle or intersect the site based on the location presented in the master's thesis (a detailed mapping and description of definite Kings Mountain Belt Rocks in this area). In addition, as stated in the Geological and Hydrological Study report dated August 25, 1992, no evidence of fault-related detrimental conditions was detected in the borings or rock cores made at the site. Consequently, the Eufola Fault is considered not to impact development of the landfill.

Groundwater Potentiometric Data and Water Table Information for the Site

Additional groundwater potentiometric data has been submitted recently along with additional groundwater table information for the northern areas of the site bordering the stream. These data should be sufficient

to allow these two issues to be resolved. Groundwater table levels have been monitored with time and these data used to prepare a revised groundwater potentiometric map. Single-level groundwater monitoring wells are considered suitable to monitor the groundwater. Nesting of groundwater monitoring wells is not considered necessary.

Hydraulic Conductivity Tests and Results

Field testing of hydraulic conductivities of subsurface soil strata at the site for the planned Iredell County Landfill Expansion was conducted in accordance with ASTM Standard Guide D 5126-90. This ASTM standard guide is designated for measuring hydraulic conductivities above the water table. The borehole permeameter test method used at the Iredell County Landfill Expansion Site is a part of this standard guide.

The borehole permeameter is an accepted method for measuring hydraulic conductivity of subsurface strata. Field hydraulic conductivity tests above the water table were conducted for Formations I, II, III, IV, and VI. Tests for Formations V, VII, and VIII were made below the water table.

Standard text references for the borehole permeameter test method used are presented in the Geological and Hydrological Study Report for the Iredell County Landfill Expansion. These references include the use of the borehole permeameter test method below the water table. The text "Fundamentals of Geotechnical Analysis by Dunn, Anderson, and Kiefer, John Wiley & Sons, New York, New York, copyright 1981" reference the use of borehole permeameter tests only below the water table. The only difference between testing below and above the water table is the use of a differential pressure head between the test water in the borehole and the groundwater table. Laws of Physics indicate the test method should technically be acceptable below the water table if it is acceptable above the water table. Actually, the use of the test method above the water table is based on flow caused by a differential head.

In summary, approval of the hydraulic conductivity tests and resulting values is clearly warranted based on the information above and from the Geological and Hydrological Study Report as follows:

- ASTM Standard Testing Guide recognizes the applicability of the method used. Standard text references have been previously provided that document the borehole permeameter method as an acceptable method for testing for hydraulic conductivities above or below the water table. Several of the texts are references of renown in the field of geotechnical engineering. The method has survived several editions of the texts.
- Soil classifications and test results of hydraulic conductivities are in agreement with reported normal hydraulic conductivities as demonstrated in the Geologic and Hydrologic Study Report for the Iredell County Sanitation Landfill Expansion. The hydraulic conductivity data plot on the less permeable side of the normal range for the soil classifications. Grain size distribution curves for these soils show that the fines content (clay and silt) is generally above 30 percent. As stated in the dewatering text, "Construction Dewatering; A Guide To Theory & Practice By Patrick Powers, P.E., John Wiley & Sons, Inc., New York, New York, copyright 1981, pg 58", sands containing more than 10% fines do not yield high volumes of water. That is, the permeability of sands are drastically decreased with fines in excess of 10%. If the hydraulic conductivity test values reported plotted in the more pervious part of the range of typical values for the soil descriptions, the accuracy of the data could possibly be questioned.

- A general classification of the formation soils is presented in Table 3 of the Geological and Hydrological Study Report where the hydraulic conductivity values are presented. A review of the boring logs, which contain appropriate modifiers for the formation descriptions, shows a significant amount of fines in the formations.
- The hydraulic conductivity test method was directed and resulting data reviewed by a registered professional engineer experienced and qualified in testing hydraulic conductivities, computation of groundwater flow and seepage, soil classifications, and overall geotechnical engineering. The testing was done in accordance with normal engineering care, practice, and standards.

The hydraulic conductivity test method and results are hereby requested to be approved and not arbitrarily questioned or rejected. If rejected (not approved), factual and site specific evidence that these data and the test method are in error or wrong should be provided. As shown by the range of permeabilities for the general soil classifications presented in the Geologic and Hydrologic Study Report, a wide variation of hydraulic conductivities exist for that general classification. Critical comments on hydraulic conductivity, therefore, should be site specific; data from elsewhere that are not site specific should not be used to approve or disapprove site specific results that fall within normal published ranges. In particular, this should not be done when a clear, rational review of other site specific characteristics, conditions, data and information support the site specific data.

Respectfully submitted,
GAI Consultants-NC, Inc.



Wendell W. Parker, Ph.D., P.E.
Vice President

WWP/taw



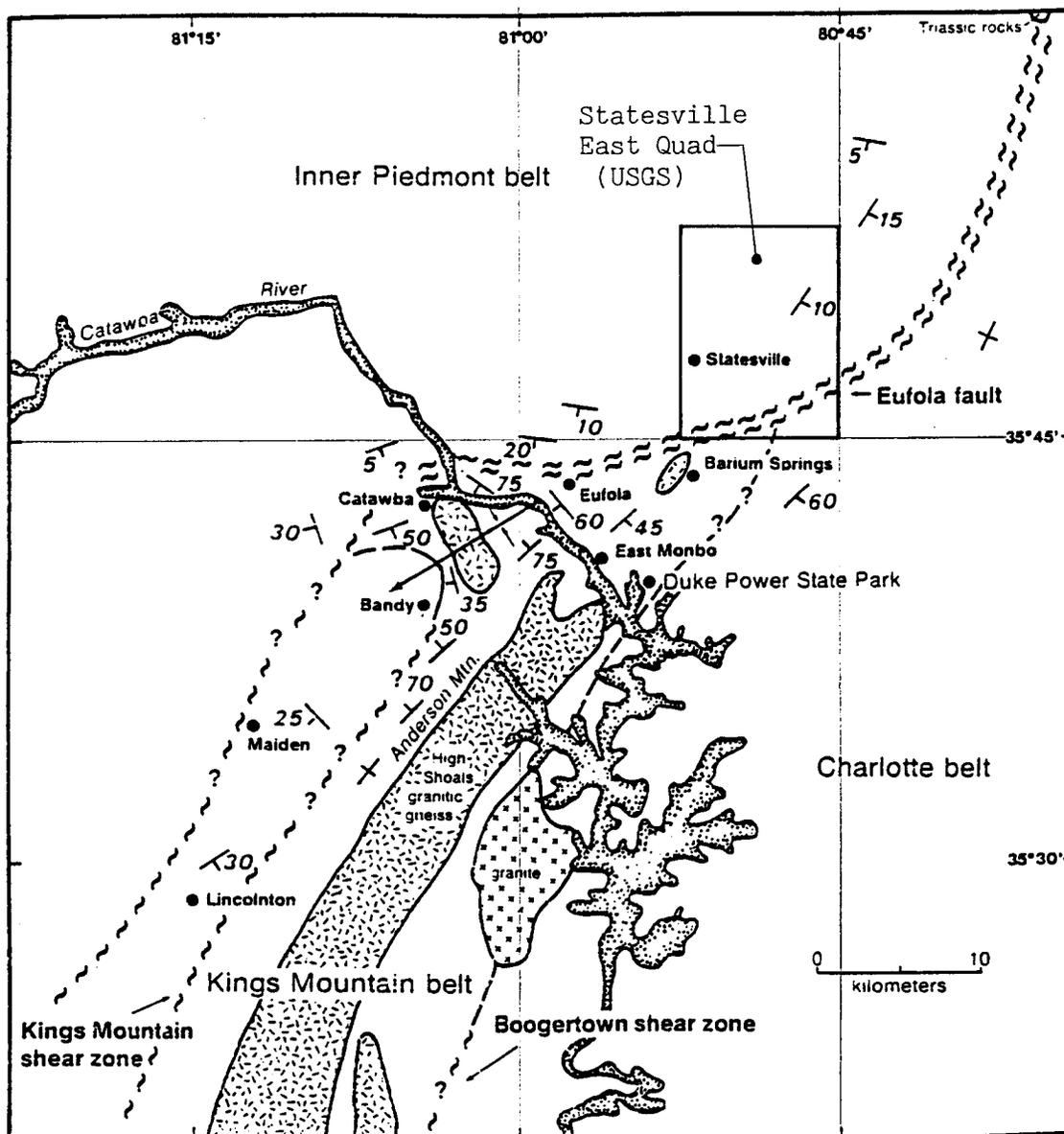


Figure 4. Proposed northern terminus and regional relationships of the Kings Mountain belt (after Milton, 1981).

OPERATION/CONSTRUCTION MANAGERS

CIVIL/SANITARY ENGINEERS

**Municipal
Services**



**Engineering
Company, P.A.**

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

September 23, 1992

Mr. Ellis Cayton
Environmental Engineer
Solid Waste Division
NC Department of Environment, Health
and Natural Resources
PO Box 27687
Raleigh, NC 27611



Re: Iredell County Landfill

Dear Mr. Cayton:

Please find enclosed the items we previously discussed concerning the above referenced landfill. These items are as follows:

1. Letter from GAI Consultants concerning unstable areas.
2. Letter from City of Statesville concerning zoning.
3. Copy of letter to the Statesville Airport notifying them of the FAA decision.
4. Four copies of the photograph with the two-mile radius showing there are no State Parks within the two miles.

If you have questions or concerns, please do not hesitate to call me at 919-772-5393.

Very truly yours,
MUNICIPAL ENGINEERING SERVICES CO., PA

D. Wayne Sullivan

D. Wayne Sullivan

DWS:cw

Enclosures

Copy: Mr. Carson Fisher, PE
Mr. Ronald Weatherman

OPERATION/CONSTRUCTION MANAGERS

CIVIL/SANITARY ENGINEERS

**Municipal
Services**



**Engineering
Company, P.A.**

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

September 23, 1992



Mr. Gary Huss
City Planner
City of Statesville
PO Box 1111
Statesville, NC 28687

Re: Iredell County Landfill

Dear Mr. Huss:

Please find enclosed a copy of a letter from the FAA concerning the location of the Iredell County Landfill with respect to the Statesville Airport.

If you have any questions concerning this matter, please do not hesitate to call me at 919-772-5393.

Very truly yours,
MUNICIPAL ENGINEERING SERVICES CO., PA

D. Wayne Sullivan

DWS:cw

Enclosure

Copy: Mr. Carson Fisher

City of Statesville



P. O. Box 1111 • Statesville, North Carolina 28677

September 17, 1992

Planning Department

704-878-3574

Community Development
& Appearance

878-3578

Inspector
Main Street

878-3555

878-3436

RECEIVED
SEP 24 1992

SEP 18 1992

IREDELL COUNTY
ENGINEER'S OFFICE

To Whom It May Concern:

Please be advised that the proposed Iredell County Landfill site, specifically described as Lot 156, Block A, Iredell County Tax Map 5M, is presently zoned GI-3 (General Industrial). Site plan review by staff, Planning Board and City Council has determined that all requirements of the Statesville Zoning Ordinance have been met.

Should you have further questions, please do not hesitate to contact me at 878-3574.

Sincerely,

David H. Currier
Director of Planning & Dev.

DHC:ts



GAI Consultants-NC, Inc.

4000 Blue Ridge Road
Suite 500
Raleigh, NC 27612
919/783-4783
FAX 919/783-0241

September 11, 1992



Mr. Wayne Sullivan
Municipal Engineering Services Company., P.A.
Post Office Box 97
Garner, North Carolina 27529

Re: Unstable Areas
Iredell County Landfill Expansion
Iredell County, North Carolina
Project No. 92101.02

Dear Mr. Sullivan:

No unstable areas were detected at the site for the Iredell County Landfill Expansion during a surficial visual inspection and a review of the results of an extensive subsurface investigation and testing program with borings and probes.

In summary, there were no poor foundation conditions encountered, included weak or unstable soils, that might result in inadequate foundation support for the structural components of the landfill expansion. No areas considered susceptible to mass movement were detected. (Mass movements are defined as the downslope movement of soil and rock, either alone or mixed with water, under the influence of gravity.) No karst terrain or areas susceptible to karst development were detected. (Karst terrain or areas susceptible to karst development are land areas underlain by soluble bedrock that may contain or develop subterranean drainage systems and subsurface voids whose presence could lead to the rapid development of sinkholes.)

I trust this letter meets your needs relative to the absence of unstable areas at the planned location of the Iredell County Landfill Expansion.

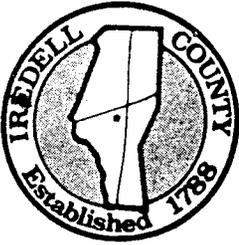
Sincerely,
GAI Consultants-NC, Inc.

Wendell W. Parker, Ph.D., P.E.
Engineering Manager

WWP/la

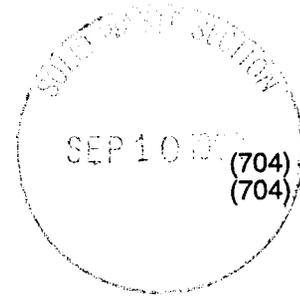
:92101-02.LT2





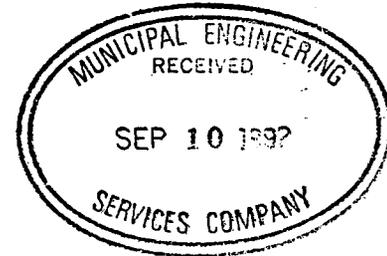
IREDELL COUNTY

Post Office Box 788
Statesville, North Carolina 28677



September 4, 1992

Municipal Engineering Services
P.O. Box 97
Garner, NC 27529



Attn: Wayne Sullivan

Re: Lined Landfill Site Approval

Dear Wayne:

Enclosed are copies of the following:

1. Iredell County Resolution for Local Government Approval of the lined landfill site and
2. City of Statesville minutes from their April 6, 1992 meeting where they approved the site location of the Iredell County landfill.

Please forward this information to the State Solid Waste Section. Let me know as quickly as possible if any other information is needed.

Sincerely,

A handwritten signature in cursive script that reads "H. Carson Fisher".

H. Carson Fisher

Enclosures

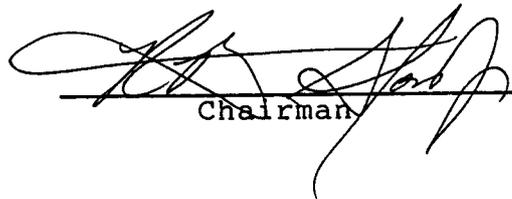
cc: Ron Weatherman

RESOLUTION FOR LOCAL GOVERNMENT APPROVAL
REQUIRED BY 15 N.C. ADMINISTRATIVE CODE 13B .0504(1) (e) (i)

(RESOLVED), that the Board of County Commissioners of Iredell County hereby grants prior approval for the issuance of a sanitary landfill permit by the Division of Solid Waste Management to Iredell County, said landfill to be established on approximately 60 acres, shown on the attached map, located within Iredell County, which acreage does not lie within any incorporated city or town, not within the extraterritorial zoning jurisdiction of any city or town.

Adopted, this the 14th day of September, 1992.

Board of County Commissioners


Chairman

Attest:


Clerk to the Board

North Carolina

Iredell County

I hereby certify that the foregoing is a true and accurate copy of the Minutes of the City Council of the City of Statesville at a Regular City Council Meeting held on April 6, 1992 in the Council Chambers of the City Hall, Statesville, North Carolina, and recorded in Minute Book 15, Pages 195 & 196 regarding the approval of the site location of the Iredell County Landfill located on Twin Oaks Road.

In Witness Whereof, I have hereunto set my hand and have caused the official corporate seal of said City of Statesville to be affixed, this the 31th day of August 1992.

