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