Mary L Kerby
City Clerk

August 31, 1992



MINUTE BOOK 15, PAGE 195
CITY COUNCIL MEETING, APRIL 6, 1992
CITY HALL COUNCIL CHAMBERS, 7:30 PM
STATESVILLE, NORTH CAROLINA

Councilmembers Present: Dagenhart, Johnson, Kutteh, Lawton,
Marshall, Peterson, Prendergast, Williams

Councilmembers Absent: None

Staff Present: King, Currier, Davis, Gaines, Hudson,
Lambert, Staley, Kerley, Johnson, Stewart

Media Present: Alice Brown, Statesville Record & Landmark

Visitors: 14

Invocation: The invocation was given by Mary Kerley.

Mayor Bentley called the meeting to order and read the Consent Agenda as follows:

CONSENT AGENDA

- A. Approval of the Minutes of the Regular Meeting of March 16, 1992.
- B. Second reading of an Ordinance specifically prohibiting truck traffic on a portion of Miller Avenue and a portion of Oakland Avenue. (Ord. #10-92)
- C. Second reading of an Ordinance authorizing the City Council to prohibit truck traffic on designated city streets. (Ord. #11-92)
- D. Consider approval of a preliminary subdivision plat entitled Carrington.
- E. Consider request from DSDC to approve a facade grant for "Mr. Quick" for two facades - \$500.00 per facade-in the total amount of \$1,000.00.
- F. Consider passing a resolution authorizing a contract agreement with the North Carolina Department of Transportation for the preparation of the new Thoroughfare Plan. (Reso. #6-92)
- G. Consider passing a motion closing Broad Street (from Tradd Street to Meeting Street), Center Street (from Front Street to Water Street) and Court Street in its entirety for the annual "Weekend in the Village" festival.
- H. Consider passing a motion closing streets in the downtown area for the third annual bicycle race (Annual Home Federal Criterium) on Friday, September 11, 1992.
- I. Adoption of resolution declaring obsolete pumps at the Water Purification Plant surplus and donating them to the company of Charles R. Underwood. (Reso. #7-92)
- J. Consider passing a motion for approval of the site location of the Iredell County Landfill located on Twin Oaks Road.
- K. Cancellation of the April 20, 1992 City Council Meeting due to Easter Holiday.

Mayor Bentley asked if there were any items that Council wished removed for further discussion.

There being no corrections or changes, upon a motion by Councilmember Johnson, seconded by Councilmember Marshall, the Consent Agenda was unanimously approved.

REGULAR AGENDA

Appropriate from the Raw Water Supplies Capital Project Fund \$150,000.00 for local development and designing for a new raw water pump station, intake and transmission line.

City Manager, Jack King, presented this item to Council. He made a recommendation that this item be continued until the City Attorney could verify ownership. The Council agreed unanimously.

Appearance of Judy Lazenby, Director of Travel & Tourism, to obtain approval for printing the Meeting Planners Guide.

Director of Travel & Tourism, Judy Lazenby, presented this item to Council. She stated that each company was given the same basic information about what was wanted and asked to make suggestions on how to improve the readability and usage of the guide. She stated that the Meeting Planners Guide had received bids which were as follows:

Statesville Instant Printers	1009.00
Printcrafters	1356.89
PIP	1432.10
Brady Printing	1785.00
for 2-color ink)	1932.25

The staff chose to take the \$1,785 bid from Brady Printing.

Upon a motion by Councilmember Dagenhart, seconded by Councilmember Peterson, the printing of the Meeting Planners Guide from the Travel & Tourism budget was unanimously approved.

Conduct a public hearing and consider first reading of an Ordinance directing that the Director of Community Development and Appearance vacate, close, and demolish the dwelling unit known as 506 Fall Street, located on Lot 2, Block C, Iredell County Tax Map 7A-23.

David Stewart presented this item to Council. This is the property of Edward N. McLelland, James McLelland, Mary L. McLelland, and Carolyn S. Traylor.

The owners were served the Complaint and Notice of Hearing and the Findings of Fact by certified mail and publication. The hearing was held on January 3, 1992, with no parties present. Telephone and written correspondence had occurred with some of the owners. They all said to demolish the house.

Nothing has been done to the house. Repair costs would exceed \$15,000 and the structure only has a tax value of \$6,020, including the lot. The structure meets the criteria as being dilapidated and is subject to demolition. There are delinquent taxes on this property in excess of \$ 168.

Mr. Stewart showed slides of the exterior and interior condition of the house.

Councilmember Prendergast asked for an approximate cost to cover the demolition.

MEMORANDUM

August 26, 1992

To: Jim Coffey
From: Ellis Cayton
Re: Iredell County Site Plan Application

Jim, I have yet to receive revisions to the Iredell County site plan application. I gave a draft letter with comments to Jim Woody and Wayne Sullivan in our meeting with them on July 23, 1992. However, Wayne intends to bring the revisions over this afternoon, August 26, 1992.

On August 4, 1992, Bobby Lutfy and myself met with Wayne Sullivan and Wendell Parker to discuss deficiencies in the hydro-geo report necessary to meet 0.0504 (1)(c). GAI Consultants submitted revisions on August 25, 1992. Neither Bobby or myself have had a chance to review the changes.

One very important issue is local government approval and zoning. The originally 60 acre parcel granted site suitability is in the county as is another 20 acres for which they would like to obtain site suitability. However, a larger 90 acre tract for which they would like site suitability approval is in the city. They have zoning approval from the city for its jurisdiction and from the county for its jurisdiction. They also have local government approval for the original 60 acres. Their grievance, according to Wayne in a telephone conversation August 26, is why do they need local government approval from the city for the 90 acres when their zoning letter already indicates the city's approval.

Also according to Wayne, the major purpose of the meeting will be to impress upon you that they intend to be in the new landfill by October 9, 1993.

OPERATION/CONSTRUCTION MANAGERS

**Municipal
Services**

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393



CIVIL/SANITARY ENGINEERS

**Engineering
Company, P.A.**

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

August 26, 1992



Mr. Ellis Cayton, PE
Environmental Engineer
Division of Solid Waste Management
PO Box 27687
Raleigh, NC 27611-7687

Re: Iredell County Sanitary Landfill
Site Application

Dear Mr. Cayton:

I am writing in response to our conversation in regards to the above referred site application. Please find enclosed the following:

- 1) Four copies of flood plain maps showing the 100 year flood boundary with respect to the site. The site is not affected by the flood plain.
- 2) A letter to Mr. Michael P. Schafale regarding the impact on a state park, recreation or scenic area. We have not heard back from Mr. Schafale at this time.
- 3) Four copies of the quarter and two mile radius aerial photos showing the information required in Section 0.0504 (1) (a and b)
- 4) Copies of letters from Iredell County concerning the zoning and permission from the governing bodies.

The information that was requested in the meeting with Bobby Lufty has been forwarded to you by G.A.I. Consultants. This information should cover any discussions we had concerning the geological and hydrological study.

Mr. Ellis Cayton

August 26, 1992

Page 2

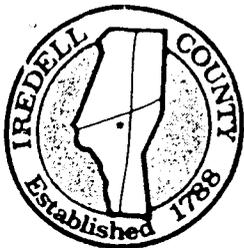
If you need any additional information or have any questions, please feel free to contact us.

Sincerely yours,
MUNICIPAL ENGINEERING SERVICES CO., PA

D. Wayne Sullivan

D. Wayne Sullivan

DWS:sw



IREDELL COUNTY

Post Office Box 788
Statesville, North Carolina 28677

(704) 878-3000
(704) 663-1616

August 3, 1992

Mr. H. Carson Fisher
Iredell County Engineer
Post Office Box 788
Statesville, NC 28687



RE: Zoning Approval
Lined Landfill Site
Twin Oaks Road

Dear Carson:

I have reviewed the plans for the lined landfill site on Twin Oaks Road and they meet the applicable requirements of the Iredell County Zoning Ordinance in the RA District for a landfill.

If you have any questions please contact me at Ext. 3121.

Sincerely,

A handwritten signature in cursive script, appearing to read "D. Dean Osborne".

D. Dean Osborne
Planner II

DDO:kh

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

IREDELL COUNTY,
NORTH CAROLINA
(UNINCORPORATED AREAS)

PANEL 125 OF 220

COMMUNITY-PANEL NUMBER

370313 0125 B

EFFECTIVE DATE:

MAY 15, 1980



U.S. DEPARTMENT OF HOUSING
AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

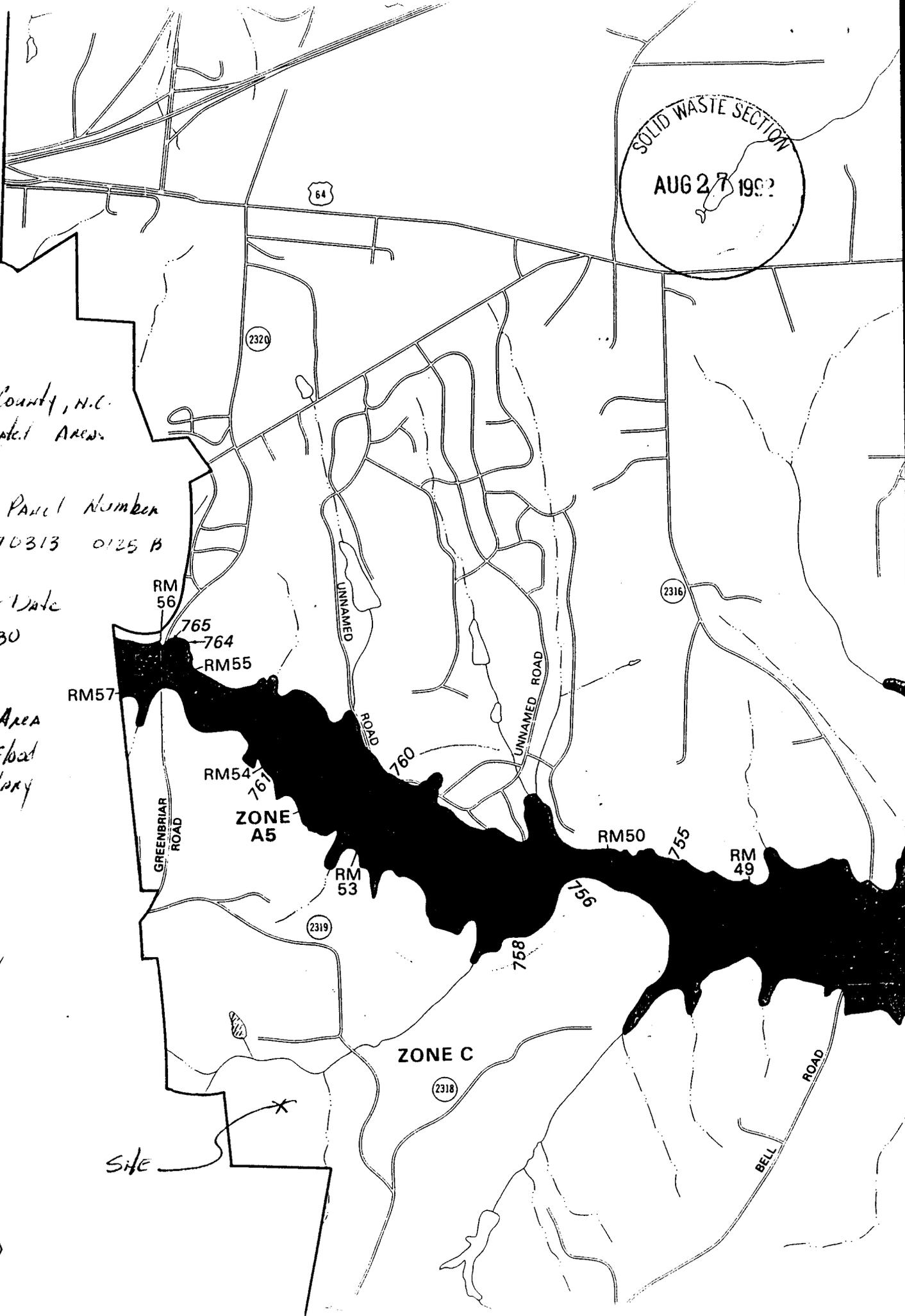
SOLID WASTE SECTION
AUG 27 1992

Fredell County, N.C.
UNINCORPORATED AREA

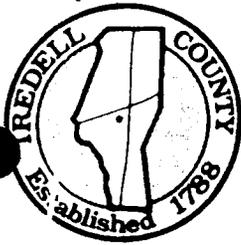
Community - Parcel Number
370313 0125 B

Effective Date
5/15/80

Shaded Area
100 yr. Flood
Boundary

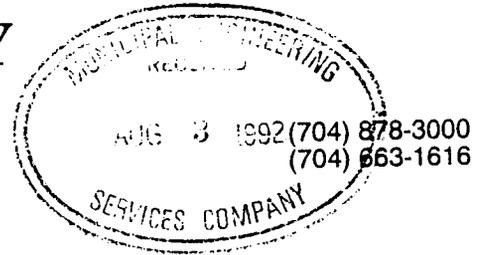


Site



IREDELL COUNTY

Post Office Box 788
Statesville, North Carolina 28677



July 28, 1992

Municipal Engineering Services Co., Inc.
P.O. Box 97
Garner, NC 27529



Attn: Mr. D. Wayne Sullivan

Re: Iredell County Site Approval

Dear Wayne:

In response to your letter of July 24, 1992 concerning approval of the subject landfill site, we question the need for letters from the Iredell County Board of Commissioners and the City of Statesville Board. It would appear that zoning approval would constitute the only approvals required. Both zoning boards have enforcement authority over their jurisdiction, not the governing boards. And since both zoning boards have approved the site, is it necessary to have approval from the governing boards?

Please advise.

Sincerely,

A handwritten signature in cursive script that reads "H. Carson Fisher".

H. Carson Fisher, P.E.
County Engineer

cc: Mr. Joel Mashburn, County Manager
Mr. Jerry Lundy, Planning and Services Director

OPERATION/CONSTRUCTION MANAGERS

CIVIL/SANITARY ENGINEERS

**Municipal
Services**



**Engineering
Company, P.A.**

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

July 24, 1992

Mr. Michael P. Schafale
Natural Heritage Program
Division of Parks and Recreation
PO Box 27687
Raleigh, NC 27611-7687

Re: Proposed Iredell County Landfill

Dear Mr. Schafale:

I would like to thank you for responding to our request concerning the rare and endangered species on the above referenced proposed landfill.

I am writing to request information as to whether this site has an adverse impact on a state park, recreation or scenic area, or any other lands included in the state nature and historic preserve.

I would like to thank you in advance for all considerations given this request. If you have any questions, please feel free to contact me at (919) 772-5393.

Sincerely yours,
MUNICIPAL ENGINEERING SERVICES CO., PA

D. Wayne Sullivan

DWS:sw

July 30, 1992

4000 Blue Ridge Road
Suite 500
Raleigh, NC 27612
919/783-4783
FAX 919/783-0241**Mr. Wayne Sullivan**
Municipal Engineering Services Company, P.A.
Post Office Box 97
Garner, North Carolina 27529**Re: July 22, 1992 Review Letter**
North Carolina Division of Solid Waste Management
Iredell County Landfill Expansion
Project No. 92101.02

Dear Mr. Sullivan:

This letter responds to Comment No. 4 in the Completeness Review - Iredell County Sanitary Landfill Site Plan Application letter dated July 22, 1992 from the North Carolina Division of Solid Waste Management (SWM) regarding the Geological and Hydrological Study Report dated April 1992 and Report Supplement dated May 14, 1992 prepared by GAI for the Iredell County Landfill Expansion. Comment No. 4 pertains to North Carolina Solid Waste Management Rules, NCAC T15A: 13B .0504 (1) (c) (as amended through January 9, 1992). This section of the management rules covers the requirements for a geological and hydrological study of the site. Each of the items in Section .0504(1)(c) required to be part of the geological and hydrological study are identified and discussed below with reference to GAI's Geological and Hydrological Study Report.

- Item (i): The quantity, type, and location of the soil borings and laboratory testing were confirmed with Mr. Bobby Lutfy of the Division of Solid Waste Management prior to commencement of the study. Sampled soil borings to be made to a minimum depth of 50 feet to establish engineering characteristics of unconfined, confined, or semiconfined hydrological units were also confirmed with Mr. Bobby Lutfy. See Sub-item (E) below.
- (A): The study included soil and rock borings and probes. Standard penetration resistance values for the borings are presented on the boring logs in Appendix I of the report. No standard penetration tests were performed in the probe boreholes as the probes were made specifically for groundwater level monitoring.
- (B): Particle size analyses were performed on selected soil samples from the borings considered to be representative of the hydrological units existing at the site. The results of the particle size analyses are presented in Appendix II of the report and the supplement in the form of grain size distribution curves with particle size percentage summary tables below the curves.
- (C): Samples of soils from the borings sampled (See Page 3 of the report) were classified according to the Unified Soil Classification System (USCS). USCS classifications, including group symbols, are presented on the logs of these borings in Appendix I of the report. To eliminate the need for comparisons of soil formations described in the report in Table 2 for Plates 2 and 3 with the boring logs in Appendix I to establish designated USCS group symbols, appropriate group symbols have been included in the attached copy of Table 2 from the report.

- (D): Geologic considerations are covered on Pages 1 and 2 of the report. Subtitle D concerns, including fault areas and seismic impact zones, are discussed on Page 2. In addition, conclusions regarding fault areas, seismic impact zones, and unstable areas are presented on Page 8. A map showing faults active during the Holocene Epoch in the United States has been ordered from the USGS Map Distribution Center, Denver, Colorado and will be submitted immediately following receipt. A map showing probable estimates of maximum seismic accelerations in rock in North Carolina is attached and indicates the site is not in a seismic impact zone.
- (E): See Item (i) above. Table 2 in the report and as attached contains information on the major lithologic units. Also see Pages 5,6, and 7 in the report.
- (E),(I): Permeability tests were performed on major lithologic units in-situ or on relatively undisturbed samples in the laboratory. Discussion of the testing is presented on Pages 5,6, and 7 in the report. Test results also are presented on the boring logs in Appendix I at the respective depths and locations of the in-situ tests.
- (E),(II): The results of natural moisture content tests on selected cohesive soil samples were determined in the laboratory. The results are discussed in general on Pages 5,6, and 7 in the report and are presented on the boring logs in Appendix I at the respective depths and locations. Natural moisture content tests were not performed on granular soil samples as results are generally non-representative and inaccurate due to sample drainage during sampling, transportation, and handling.
- (E),(III): Porosity values for major lithologic units were determined. The values are presented on Pages 5, 6, and 7 in the report; average porosity values for each soil formation are presented in Table 2.
- (F): Samples of site soils possibly suitable for use as cover were obtained and transported to the laboratory for testing in order to evaluate potential for use as cover soil.
- (F),(I): Remolded permeability tests were performed on the samples of proposed cover soils compacted to 95% standard Proctor maximum dry density for each soil sample. The results are presented on Pages 5, 6, and 7 of the report and in the supplement.
- (F),(II): Total porosity values for the cover soil samples were calculated from specific gravity test results and are presented on Page 7 of the report.
- (F),(III): Atterberg limits tests were performed on samples of soils being considered for cover and the results are presented and discussed on Pages 5, 6, and 7 of the report and presented on the boring logs in Appendix I at the respective depths and locations.
- (G): Stratigraphic cross-sections are presented on Plates 2 and 3 in the report and soil formation characteristics are presented in Table 2 and discussed on Pages 4, 5, 6, and 7.
- (H): A tabulation of groundwater table elevations at the time of boring and at subsequent times is presented in Table 1 for piezometers installed prior to April 22, 1992. Depths to water in piezometers installed after April 22, 1992 are presented on the probe logs in the supplement. Additional groundwater levels with time have been obtained since issuance of the report and are presented on the attached Groundwater Elevation Table.
- (I): Boring and probe logs are presented in Appendix I of the report and the supplement.

Mr. Wayne Sullivan
Page 3
July 30, 1992

- Item (ii): Separate response by Municipal Engineer Services Co.
- Item (iii): A potentiometric map of the surficial aquifer based on stabilized water table elevations is presented on Plate 4 of the report.
- Item (iv): Please see the referenced report.

Section T15A: 13B .0504 (1) (c) of the NC SWM Rules is addressed in the Geological and Hydrological Study Report and Report Supplement. These two submittals were prepared to cover all requirements and sufficiently address all elements of Section T15A: 13B .0504 (1) (c).

We trust this letter provides a sufficient response to the July 22, 1992 review letter of The Division of Sound Waste Management. Please let us know when we can be of additional assistance.

Respectfully,
GAI Consultants-NC, Inc.



Gary Janshego
Geotechnical Engineer



Wendell W. Parker, Ph.D., P. E.
Engineering Manager

GJJ:WWP:dsm



TABLE 2
SUBSURFACE SOIL FORMATIONS
IREDELL COUNTY LANDFILL
PROJECT NO. 92101.02

<u>Formation Number</u>	<u>Soil Description</u>	<u>Permeability (k_{ave}) cm/sec</u>	<u>Porosity (n_{ave}) %</u>
I	Silt, with sand/sandy silt (MH/ML)	4×10^{-7}	38
II	Silt, trace sand and clay (ML)	4×10^{-6}	48
III	Silty sand (SM)	2×10^{-6}	42
IV	Sandy silt/silty sand (ML/SM)	3×10^{-5}	33
V	Silt, trace sand (ML)	3×10^{-5}	51
VI	Sandy silt (ML)	5×10^{-6}	48
VII	Silt, with sand (ML)	3×10^{-6}	48
VIII	Silt, trace sand (ML)	1×10^{-5}	51

Note: USCS Group Symbols were added to the soil descriptions on July 30, 1992.

GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA

<u>Piezometer Number</u>	<u>Reading Date</u>		
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>
P-1	804.5	805.0	804.5
P-2	---	813.5	813.5
P-3	---	822.5	821.5
P-4	---	840.0	839.5
P-5	---	846.0	847.0
P-6	795.5	795.5	795.0
P-7	---	809.0	809.5
P-8	827.5	828.5	828.5
P-10	838.0	838.5	839.0
P-11	Dry	Dry	Dry
P-12	844.0	845.0	845.5
P-13	853.5	854.5	854.5
P-14	Dry	855.5	Dry
P-15	820.0	819.0	818.5
P-16	841.0	841.5	841.5
P-17	---	781.0	781.0
P-18	---	816.5	815.5
P-19	Dry	798.0	798.0
P-20	800.5	800.5	798.0
P-21	812.0	811.5	808.5
P-22	833.5	832.5	832.0
P-23	836.5	837.0	837.0
P-24	827.0	827.0	826.5
P-25	819.5	819.5	819.0
P-26	809.5	810.0	807.0
P-27	---	780.5	780.0
P-28	---	798.0	797.5
P-29	817.0	817.5	816.5

**GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA**

<u>Piezometer Number</u>	<u>Reading Date</u>		
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>
P-30	817.5	818.0	817.5
P-31	827.0	827.0	824.0
P-32	---	831.5	829.0
P-33	835.5	835.0	833.5
P-34	841.0	841.0	839.0
P-35	844.0	844.5	841.5
P-36	847.0	847.5	846.0
P-37	850.5	850.5	849.5
P-38	852.0	854.5	850.0
P-39	852.0	852.5	852.0
P-40	848.5	849.0	849.0
P-41	848.0	848.5	848.5
P-42	848.0	848.0	848.0
P-43	845.5	845.0	845.0
P-44	840.5	840.5	840.5
P-45	833.5	832.5	832.0
P-46	830.5	830.5	830.0
P-47	818.5	819.0	819.0
P-48	812.5	813.0	813.0
P-49	809.0	809.0	809.0
P-50	----	789.5	789.5
P-51	----	776.0	776.0
P-53	790.5	790.5	790.5
P-55	776.5	776.5	776.5
P-57	----	793.5	793.0
P-58	----	811.0	811.0
P-59	----	831.5	832.0

GROUNDWATER ELEVATION TABLE
IREDELL COUNTY LANDFILL
IREDELL COUNTY, NORTH CAROLINA

<u>Piezometer Number</u>	<u>Reading Date</u>		
	<u>3-25-92</u>	<u>4-30-92</u>	<u>5-28-92</u>
P-62	---	824.0	823.5
P-63	817.0	816.0	816.0
P-65	---	786.0	786.0
P-66	---	778.5	772.0
P-68	---	775.0	774.5
P-70	---	780.0	780.0
P-71	789.0	789.0	788.0
P-72	---	---	794.0
P-73	813.5	814.0	813.5
P-74	---	834.5	834.5
P-75	831.5	821.5	832.0
B-1	802.0	803.0	803.0
B-2	836.5	837.0	837.0
B-4	842.0	842.0	841.5

22

TABLE III-1

IN-SITU PERMEABILITY DATA
 IREDELL COUNTY LANDFILL
 PROJECT NO. 92101.02

<u>Formation Number</u>	<u>Boring</u>	<u>Depth ft.</u>	<u>Permeability cm/sec</u>	<u>Average Permeability cm/sec</u>
I	P34	4.0	6.0×10^{-7}	4×10^{-7}
	P25	9.0	2.9×10^{-7}	
	P53	4.0	5.6×10^{-7}	
	P73	4.0	2.1×10^{-7}	
II	P13	14.0	3.4×10^{-6}	4×10^{-6}
	P34	9.0	3.8×10^{-6}	
	P47	9.0	2.6×10^{-6}	
	P47	29.0	4.2×10^{-6}	
III	P25 Silty Sand	24.0	1.5×10^{-6}	2×10^{-6}
	P34	29.0	1.8×10^{-6}	
	P53	24.0	3.6×10^{-6}	
IV	P25 (Silty Silt) Silty Sand	39.0	1.7×10^{-5}	3×10^{-5}
	P34 Silty Sand	39.0	3.0×10^{-5}	
	P47	49.0	2.0×10^{-5}	
	P53	39.0	5.1×10^{-5}	
	P53	44.0	4.7×10^{-5}	
V	P25	29.0	2.9×10^{-5}	3×10^{-5}
VI	P73	14.0	4.9×10^{-6}	5×10^{-6}
VII	P73	29.0	2.9×10^{-6}	3×10^{-6}
VIII	P13	34.0	1.2×10^{-5}	1×10^{-5}

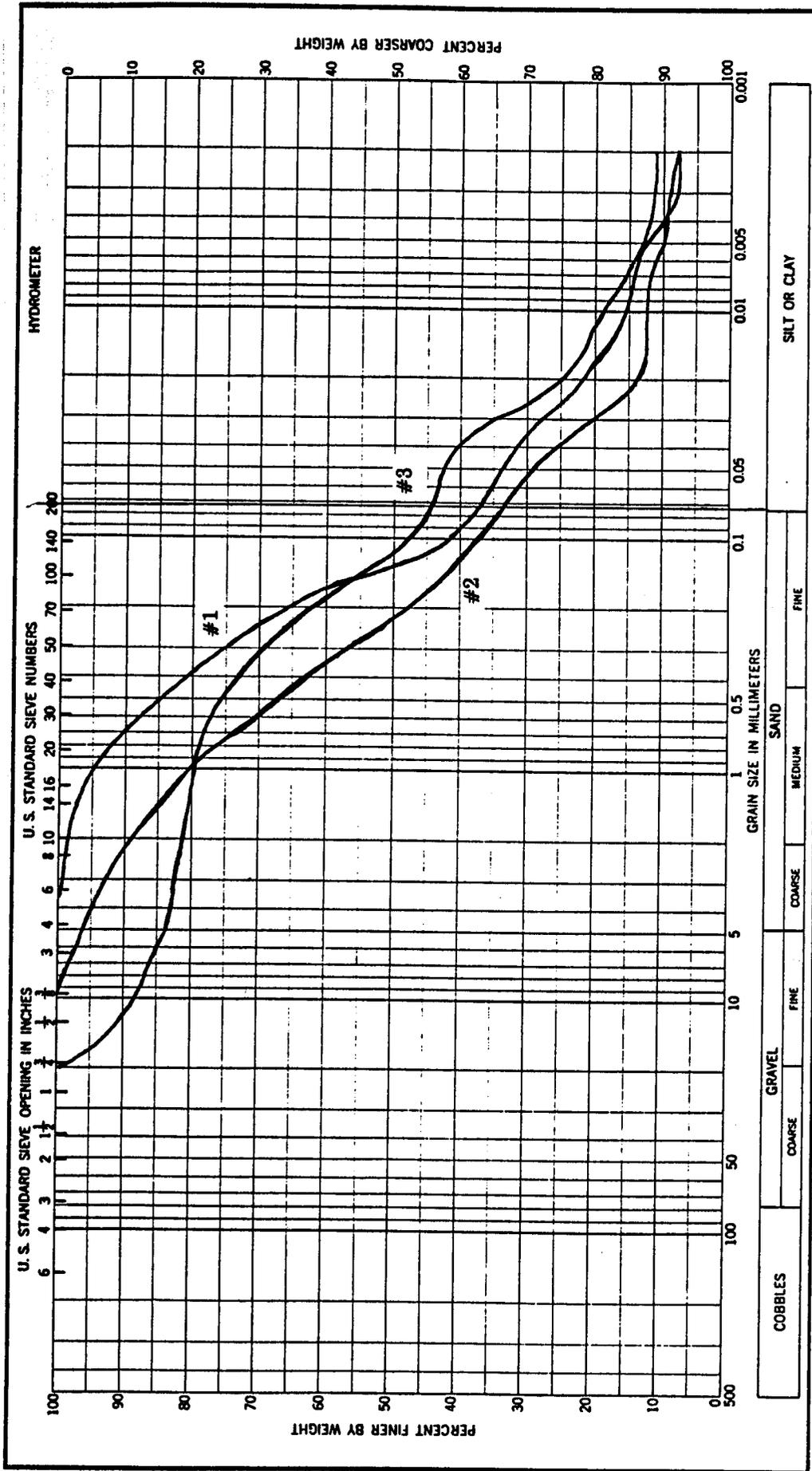
IREDELL COUNTY

① Hydraulic Conductivity / Permeability Testing

Borings: 13, 25, 34, 47, 53, 73

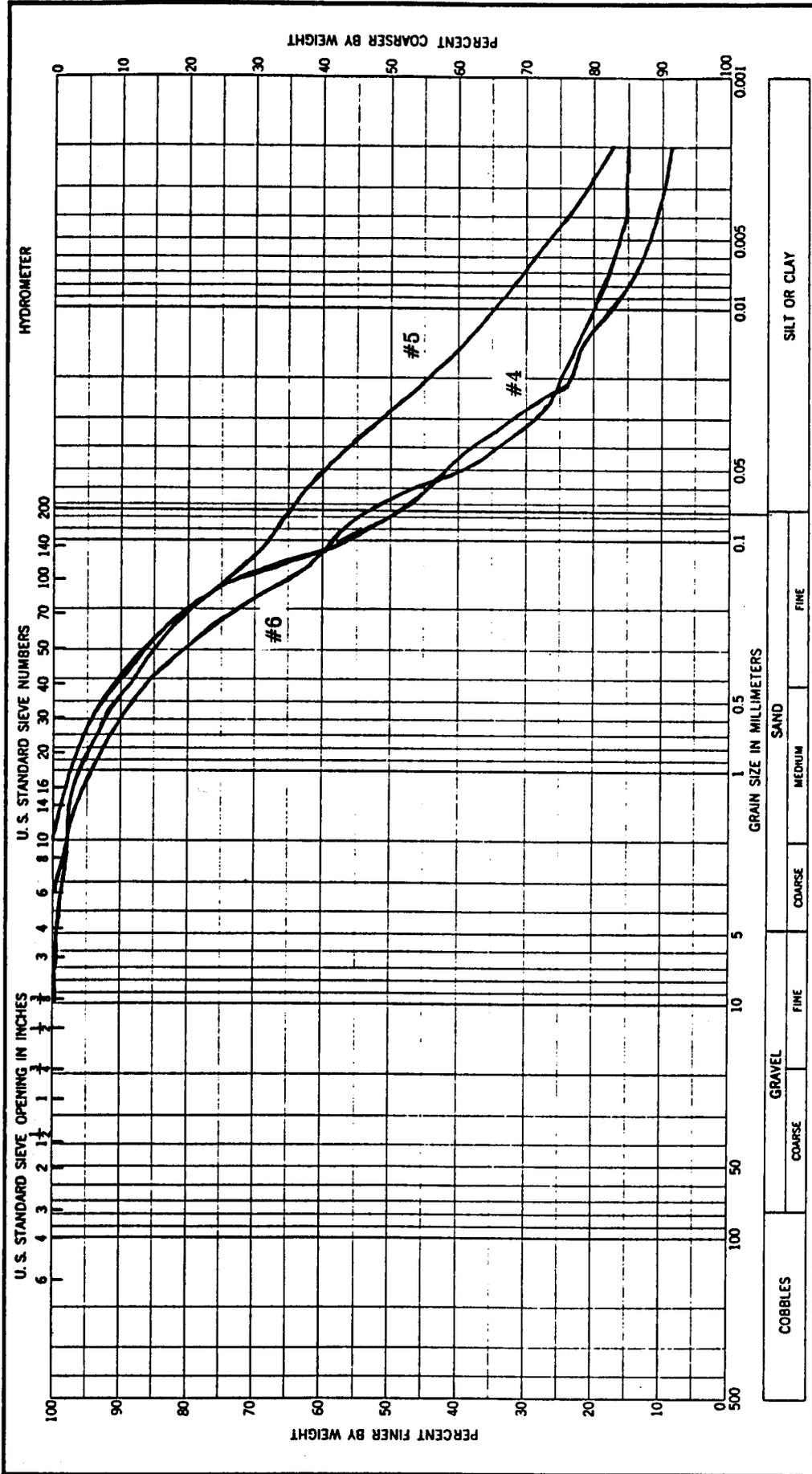
② Soil Testing: Sieve Analysis

<u>FORMATION</u>		<u>Field Log</u> <u>USCS</u>	<u>depth</u>	<u>% Silt + Clay</u>	<u>USCS</u>	<u>AASHTO</u>
	Borings:	P-23	19	44	SM	silt/clay
IV		P-34 ✓	39	34	SM	Silty F. Sand
		P-71 ✓	14	38	SM	silt/clay
III		P-25 ✓	24	46	SM	"
IV		P-25 X-	39	51	ML	"
VI		P-44 ✓	64	65	ML	"
III		P-44 ✓	34	39	SM	"
III		P-53 ✓	14	20	SM	Sand
		P-63 ✓	19	53	ML	silt/clay
		B-4 -	2-8	58.7	ML	A-7
		B-6 -	2-10	71.4	MH	A-5

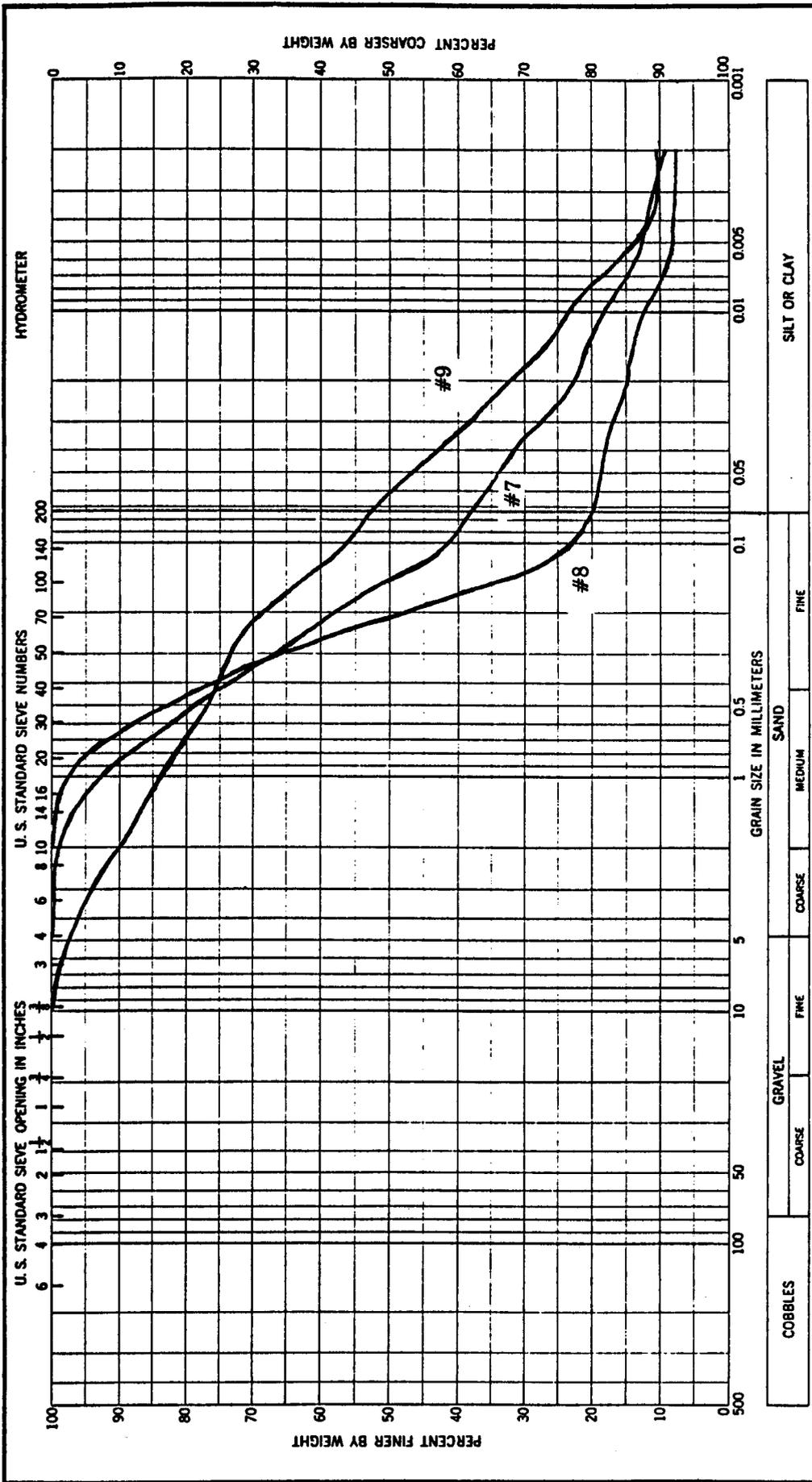


Silt + Clay
 44
 34
 38

Curve	Boring No.	Depth, ft	Percent Sand	Percent Silt	Percent Clay
#1	P23	19.0	40	32	12
#2	P34	39.0	61	25	9
#3	P71	14.0	62	30	8

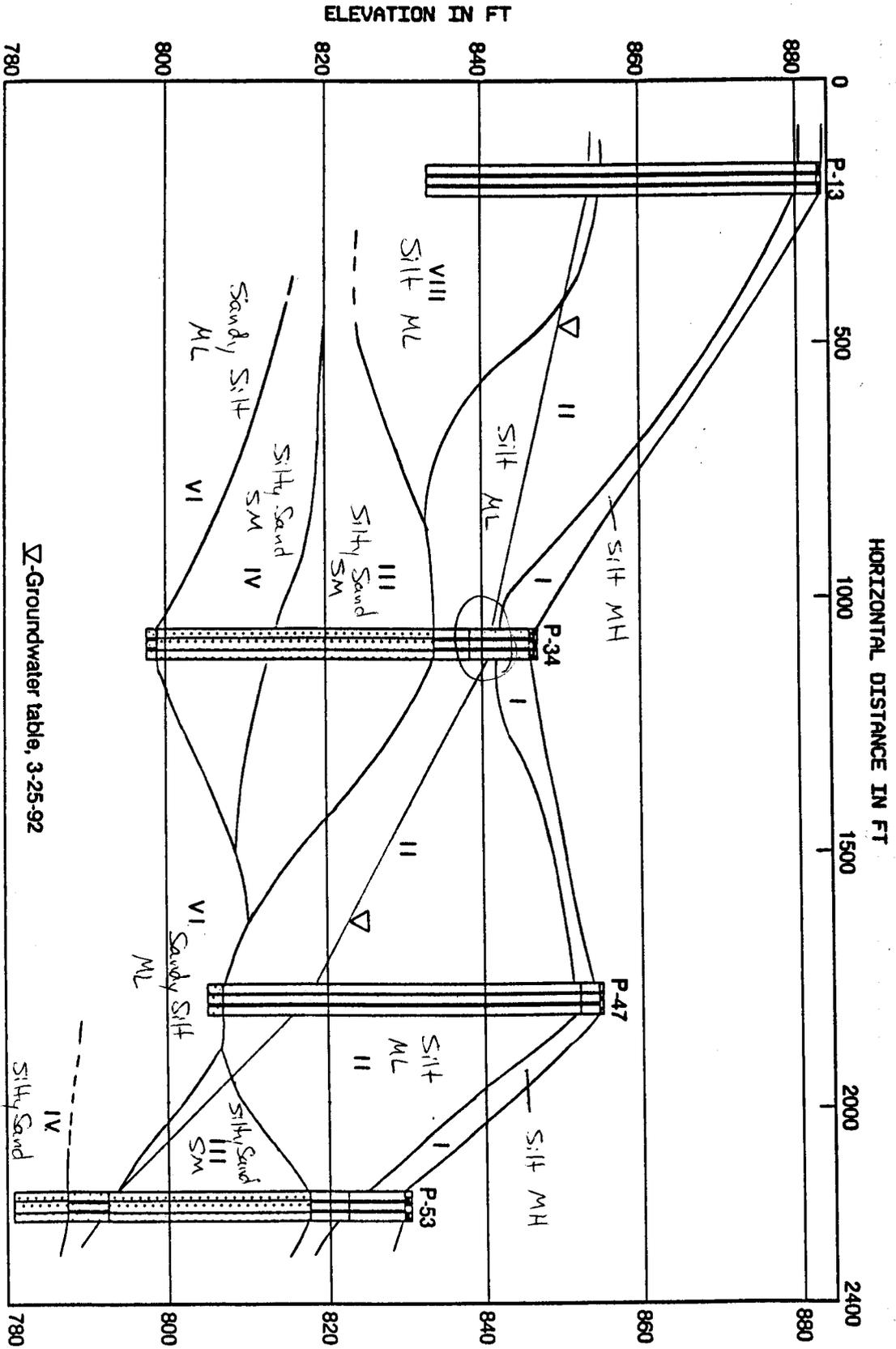


Curve	Boring No.	Depth, ft	Percent Sand	Percent Silt	Percent Clay	Silt + Clay
#4	P25	24.0	53	38	8	46
#5	P25	39.0	49	36	15	51
#6	P44	64.0	35	47	18	65



Silt + Clay
 39
 20
 53

Curve	Boring No.	Depth, ft	Percent Sand	Percent Silt	Percent Clay
#7	P44	34	61	29	10
#8	P53	14	80	12	8
#9	P63	19	45	42	11

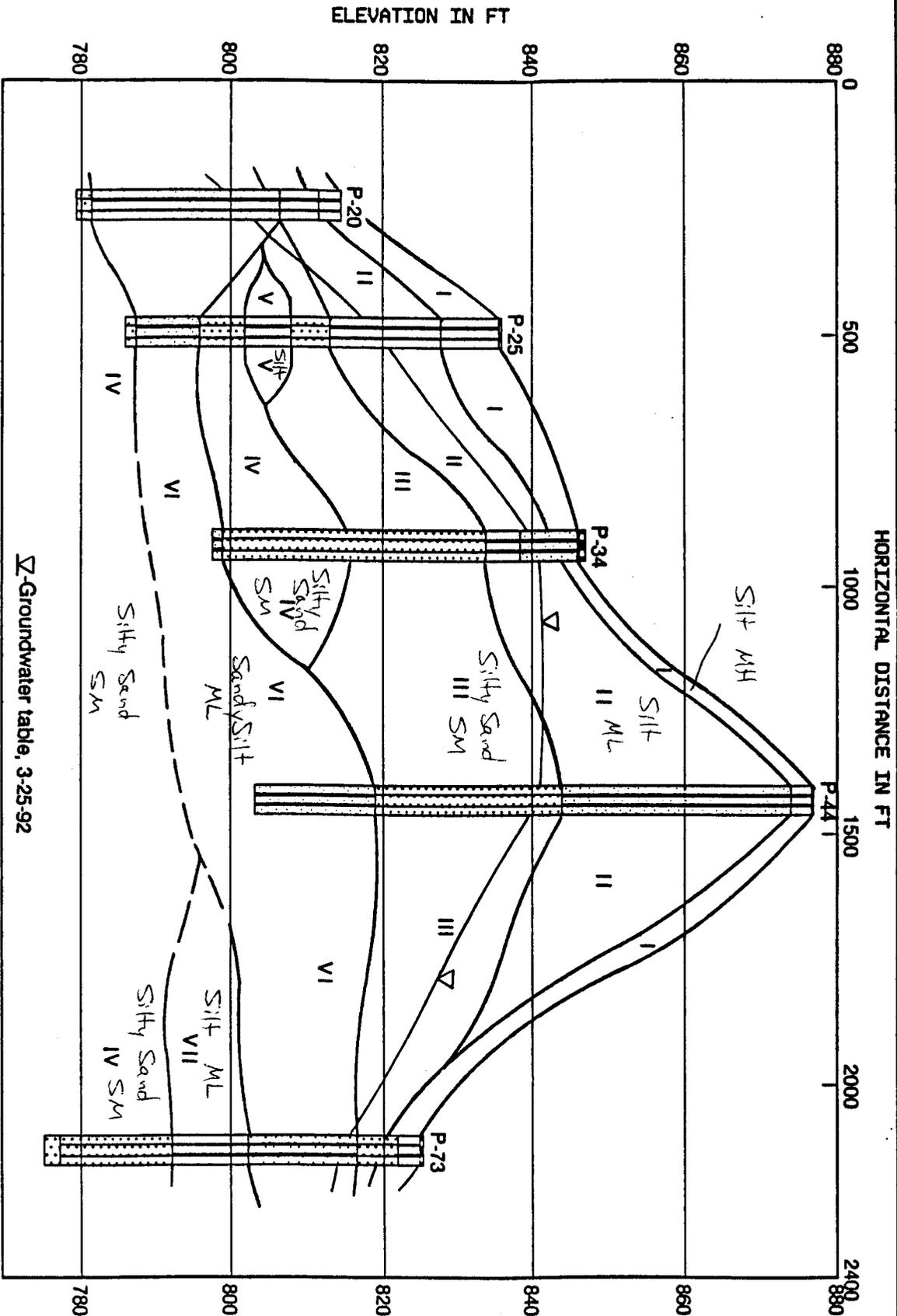


Data concerning subsurface conditions have been obtained at boring locations only. Actual conditions at locations between borings may differ from the generalized profile shown here.

See Table 2 for formation soil types, permeabilities, and porosities

▽-Groundwater table, 3-25-92

**SUBSURFACE PROFILE A-A
PLATE 2**



Data concerning subsurface conditions have been obtained at boring locations only. Actual conditions at locations between borings may differ from the generalized profile shown here.

See Table 2 for formation soil types, permeabilities, and porosities

Σ-Groundwater table, 3-25-92

**SUBSURFACE PROFILE B-B
PLATE 3**

SOIL FORMATIONS

FORMATION I

P-13	Silt	MH	Brown, med. dense w/ clay	
P-34	Sandy Silt	ML	Brown, loose	6.0×10^{-7}
P-47	Silt	MH	Red, med. dense w/ clay	
P-53	Silt	MH	Red, loose w/ clay	5.6×10^{-7}
P-20	Silt	MH	Red, med. dense w/ sand	
P-25	Silt	MH	Red, med. dense w/ clay	
P-34	Sandy Silt	ML	Brown, loose	6.0×10^{-7}
P-44	Silt	MH	Red, med. dense w/ clay + sand	
P-73	Silt	MH	Brown, loose w/ sand + clay	

FORMATION II

P-13	Silt	ML	Brown, med. dense	3.4×10^{-6}
P-34	Silt	ML	Tan, loose	3.8×10^{-6}
P-47	Silt	ML	Red, dense w/ sand	2.6×10^{-6}
P-53	Silt	ML	Brown, loose w/ mica	4.2×10^{-6}
P-20	Silt	ML	Brown, med. dense w/ mica	
P-25	Silt	ML	Brown, loose w/ sand + gravel	2.9×10^{-7}
P-34	Silt	ML	Tan, loose	3.8×10^{-6}
P-44	Sandy Silt	ML	Tan, med. dense	
P-73	—	—	—	—

FORMATION III

P-13	-	-			
P-34	Silty Sand	SM	Brown, med. dense	3.6 x 10⁻⁶	1.8 x 10 ⁻⁶
P-47	-	-			
P-53	Silty Sand	SM	Tan, loose		3.6 x 10 ⁻⁶
P-20	-	-			
P-25	Silty Sand	SM	Grey, dense		1.5 x 10 ⁻⁶
P-34	Silty Sand	SM	Brown, med. dense		1.8 x 10 ⁻⁶
P-44	Silty Sand	SM	Tan, med. dense		
P-73	Silty Sand	SM	Tan, loose		2.1 x 10 ⁻⁷

FORMATION IV

P-25	Silty Sand	SM	White, med dense		1.7 x 10 ⁻⁵
P-34	Silty Sand	SM	Brown, med dense		3.0 x 10 ⁻⁵
P-53	Silty Sand	SM	Tan, med dense		4.7 x 10 ⁻⁵

FORMATION V

P-25	Silt	ML	Brown, med dense		2.9 x 10 ⁻⁵
------	------	----	------------------	--	------------------------

FORMATION VI

P-13	-	-		
P-34	Sandy Silt	ML	Tan, very dense	
P-47	Sandy Silt	ML	Brown, very dense	2.0×10^{-5}
P-53	Sandy Silt	ML	Brown, med dense	5.1×10^{-5}
P-20	Sandy Silt	ML	Tan, med. dense	
P-25	Sandy Silt	ML	Tan, dense	
P-34	Sandy Silt	ML	Tan, very dense	
P-44	Sandy Silt	ML	Brown, very dense	
P-73	Sandy Silt	ML	Tan, loose	4.9×10^{-6}

FORMATION VII

P-73	Silt	ML	Tan, med. dense	4.9×10^{-6}
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FORMATION VIII

P-13	Silt	ML	Brown,	1.2×10^{-5}
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TABLE 2

**SUBSURFACE SOIL FORMATIONS
IREDELL COUNTY LANDFILL
PROJECT NO. 92101.02**

<u>Formation Number</u>	<u>Soil Description</u>	<u>Permeability (k_{ave}) cm/sec</u>	<u>Porosity (n_{ave}) %</u>
I	Silt, with sand/sandy silt	4×10^{-7}	38
II	Silt, trace sand and clay	4×10^{-6}	48
III	Silty sand	2×10^{-6}	42
IV	Sandy silt/silty sand	3×10^{-5}	33
V	Silt, trace sand	3×10^{-5}	51
VI	Sandy silt	5×10^{-6}	48
VII	Silt, with sand	3×10^{-6}	48
VIII	Silt, trace sand	1×10^{-5}	51

IREDELL County

BORING No.	TOTAL DEPTH	Soil CLASSIFICATIONS	AUGER REFUSAL	COMMENTS
B-1	43.5	YES	AR	OK
B-2	45.0	YES	-	-
B-4	50.0	YES	-	OK
P-1	29.8	YES	-	-
P-2	32.6	YES	AR	OK
P-3	30.0	NO	NO	X
P-4	50.0	YES	AR	OK
P-5	35.0	NO	NO	X
P-6	20.0	YES	NO	- X
P-7	30.0	NO	NO	X
P-8	50.0	YES	-	OK
P-9	Deleted			
P-10	45.0	YES	NO	- X
P-11	40.0	NO	NO	X
P-12	49.0	NO	NO	X
P-13	50.0	YES	-	OK
P-14	30.0	NO	NO	X
P-15	30.0	YES	NO	- X
P-16	49.0	NO	NO	X
P-17	51.0	YES	AR	OK
P-18	16.0	NO	AR	- -
P-19	25.0	NO	NO	X
P-20	35.0	YES	-	- X
P-21	35.0	NO	NO	X
P-22	30.0	NO	NO	X
P-23	40.0	YES	NO	- X
P-24	29.0	NO	NO	X

BORING No.	TOTAL DEPTH	Soil CLASSIFICATIONS	AUGER REFUSAL	COMMENTS
P-25	50.0	YES	—	OK
P-26	34.0	NO	NO	X
P-27	19.8	YES	—	±
P-28	8.0	NO	NO	X
P-29	48.0	YES	AR	OK
P-30	23.0	NO	NO	X
P-31	20.0	YES	NO	— X
P-32	50.0	YES	—	OK
P-33	19.0	NO	NO	X
P-34	49.3	YES	—	OK
P-35	24.0	NO	NO	X
P-36	20.0	YES	NO	— X
P-37	19.5	NO	NO	X
P-38	20.0	YES	NO	— X
P-39	24.0	NO	NO	X
P-40	50.0	YES	—	OK
P-41	39.0	NO	NO	X
P-42	49.3	YES	—	OK
P-43	44.0	NO	NO	X
P-44	73.7	YES	—	OK
P-45	49.6	YES	±	OK
P-46	49.0	NO	NO	X
P-47	49.9	YES	—	OK
P-48	49.0	NO	NO	X
P-49	44.7	YES	—	— X
P-50	In complete data			

BORING No.	TOTAL DEPTH	Soil CLASSIFICATIONS	AUGER REFUSAL	COMMENTS
P-51	49.5	YES	AR	OK
P-52	Deleted			
P-53	49.6	YES	±	OK
P-54	Deleted			
P-55	25.0	YES	No	- X
P-56	Deleted			
P-57	Incomplete			
P-58	18.7	YES	No	- X
P-59	25.0	No	No	X
P-60	Deleted			
P-61	Deleted			
P-62	40.0	No	No	X
P-63	49.6	YES	±	OK
P-64	Deleted			
P-65	75.0	YES	±	OK
P-66	35.0	No	No	X
P-67	Deleted			
P-68	59.0	YES	AR	OK
P-69	Deleted			
P-70	38.6	YES	No	- X
P-71	30.0	YES	No	- X
P-72	Incomplete			
P-73	50.0	YES	-	OK
P-74	Incomplete			
P-75	40.0	YES	No	- X

TERMS AND SYMBOLS USED ON BORING LOGS

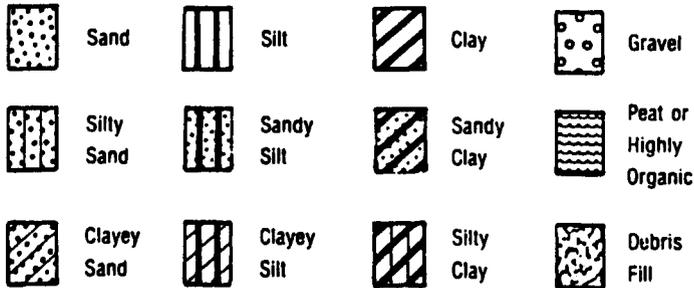
DRILLING AND SAMPLING TYPE

AS - Auger Sample
 BS - Bag Sample
 CS - Continuous Sample
 FA - Flight Auger
 HA - Hand Auger

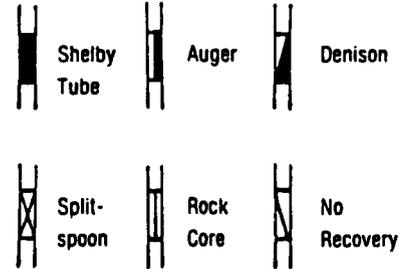
HSA - Hollow Stem Auger
 NW - Wireline Core
 NX - NX Core
 RB - Rotary Bit
 SS - Split Spoon Sample

ST - Shelby Tube Sample
 WB - Wash Bore
 WS - Wash Sample

SOIL TYPES SYMBOLS



SAMPLER TYPES SYMBOLS

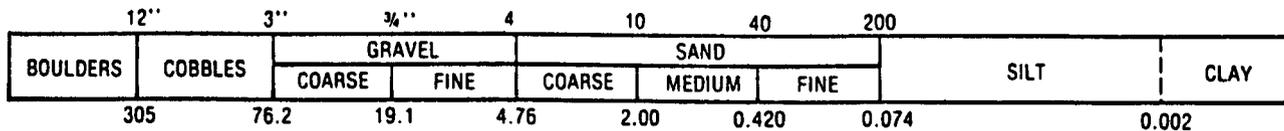


DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on ASTM Designations D-2487 and D-2488 (Unified Classification System). Information on each boring log is a compilation of subsurface conditions, i.e. the soil or rock classifications are obtained from the field as well as from laboratory testing of selected samples. The indicated boundaries between strata on the boring logs are approximate only and may be transitional. Solid lines indicate observed stratum boundaries, and dashed lines indicate interpreted stratum boundaries.

SOIL GRAIN SIZE

U.S. STANDARD SIEVE



SOIL GRAIN SIZE IN MILLIMETERS

CONSISTENCY OF COHESIVE SOILS

Descriptive Term	Cohesion (psf)
Very Soft	less than 250
Soft	250 to 500
Firm	500 to 1000
Stiff	1000 to 2000
Very Stiff	2000 to 4000
Hard	greater than 4000

RELATIVE DENSITY OF GRANULAR SOILS

Descriptive Term	Blows Per Ft ("N")
Very Loose	less than 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	greater than 50

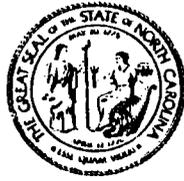
MOISTURE CONDITION

Damp	Slight indication of moisture
Moist	Color change with short period of air exposure (granular soil) Below optimum moisture content (cohesive soil)
Wet	High degree of saturation by visual and touch (granular soil) Above optimum moisture content (cohesive soil)
Saturated	Free surface water

RELATIVE PROPORTIONS

trace	minor amount
with	significant amount
modifier/and	sufficient amount to influence material behavior

502865



State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

July 22, 1992

Mr. Wayne Sullivan
Municipal Engineering Services Co., P.A.
P.O. Box 97
Garner, N.C. 27529

Re: Completeness Review - Iredell County Sanitary Landfill Site
Plan Application

Dear Mr. Sullivan:

The Solid Waste Section has conducted a preliminary review of the referenced project, submitted by Municipal Engineering Services Co., PA in behalf of Iredell County. In accordance with the N.C. Solid Waste Management Rules, the following comments must be addressed to continue the review process:

1. The application inadequately addresses Section 0.0503 (1) (a) which concerns floodplains. Please revise the application to meet the requirements of the rule. Floodplains were addressed in association with the application for the 60 acre tract previously granted site approval. However, the map needs documentation showing the source, the year the map was developed, and a stated return year upon which the floodplain map was developed.
2. The application does not address Section 0.0503 (1) (b) (iv) which concerns adverse impacts to state parks, recreation or scenic areas, or any other lands included in the state nature or historic preserve. The Section will require written documentation from N.C. DEHNR, Division of Parks and Recreation, N. C. Natural Heritage Program stating the proposed project meets the requirements of Section 0.0503 (1) (b) (iv) before site plan approval can be granted to the new areas.

3. The application does not adequately address Section 0.0504 (1) (a and b). Please revise the application to address all of the requirements listed in Section 0.0504 (1) (a and b).
4. The application does not fully address Section 0.0504 (1) (c) of the N.C. SWM Rules which requires a geological and hydrological study of the site. Various requirements in this section are left out of the application or are insufficiently addressed. The applicant shall revise the application to ensure that all elements of Section 0.0504 (1) (c) are met.
5. The application does not fully address Section 0.0504 (1) (e) (i) of the N.C. SWM Rules. A copy of either the resolution or the minutes of the meeting where a vote on a motion was taken is required and shall be forwarded to the Division.
6. The application does not fully address Section 0.0504 (1) (e) (ii) of the N.C. SWM Rules which requires a letter from local government stating, "the proposal meets all of the requirements of the local zoning ordinance, or that the site is not zoned." As submitted, the letter from Iredell County describes the property's zoning and conditions which must be met in order for a landfill to be located on the property.
7. In January 1992, the Solid Waste Section implemented Policy Memorandum #18 which provides permitting policy during the interim period before new U.S. Environmental Protection Agency (EPA) regulations for Municipal Solid Waste Landfills (MSWLFs) take effect. The application should be amended to include a section addressing the new EPA rules (Subtitle D) as required by Policy Memorandum #18.

Subtitle D regulations not currently incorporated into North Carolina Solid Waste Management Rules and which pertain to the site plan application process include several new location restrictions and conceptual design criteria. Additional location restrictions not addressed elsewhere in the site plan application but which must be addressed under the interim permitting policy include: Subtitle D Section 258.10 (b) - (concerns airport safety); Subtitle D Section 258.13 - (concerns fault areas); Subtitle D Section 258.14 - (concerns seismic impact zones); and Subtitle D Section 258.15 - (concerns unstable areas). Current state regulations pertaining to floodplains already mirror Subtitle D. Consequently, floodplains can be addressed in the current application format.

These comments are intended to expedite the review of the application, and in no way do they restrict the Section's right to request information following the technical review process.

If there are any questions, or if you would like to schedule a meeting to discuss the application, please contact me at (919) 733-0692.

Respectfully,

Ellis Cayton, P.E.

cc: Mr. Rick Doby
Mr. Julian Foscue
Mr. Joel Mashburn

Iredell Site Suitability

Items NOT FULLY Addressed in
0.0504 (1) (c)

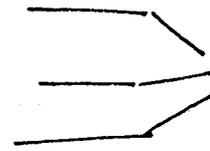
Springs

- * 1) Soils are not classified in USCS classification system 0.0504 (1) (c) (i) (C)
- 2) I have not reviewed for 0.0504 (1)(c)(i)(D), geologic considerations, solutions etc....
- 3) Percent water for undisturbed samples & Porosity for undisturbed samples are not provided 0.0504 (1)(c) (i) (E) (II + III)
- 4) Total Porosity & Atterberg Limits are not provided for Remolded Samples 0.0504 (1) (c) (i) (F) (II + III)
- 5) There are only 2 subsurface cross-sections - this seems insufficient considering the number of ~~borings~~ borings provided. 0.0504 (1)(c)(i)(G)
- (6) 0.0504 (1)(c)(i) (H) is confusing. From boring logs I see 0 hours after drilling & 24 hours after drilling. I do not see 7 days after boring.
- (7) There is no horizontal control for borings. The plan sheet shows this - ^{does} ~~is~~ this ^{provide enough accuracy?} ~~accuracy~~. There is a surface elevation for borings
- (8) Can a potentiometric map be developed without 7 day borings - I mean is one based on 0 hours & 24 hours okay?

*  Actually, on page 5 & 6, they say that:

they provided

- 3 Atterburg Limits
- 3 remolded permeabilities
- 3 specific gravity test
- 3 triaxial permeabilities



For core materials

With the Atterburg Limits, USCS could have been done.

On page 5, they claim to have classified according to USCS.

They also claim to have performed:

- 20 in-situ permeabilities
- + 11 grain-size analyses
- + 15 natural moisture contents

They also say that in ~~Appendix~~, Table 2 porosities are given. No lab sheets are provided to support this.

WATER TABLE ELEVATIONS
IREDELL COUNTY LANDFILL
 GAI Consultants-NC
 Project No. 92101.02

Piezometer Number	Date Drilled	Surface Elevation	Water Table Elevations - After Drilling				
			0 hrs	24 hrs	* Date	*Elevation	3-25-92
P-1	2-12-92	819.6	802.0	804.5			804.5
P-2	4-09-92	820.9	815.0	-----	4-20-92	815.5	-----
P-3	4-15-92	841.5	820.5	-----	4-20-92	822.0	-----
P-4	4-13-92	849.9	842.0	842.0			-----
P-5	4-15-92	870.2	847.0	847.0			-----
P-6	2-07-92	797.8	791.5	-----	3-25-92	795.5	795.5
P-7	4-16-92	832.5	805.5	-----	4-20-92	806.5	-----
P-8	1-30-92	856.2	825.0	826.0			827.5
P-10	1-30-92	872.8	836.5	838.5			838.0
P-11	6-26-90	875.0	840.0	-----	7-03-90	846.5	Dry <i>c/I ?</i>
P-12	2-06-92	875.8	828.0	844.0			844.0
P-13	1-07-92	883.2	846.0	853.0			853.5
P-14	6-26-90	884.0	875.0	-----	7-03-90	878.0	Dry <i>c/I ?</i>
P-15	2-14-92	834.7	817.5	-----	2-17-92	819.0	820.0
P-16	2-06-92	873.0	827.0	839.0			841.0
P-17	4-01-92	787.1	780.5	-----	4-20-92	782.0	-----
P-18	4-16-92	828.9	Dry	-----	4-20-92	Dry	-----
P-19	6-25-90	820.6	799.5	-----	7-03-90	Dry	Dry
P-20	2-07-92	814.4	801.5	-----	2-11-92	799.5	800.5
P-21	6-25-90	820.0	792.0	-----	7-03-90	793.0	812.0 <i>c/I ?</i>
P-22	6-25-90	855.7	830.5	-----	7-03-90	830.57	833.5
P-23	1-27-92	861.4	836.5	836.5			836.5
P-24	2-06-92	842.4	821.5	825.5			827.0
P-25	1-08-92	835.9	814.0	817.5			819.5
P-26	2-06-92	831.5	806.5	807.5			809.5
P-27	4-01-92	785.6	779.5	-----	4-17-92	781.0	-----
P-28	4-16-92	804.6	Dry	-----	4-20-92	Dry	-----
P-29	2-20-92	829.2	814.5	814.0			817.0
P-30	2-05-92	831.7	815.0	815.5			817.5
P-31	1-09-92	835.3	825.5	826.5			827.0
P-32	4-09-92	838.1	829.5	-----	4-21-92	832.0	-----
P-33	2-05-92	842.3	831.0	834.0			835.5
P-34	1-08-92	846.8	840.0	841.0			841.0
P-35	2-05-92	849.5	832.5	842.5			844.0
P-36	1-09-92	852.0	848.5	848.5			847.0
P-37	2-05-92	857.8	845.0	849.0			850.5
P-38	1-16-92	861.6	849.0	850.5			852.0
P-39	2-05-92	867.1	849.0	851.0			852.0

* Date and Elevation of second reading later than 24 hours after drilling; 24 hr reading not available

**WATER TABLE ELEVATIONS
IREDELL COUNTY LANDFILL
GAI Consultants-NC
Project No. 92101.02**

Piezometer Number	Date Drilled	Surface Elevation	Water Table Elevations - After Drilling				
			0 hrs	24 hrs	* Date	*Elevation	3-25-92
			846.0	848.5			848.5
P-40	1-29-92	875.0	849.0	-----	2-11-92	847.5	848.0
P-41	2-07-92	877.0	847.5	847.5			848.0
P-42	1-28-92	876.7	842.0	844.5			845.5
P-43	2-04-92	874.5	839.0	-----	2-13-92	840.0	840.5
P-44	2-07-92	876.9	830.5	833.5			833.5
P-45	1-14-92	870.3	831.0	-----	2-11-92	830.5	830.5
P-46	2-07-92	862.2	811.5	818.5			818.5
P-47	1-15-92	854.9	812.0	812.5			812.5
P-48	2-05-92	851.3	808.5	809.0			809.0
P-49	1-15-92	842.2	Dry	-----	4-27-92	789.0	-----
P-50	4-23-92	818.7	777.0	-----	4-20-92	776.0	-----
P-51	3-30-92	780.8	788.5	790.5			790.5
P-53	1-16-92	830.4	775.5	775.7			776.5
P-55	2-10-92	791.7	786.0	-----	4-27-92	794.0	-----
P-57	4-23-92	798.9	809.0	-----	4-21-92	810.0	-----
P-58	4-09-92	816.9	832.5	-----	4-20-92	832.5	-----
P-59	4-16-92	841.6	819.5	-----	4-20-92	820.0	-----
P-62	4-16-92	858.9	813.5	-----	2-11-92	816.5	817.0
P-63	1-17-92	850.5	787.0	-----	4-16-92	787.5	-----
P-65	4-08-92	815.2	774.0	-----	4-20-92	774.0	-----
P-66	4-16-92	805.0	775.5	-----	4-20-92	774.5	-----
P-68	4-07-92	780.5	781.0	-----	4-20-92	780.0	-----
P-70	4-07-92	795.8	784.0	786.0			789.0
P-71	2-12-92	803.0	793.5	-----	5-28-92	794.0	-----
P-72	4-28-92	796.6	806.5	812.5			813.5
P-73	2-12-92	825.3	835.5	-----	4-27-92	835.0	-----
P-74	4-23-92	861.4	828.0	831.0			831.5
P-75	1-29-92	857.0	793.5	788.5			802.0
B-1	8-5-86	828.5	818.0	826.0			836.5
B-2	8-5-86	858.8	875.0	831.0			842.0
B-4	8-7-86	875.0					

* Date and Elevation of second reading later than 24 hours after drilling; 24 hr reading not available

UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3 in. and basing fractions on estimated weights).				
COARSE-GRAINED SOILS More than half of material is larger than No. 200 sieve size. More than half of material is larger than No. 200 sieve size.	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (Little or no fines).	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.			
		Gravels with Fines (Appreciable amount of fines).	GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.			
		SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands (Little or no fines).	GM	Silty gravel, gravel-sand-silts mixture.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).		
			Sands with Fines (Appreciable amount of fines).	GC	Clayey gravels, gravel-sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		
	FINE-GRAINED SOILS More than half of material is smaller than No. 200 sieve size. The No. 200 sieve is about the smallest particle visible to the naked eye.	SANDS AND SILTS AND CLAYS Liquid limit is less than 50	Clean Sands (Little or no fines).	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.		
			Sands with Fines (Appreciable amount of fines).	SP	Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.		
		SANDS AND SILTS AND CLAYS Liquid limit is greater than 50	Clean Sands (Little or no fines).	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).		
			Sands with Fines (Appreciable amount of fines).	SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		
			SANDS AND SILTS AND CLAYS Liquid limit is less than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None
				CL	Inorganic clays of low to medium plasticity gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium
OL	Organic silts and organic silty clays of low plasticity.	Slight to medium		Slow	Slight			
SANDS AND SILTS AND CLAYS Liquid limit is greater than 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium			
	CH	Inorganic clays of high plasticity, fat clays.	High to very High	None	High			
	OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to medium			
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.					

**CORRELATION OF PENETRATION RESISTANCE (ASTM D 1586) WITH
RELATIVE DENSITY AND CONSISTENCY**

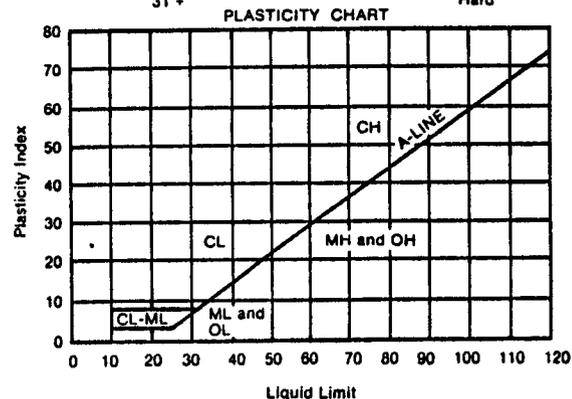
PENETRATION RESISTANCE, N Blows per foot	RELATIVE DENSITY	PENETRATION RESISTANCE, N Blows per foot	CONSISTENCY
0 - 4	Very Loose	0 - 2	Very Soft
5 - 10	Loose	3 - 4	Soft
SANDS AND GRAVELS 11 - 20	Firm	SILTS AND CLAYS 5 - 8	Firm
21 - 30	Very Firm	9 - 15	Stiff
31 - 50	Dense	16 - 30	Very Stiff
Over 50	Very Dense	31 +	Hard

PARTICLE SIZE IDENTIFICATION

BOULDER	- Greater than 12 inches	SAND	- Coarse - 2 mm to 4.76 mm
COBBLES	- 3 inches to 12 inches		- Medium - 0.42 mm to 2 mm
GRAVEL	- Coarse - 1/4 inch to 3 inches	SILT & CLAY	- Fine - 0.074 mm to 0.42 mm
	- Fine - 4.76 mm to 1/4 inch		- Less than 0.074 mm

SOIL LABORATORY TEST DATA SYMBOLS FOR BORING LOGS

γ_w = Wet Unit Weight	W = Moisture Content (%)
γ_d = Dry Unit Weight	LL = Liquid Limit (%)
v = Void Ratio	PL = Plastic Limit (%)
c_c = Unconfined Compressive Strength	PI = Plasticity Index (%) (LL-PL)
c_u = Compression Index	
c = Cohesion, Total Stress	
c_e = Cohesion, Effective Stress	
ϕ = Friction Angle, Degrees, Total Stress	TRIAxIAL = Triaxial Shear Test
ϕ' = Friction Angle, Degrees, Effective Stress	CONSOL. = Consolidation Test
	G.S. = Grain Size Distribution Test



TERMS AND SYMBOLS USED ON BORING LOGS

DRILLING AND SAMPLING TYPE

AS - Auger Sample	HSA - Hollow Stem Auger	ST - Shelby Tube Sample
BS - Bag Sample	NW - Wireline Core	WB - Wash Bore
CS - Continuous Sample	NX - NX Core	WS - Wash Sample
FA - Flight Auger	RB - Rotary Bit	
HA - Hand Auger	SS - Split Spoon Sample	

SOIL TYPES SYMBOLS

	Sand		Silt		Clay		Gravel
	Silty Sand		Sandy Silt		Sandy Clay		Peat or Highly Organic
	Clayey Sand		Clayey Silt		Silty Clay		Debris Fill

SAMPLER TYPES SYMBOLS

	Shelby Tube		Auger		Denison
	Split-spoon		Rock Core		No Recovery

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on ASTM Designations D-2487 and D-2488 (Unified Classification System). Information on each boring log is a compilation of subsurface conditions, i.e. the soil or rock classifications are obtained from the field as well as from laboratory testing of selected samples. The indicated boundaries between strata on the boring logs are approximate only and may be transitional. Solid lines indicate observed stratum boundaries, and dashed lines indicate interpreted stratum boundaries.

SOIL GRAIN SIZE

U. S. STANDARD SIEVE

	12"	3"	3/4"	4	10	40	200		
BOULDERS	COBBLES		GRAVEL		SAND			SILT	CLAY
			COARSE	FINE	COARSE	MEDIUM	FINE		
	305	76.2	19.1	4.75	2.00	0.420	0.074		0.002

SOIL GRAIN SIZE IN MILLIMETERS

CONSISTENCY OF COHESIVE SOILS

Descriptive Term	Cohesion (psf)
Very Soft	less than 250
Soft	250 to 500
Firm	500 to 1000
Stiff	1000 to 2000
Very Stiff	2000 to 4000
Hard	greater than 4000

RELATIVE DENSITY OF GRANULAR SOILS

Descriptive Term	Blows Per Ft ("N")
Very Loose	less than 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	greater than 50

MOISTURE CONDITION

Damp	Slight indication of moisture
Moist	Color change with short period of air exposure (granular soil) Below optimum moisture content (cohesive soil)
Wet	High degree of saturation by visual and touch (granular soil) Above optimum moisture content (cohesive soil)
Saturated	Free surface water

RELATIVE PROPORTIONS

trace	minor amount
with	significant amount
modifier/and	sufficient amount to influence material behavior

502665

TABLE III-1

**IN-SITU PERMEABILITY DATA
IREDELL COUNTY LANDFILL
PROJECT NO. 92101.02**

<u>Formation Number</u>	<u>Boring</u>	<u>Depth ft.</u>	<u>Permeability cm/sec</u>	<u>Average Permeability cm/sec</u>
I	P34	4.0	6.0×10^{-7}	4×10^{-7}
	P25	9.0	2.9×10^{-7}	
	P53	4.0	5.6×10^{-7}	
	P73	4.0	2.1×10^{-7}	
II	P13	14.0	3.4×10^{-6}	4×10^{-6}
	P34	9.0	3.8×10^{-6}	
	P47	9.0	2.6×10^{-6}	
	P47	29.0	4.2×10^{-6}	
III	P25	24.0	1.5×10^{-6}	2×10^{-6}
	P34	29.0	1.8×10^{-6}	
	P53	24.0	3.6×10^{-6}	
IV	P25	39.0	1.7×10^{-5}	3×10^{-5}
	P34	39.0	3.0×10^{-5}	
	P47	49.0	2.0×10^{-5}	
	P53	39.0	5.1×10^{-5}	
	P53	44.0	4.7×10^{-5}	
V	P25	29.0	2.9×10^{-5}	3×10^{-5}
VI	P73	14.0	4.9×10^{-6}	5×10^{-6}
VII	P73	29.0	2.9×10^{-6}	3×10^{-6}
VIII	P13	34.0	1.2×10^{-5}	1×10^{-5}

POROSITY AND PERMEABILITY CONSIDERATIONS

Porosity of soil and rock has been given at least three different classifications based on slightly differing behavior properties or characteristics pertaining to porosity. These three different classifications are generally named total or primary porosity, secondary porosity, and effective porosity. (Volumetric porosity and areal porosity are also porosity classifications that are worth mentioning for a rigorous treatise.) Total porosity is equal to primary porosity of an aquifer material and is related to in situ void space. Secondary porosity relates to macroscopic flow through an aquifer and is affected by fractures, faults, weathering, solution features, etc. of the aquifer material, which features generally result in an increase in both porosity and permeability of the aquifer. Effective porosity relates to gravity drainage of a fluid from an isolated unit of aquifer material and is generally a percentage of total porosity.

Permeability of aquifer materials is measured in the field and/or laboratory and is used in conjunction with porosity to estimate the rate at which fluid flows through aquifer materials. It is considered evident that permeability and porosity determinations must be compatible (determined or estimated under or for similar prevailing conditions and environment) to obtain a reasonable and applicable fluid flow rate through an aquifer.

When determining flow rates, a porosity value should be used that is compatible with fluid head, field determined permeability, field flow conditions, and aquifer material. The statement in GAI's reports concerning secondary porosity indicates that porosity values used in the rate calculations apply to the aquifer material around the well only and do not include any potential secondary porosity features that could and probably do exist between monitoring wells. GAI used values considered to be representative of the controlling porosity of the aquifer material based in part on fluid head applied, type of aquifer material, quantity of flow, and field determined permeability values. Flow rates determined or computed should be reasonable for the aquifer materials and existing conditions.

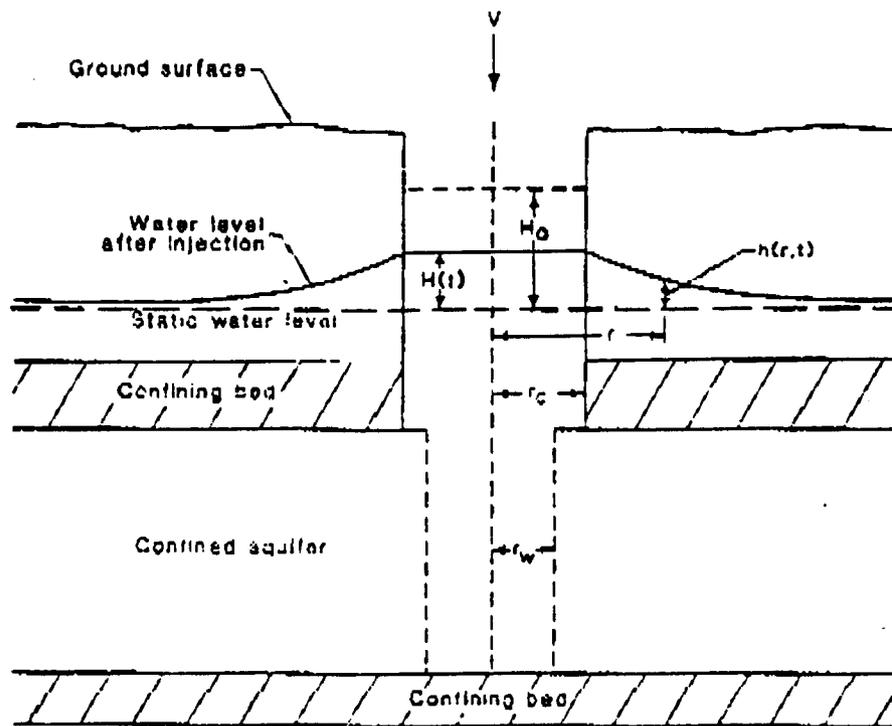


FIG. 1 Cross Section Through a Well in Which a Slug of Water is Suddenly Injected

TABLE 3-1. DEFAULT VALUES FOR EFFECTIVE POROSITY (Ne) FOR USE
IN TIME OF TRAVEL (TOT) ANALYSES

Soil textural classes	Effective porosity of saturation ^a
<u>Unified soil classification system</u>	
GS, GP, GM, GC, SW, SP, SM, SC	0.20 (20%)
ML, MH	0.15 (15%)
CL, OL, CH, OH, PT	0.01 (1%) ^b
<u>USDA soil textural classes</u>	
Clays, silty clays, sandy clays	0.01 (1%) ^b
Silts, silt loams, silty clay loams	0.10 (10%)
All others	0.20 (20%)
<u>Rock units (all)</u>	
Porous media (nonfractured rocks such as sandstone and some carbonates)	0.15 (15%)
Fractured rocks (most carbonates, shales, granites, etc.)	0.0001 (0.01%)

Source: Barari, A., and L. S. Hedges. 1985. Movement of Water in Glacial Till. *Proceedings of the 17th International Congress of the International Association of Hydrogeologists*, pp. 129-134.

^a These values are estimates and there may be differences between similar units. For example, recent studies indicate that weathered and unweathered glacial till may have markedly different effective porosities (Barari and Hedges, 1985; Bradbury et al., 1985).

^b Assumes *de minimus* secondary porosity. If fractures or soil structure are present, effective porosity should be 0.001 (0.1%).

TABLE 6
PERMEABILITY AND DRAINAGE CHARACTERISTICS OF SOILS

Coefficient of Permeability k in cm per sec (log scale)

	10^2	10^1	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	10^{-9}	
Drainage												
Soil types	Clean gravel	Good						Poor		Practically Impervious		
		Clean sands, clean sand and gravel mixtures	Clean sands, organic and inorganic silts, mixtures of sand silt and clay, glacial till, stratified clay deposits, etc.	"Impervious" soils, e.g., homogeneous clays below zone of weathering								
Direct determination of k	Direct testing of soil in its original position—pumping tests. Reliable if properly conducted. Considerable experience required											
	Constant-head permeameter. Little experience required											
Indirect determination of k		Falling-head permeameter. Reliable. Little experience required	Falling-head permeameter. Unreliable. Much experience required						Falling-head permeameter. Fairly reliable. Considerable experience necessary		Computation based on results of consolidation tests. Reliable. Considerable experience required	
	Computation from grain-size distribution. Applicable only to clean cohesionless sands and gravels											

After A. Casagrande and R. E. Fadum

If the total unit volume V_T of a soil or rock is divided into the volume of the solid portion V_s and the volume of the voids V_v , the porosity n is defined as $n = V_v/V_T$. It is usually reported as a decimal fraction or a percent.

Figure 2.11 shows the relation between various rock and soil textures and porosity. It is worth distinguishing between *primary porosity*, which is due to the

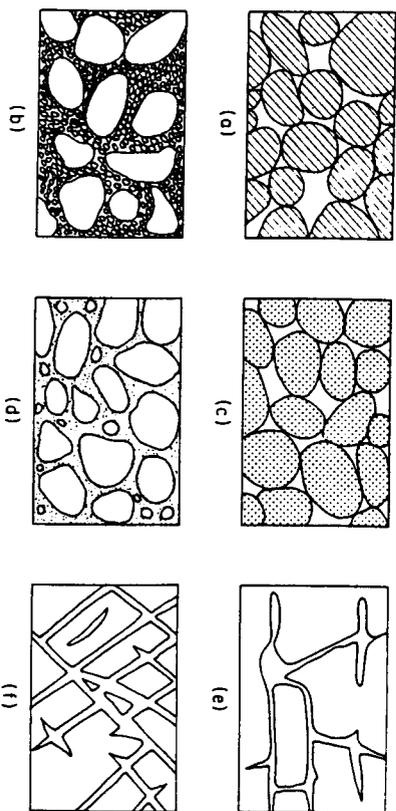


Figure 2.11 Relation between texture and porosity: (a) Well-sorted sedimentary deposit having high porosity; (b) poorly sorted sedimentary deposit having low porosity; (c) well-sorted sedimentary deposit consisting of pebbles that are themselves porous, so that the deposit as a whole has a very high porosity; (d) well-sorted sedimentary deposit whose porosity has been diminished by the deposition of mineral matter in the interstices; (e) rock rendered porous by solution; (f) rock rendered porous by fracturing (after Meinzer, 1923).

soil or rock matrix [Figure 2.11(a), (b), (c), and (d)], and *secondary porosity*, which may be due to such phenomena as secondary solution [Figure 2.11(e)] or structurally controlled regional fracturing [Figure 2.11(f)].

Table 2.4, based in part on data summarized by Davis (1969), lists representative porosity ranges for various geologic materials. In general, rocks have lower porosities than soils; gravels, sands, and silts, which are made up of angular and

	n (%)
Unconsolidated deposits	
Gravel	25-40
Sand	25-50
Silt	35-50
Clay	40-70
Rocks	
Fractured basalt	5-50
Karst limestone	5-50
Sandstone	5-30
Limestone, dolomite	0-20
Shale	0-10
Fractured crystalline rock	0-10
Dense crystalline rock	0-5

rounded particles, have lower porosities than soils rich in play clay minerals; and poorly sorted deposits [Figure 2.11(b)] have lower porosities than well-sorted deposits [Figure 2.11(a)].

The porosity n can be an important controlling influence on hydraulic conductivity K . In sampling programs carried out within deposits of well-sorted sand or in fractured rock formations, samples with higher n generally also have higher K . Unfortunately, the relationship does not hold on a regional basis across the spectrum of possible rock and soil types. Clay-rich soils, for example, usually have higher porosities than sandy or gravelly soils but lower hydraulic conductivities. In Section 8.7 techniques will be presented for the estimation of hydraulic conductivity from porosity and from grain-size analyses.

The porosity n is closely related to the *void ratio* e , which is widely used in soil mechanics. The void ratio is defined as $e = V_v/V_s$, and e is related to n by

$$e = \frac{n}{1-n} \quad \text{or} \quad n = \frac{e}{1+e} \quad (2.40)$$

Values of e usually fall in the range 0-3.

The measurement of porosity on soil samples in the laboratory will be treated in Section 8.4.

Specific Discharge, Macroscopic Velocity, and Microscopic Velocity

Our development will be more rigorous if we first differentiate, as Bear (1972) has done, between the *volumetric porosity*, n , which was defined in Section 2.5, and the *areal porosity*, n_A , which can be defined for any areal cross section through a unit volume, as $n_A = A_v/A_T$, where A_v is the area occupied by the voids and A_T is the total area. As suggested by Figure 2.27(a), various cross sections within a given unit volume may exhibit differing areal porosities n_{A_1}, n_{A_2}, \dots . The volumetric porosity, n , is an average of the various possible areal porosities, n_A .

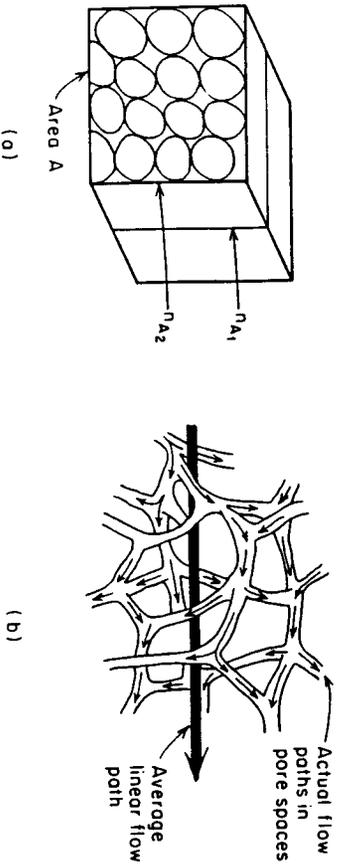


Figure 2.27 Concepts of (a) areal porosity and (b) average linear velocity.

For any cross section A , the *specific discharge*, v , is defined from Eq. (2.1) as

$$v = \frac{Q}{A}$$

In that the volumetric flux Q is divided by the full cross-sectional area (voids and solids alike), this velocity is identified as being pertinent to the macroscopic continuum approach. In actual fact, the flow passes through only that portion of the cross-sectional area occupied by voids. For cross section A , we can define a velocity $\bar{v}_1 = Q/n_1A$ that represents the volumetric flux divided by the actual cross-sectional area through which flow occurs. For the various sections A_1, A_2, \dots we can define $\bar{v}_1, \bar{v}_2, \dots$. If we denote their average by \bar{v} , then

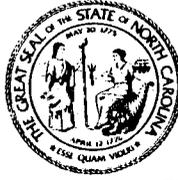
$$\bar{v} = \frac{Q}{nA} = \frac{v}{n} = \frac{-K}{n} \frac{\partial h}{\partial l} \quad (2.82)$$

The velocity \bar{v} is known under a variety of names. We will refer to it as the *average linear velocity*. In that Q , n , and A are measurable macroscopic terms, so is \bar{v} . It should be emphasized that \bar{v} does not represent the average velocity of the water particles traveling through the pore spaces. These true, microscopic velocities are generally larger than \bar{v} , because the water particles must travel along irregular paths that are longer than the linearized path represented by \bar{v} . This is shown schematically in Figure 2.27(b). The true, microscopic velocities that exist in the pore channels are seldom of interest, which is indeed fortunate, for they are largely indeterminate. For all the situations that will be considered in this text, the Darcy velocity v and the average linear velocity \bar{v} will suffice.

As a basis for further explanation of \bar{v} , consider an experiment where a tracer is used to determine how much time is required for the bulk mass of groundwater to move a short but significant distance AB along a flow path. \bar{v} is then defined as the ratio of travel distance to travel time, where the travel distance is defined as the linear distance from A to B and the travel time is the time required for the tracer to travel from A to B . In light of this conceptualization of \bar{v} , Nelson (1968) has suggested a slightly different form of Eq. (2.82):

$$\bar{v} = \frac{Q}{\epsilon n A} = \frac{v}{\epsilon n} \quad (2.83)$$

where ϵ is an empirical constant dependent on the characteristics of the porous medium. Data obtained in laboratory experiments by Ellis et al. (1968) using relatively uniform sands indicate values of ϵ in the range 0.98–1.18. Values of ϵ for nonuniform sands and for other materials do not exist at present. In studies of groundwater tracers and groundwater contamination the almost universal unstated assumption is that $\epsilon = 1$. For granular media this probably introduces little error. In fractured media the assumption may have less validity.



State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

July 22, 1992

*Gave this draft
to Jim Wootie in
mts 7/23/92*

Mr. Wayne Sullivan
Municipal Engineering Services Co., P.A.
P.O. Box 97
Garner, N.C. 27529

Re: Completeness Review - Iredell County Sanitary Landfill Site
Plan Application

Dear Mr. Sullivan:

The Solid Waste Section has conducted a preliminary review of the referenced project, submitted by Municipal Engineering Services Co., PA in behalf of Iredell County. In accordance with the N.C. Solid Waste Management Rules, the following comments must be addressed to continue the review process:

1. The application inadequately addresses Section 0.0503 (1) (a) which concerns floodplains. Please revise the application to meet the requirements of the rule. Floodplains were addressed in association with the application for the 60 acre tract previously granted site approval. However, the map needs documentation showing the source, the year the map was developed, and a stated return year upon which the floodplain map was developed.
2. The application does not address Section 0.0503 (1) (b) (iv) which concerns adverse impacts to state parks, recreation or scenic areas, or any other lands included in the state nature or historic preserve. The Section will require written documentation from N.C. DEHNR, Division of Parks and Recreation, N. C. Natural Heritage Program stating the proposed project meets the requirements of Section 0.0503 (1) (b) (iv) before site plan approval can be granted to the new areas.

*in
p.000*

3. ✓ The application does not adequately address Section 0.0504 (1) (a and b). Please revise the application to address all of the requirements listed in Section 0.0504 (1) (a and b).
4. B.B. The application does not fully address Section 0.0504 (1) (c) of the N.C. SWM Rules which requires a geological and hydrological study of the site. Various requirements in this section are left out of the application or are insufficiently addressed. The applicant shall revise the application to ensure that all elements of Section 0.0504 (1) (c) are met.
5. W.A. The application does not fully address Section 0.0504 (1) (e) (i) of the N.C. SWM Rules. A copy of either the resolution or the minutes of the meeting where a vote on a motion was taken is required and shall be forwarded to the Division.
6. The application does not fully address Section 0.0504 (1) (e) (ii) of the N.C. SWM Rules which requires a letter from local government stating, "the proposal meets all of the requirements of the local zoning ordinance, or that the site is not zoned." As submitted, the letter from Iredell County describes the property's zoning and conditions which must be met in order for a landfill to be located on the property.
7. In January 1992, the Solid Waste Section implemented Policy Memorandum #18 which provides permitting policy during the interim period before new U.S. Environmental Protection Agency (EPA) regulations for Municipal Solid Waste Landfills (MSWLFs) take effect. The application should be amended to include a section addressing the new EPA rules (Subtitle D) as required by Policy Memorandum #18.

Subtitle D regulations not currently incorporated into North Carolina Solid Waste Management Rules and which pertain to the site plan application process include several new location restrictions and conceptual design criteria. Additional location restrictions not addressed elsewhere in the site plan application but which must be addressed under the interim permitting policy include: Subtitle D Section 258.10 (b) - (concerns airport safety); Subtitle D Section 258.13 - (concerns fault areas); Subtitle D Section 258.14 - (concerns seismic impact zones); and Subtitle D Section 258.15 - (concerns unstable areas). Current state regulations pertaining to floodplains already mirror Subtitle D. Consequently, floodplains can be addressed in the current application format.

These comments are intended to expedite the review of the application, and in no way do they restrict the Section's right to request information following the technical review process.

If there are any questions, or if you would like to schedule a meeting to discuss the application, please contact me at (919) 733-0692.

Respectfully,

Ellis Cayton, P.E.

cc: Mr. Rick Doby
Mr. Julian Foscue
Mr. Joel Mashburn

OPERATION/CONSTRUCTION MANAGERS

CIVIL/SANITARY ENGINEERS

**Municipal
Services**



**Engineering
Company, P.A.**

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

April 23, 1992

Mr. Jim Coffey, Supervisor
Division of Solid Waste Management
P.O. Box 27687
Raleigh, N.C. 27611-7687

Re: Iredell County Site Suitability Application

Dear Mr. Coffey:

Please find enclosed additional information regarding the above referenced application. This information consists of 4 copies of soils, site studies and potentiometric map prepared by GAI Consultants. A letter from the Wilmington District Corps of Engineers concerning the wetlands. Also, letters from Iredell County and the City of Statesville concerning zoning of the site. Finally, an additional letter from the FAA concerning the proximity of the landfill with the airport.

Iredell County is running out of available space in their existing landfill and wants to be in their new landfill prior to October 9, 1993. Consequently, we would like to submit our operational plan as soon as possible so that the construction can take place in time for them to move into this site before the October deadline.

If you need additional information or have any questions, please feel free to contact me.

Sincerely yours,
MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

D. Wayne Sullivan

DWS:scw

Copy: Carson Fisher w/enclosure
Ron Weatherman w/o enclosure



DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS

P.O. BOX 1890
WILMINGTON, NORTH CAROLINA 28402-1890

IN REPLY REFER TO

April 21, 1992



Regulatory Branch

File No. CESAW-C092-J-049

Mr. Wayne Sullivan
Municipal Engineering Services
Post Office Box 97
Garner, North Carolina 27529

Dear Mr. Sullivan:

On January 8, 1992, you met with Mr. Steven Lund of my staff at the site of the proposed Iredell County landfill expansion on 150 acres adjacent to an unnamed tributary to Fourth Creek off S.R. 2319 east of Statesville, Iredell County, North Carolina. The purpose of this meeting was to determine U.S. Army Corps of Engineers' permit requirements for this proposed facility.

Based on our site inspection we found no jurisdictional wetlands on the property. The main tributary as well as several small spring heads feeding into the tributary may be affected by infrastructure and site preparation work such as utility line crossings, culverting and/or channel diversion. Because all of these drainageways are above the headwaters, this work could be accomplished under USACE Nationwide Permit No. 26. Based on our review of your preliminary plans for this site, the proposed work would not impact more than 1 acre of stream channel area so pre-discharge notification would not be necessary. If your plans are modified such that additional stream channel area would be affected, you should provide us with copies of these plans.

If you have any questions, please contact Mr. Lund at telephone (704) 259-0857.

Sincerely,

G. Wayne Wright
Chief, Regulatory Branch



U.S. Department
of Transportation
**Federal Aviation
Administration**



Atlanta Airports District Office
1680 Phoenix Parkway, Suite 101
Atlanta, Georgia 30349-5421

APR 13 1992

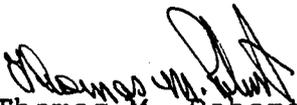
Mr. D. Wayne Sullivan
Municipal Engineering Services Co., P.A.
P.O. Box 97
Garner, NC 27529

Dear Mr. Sullivan:

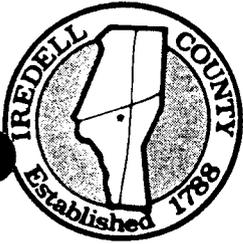
We appreciate the additional information concerning the Iredell County, North Carolina, proposed landfill. Since the existing landfill has been operating in excess of ten years without causing any known bird problem for aircraft approaching or departing runway 10/28 of the Statesville Municipal Airport, and the proposed landfill is located in the vicinity of the existing landfill which is a little more than five miles northeast of the airport, we will not object to the proposed site for the Iredell County landfill.

Thank you, again, for letting us comment on the landfill proposal.

Sincerely,


Thomas M. Roberts
Program Manager

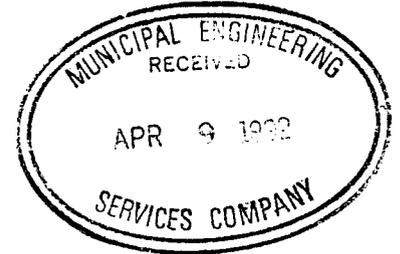
cc:
Division of Aviation, North Carolina DOT
Mr. Gary Huss, City Planner, Statesville, North Carolina



IREDELL COUNTY

Post Office Box 788
Statesville, North Carolina 28677

(704) 878-3000
(704) 663-1616



April 8, 1992

Municipal Engineering Services
P.O. Box 97
Garner, NC 27529

Attn: Wayne Sullivan

Re: City of Statesville
Zoning Approval

Dear Wayne:

Enclosed please find a copy of the letter from the City of Statesville indicating zoning approval of the Iredell County Landfill site that falls within the City's zoning jurisdiction.

Should you have any questions, don't hesitate to call me at 878-3054.

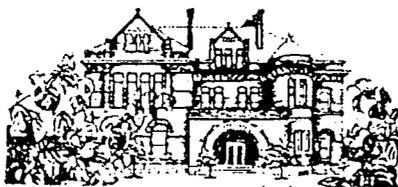
Sincerely,

A handwritten signature in cursive script that reads "H. Carson Fisher".

H. Carson Fisher, P.E.

cc: Ron Weatherman w/attachment

City of



Statesville

P. O. Box 1111 • Statesville, North Carolina 28677

April 7, 1992

Mr. Carson Fisher
Iredell County Engineer
P.O. Box 788
Statesville, NC 28677

Dear Mr. Fisher:

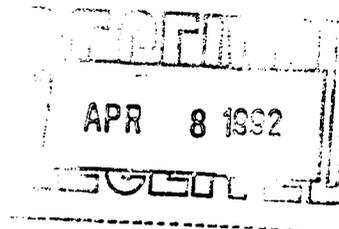
Please be advised that the City Council of the City of Statesville unanimously approved the site location of Iredell County's sanitary landfill located on Twin Oaks Road and more specifically described as Lot 176, Block A, Iredell County Tax Map 5M.

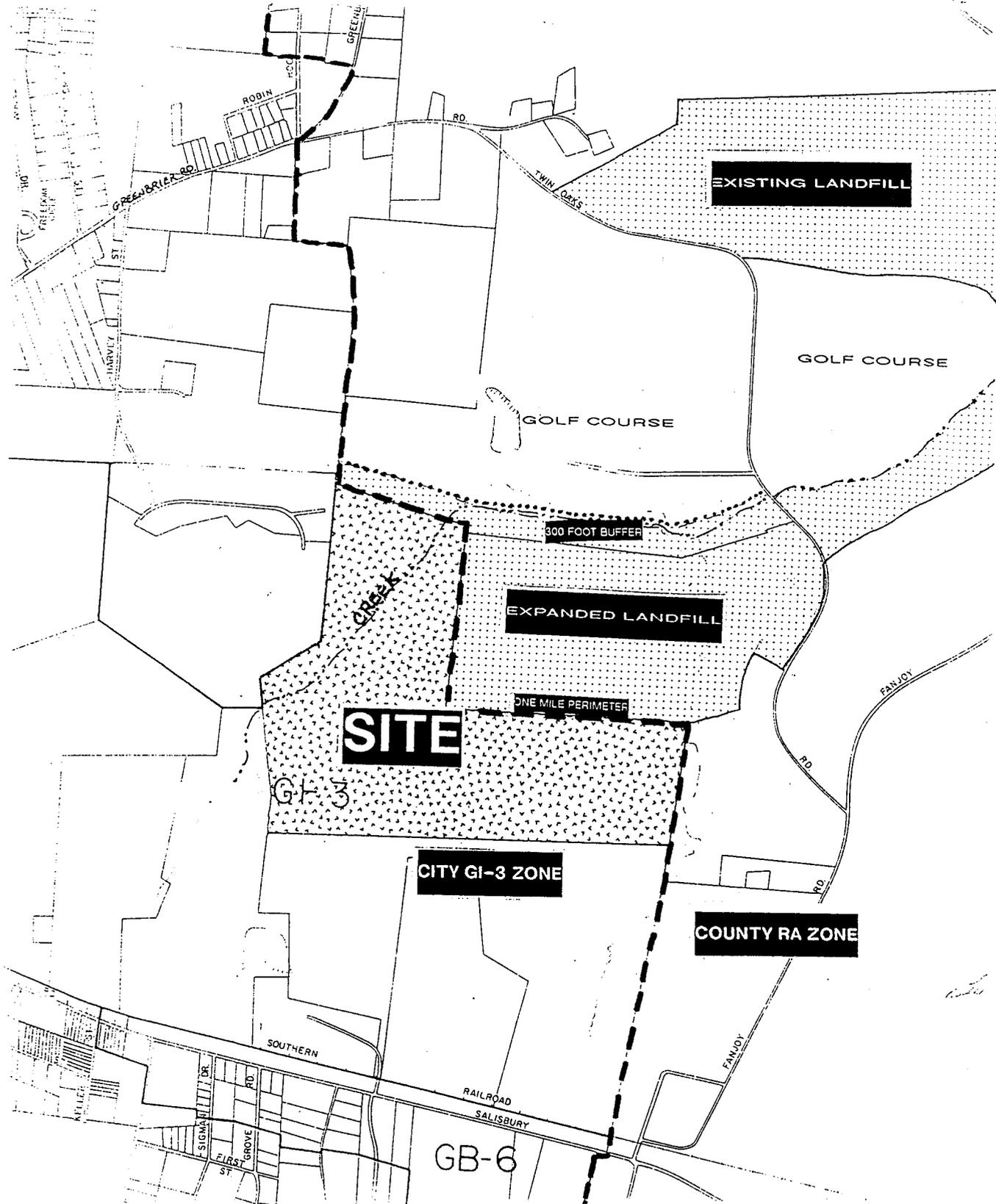
Sincerely,

David H. Currier
Planning Director/
Acting Assistant City Manager

DHC:ts

Enclosure





EXISTING LANDFILL

GOLF COURSE

GOLF COURSE

300 FOOT BUFFER

EXPANDED LANDFILL

ONE MILE PERIMETER

SITE

CITY GI-3 ZONE

COUNTY RA ZONE

GB-6

GREENBRIAR RD

ROBIN

GREENHILL

RD

TWIN OAKS

HARVEY ST

FANJOY

RD

RD

FANJOY

RAILROAD
SALISBURY

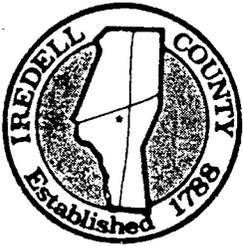
SOUTHERN

SIGMA DR

RD

FIRST GROVE ST

MILLER ST



IREDELL COUNTY

Post Office Box 788
Statesville, North Carolina 28677

(704) 878-3000
(704) 663-1616

March 16, 1992



Mr. Carson Fisher
County Engineer
Post Office Box 788
Statesville, North Carolina 28677

Dear Mr. Fisher:

As per your request, I offer the following information:

Iredell County owns property in Chambersburg Township off State Road 2319, Twin Oaks Road; more specifically identified as Lots 1,2,3,4,5,6,7,8,9,10,23,24,25; Block A, of Iredell County Tax Map 5M-1. Also, Lots 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35; Block C, of Iredell County Tax Map 5M-1.

This property is zoned RA, Residential Agricultural District which allows sanitary landfills as a permitted use provided,

- a) Such facilities are essential to the service of the area;
- b) All buildings shall be set back at least twenty (20) feet from all property lines and shall be designed and landscaped with a buffer strip (41.6) in such a way as to blend in with surrounding area; and
- c) All dangerous apparatus shall be enclosed by a chain link fence at least eight (8) feet in height.

If we can be of further assistance please contact this office at 878-3118. Thank you.

Sincerely,

A handwritten signature in cursive script that reads "Katrina Hewitt".

Katrina Hewitt
Planning Technician

PERMIT APPLICATION TRACKING SYSTEM
SOLID WASTE MANAGEMENT FACILITY

GENERAL INFORMATION

APPLICANT Iredell County TYPE OF FACILITY Lined Lateral Expansion
 TYPE OF WASTE MSW TYPE OF APPLICATION _____
 LOCATION OF FACILITY off State Road 2319, near US 70
 PERMITTING PROCESS _____
 PRELIMINARY SITING ASSISTANCE, TYPE purchase of additional adjacent acre. DATE 7/27/92

Part of Site Approved in 1986/1987
 This is an attempt to expand site through
 purchase of additional adjacent acre.

APPLICATION	APPLICATION RECEIVED	COMPLETENESS REVIEW, LETTER SENT	ADDITIONAL INFORMATION RECEIVED	NRCD		TECHNICAL REVIEW LETTER SENT	ADDITIONAL INFORMATION RECEIVED
				SENT	COMMENTS RECEIVED		
SITE PLAN	4/23/92	letter drafted - never signed - gave draft to J. Woodcock in mtg on 7/23/92	7/23/92 7/27/92 9/10/92				
SITE SUITABILITY ACTION TAKEN: ACTIVITY _____ (DEM) DATE _____							
CONSTRUCTION PLAN							
PERMIT ACTION TAKEN: ACTIVITY _____ (LQ) DATE _____							
PERMIT NO. _____							

PERTINENT ACTIVITY

DATE	TYPE OF ACTIVITY	COMMENTS
7/27/92	Gave Bobby plans, application & the	
7/23/92	Rec'd revised conceptual plan	
7/27/92	Revisions to draft completeness letter rec'd in SWS office	
9/10/92	Revisions requested in August 9, 1992 mty rec'd in SWS office	
8/4/92	Met with Wayne Sullivan (Municipal Engrs) & Wendell Parker (GAI) about necessary revisions to hydrogeology report for 0.0504.	
9/10/92	Wayne Sullivan stopped by to discuss local govt approval requirements	
9/26/92	Met with Carson Fisher & Ron Weatherman of Inadell County concerning Bobby Luffy of our application. Jim Coffey & Bobby Luffy of our section attended the mty with Ellis Layton.	
9/24/92	Rec'd additional revisions to application concerning unstable areas, airports, zoning, local govt approval	
11/3/92	Bobby Luffy, SWS Hydrogeologist, Gary Allbery & Jim Coffey, and Ellis Layton met concerning missing items and deficient parts of Inadell site plan application to determine what information would be accepted & what info would be req'd before site suitability letter issued. - Called Jim Wardie 1 day in day to advise of mty outcome.	

PERTINENT ACTIVITY

DATE	TYPE OF ACTIVITY :	COMMENTS
11/5/92	Bobby Luffy and I met with Jim Woodie & Wendell Parker to discuss remaining subsurface characterization issues.	
11/5/92	Mailed letter to Carson Fiske, Inadell County Engineer to discuss status of site plan application for proposed Inadell Co. landfill (essentially told him about remaining subsurface issues).	
11/5/92	Jim Woodie gave us revised Table 2, Grandwater Table elevation data and revised potentiometric map	
12/1/92	Bobby Luffy was asked by Ellis Clayton to see "if he had looked over latest Inadell revision 5." Bobby replied that he had not.	
11/16/92	The SWS received information from Wendell Parker, GAZ address - all the issues containing raised in Ellis Clayton's letter dated 11/5 to Carson Fiske.	
12/11/92	Fixed site specific Approved Disposal Allowance to Joel Mackinnon, Inadell County.	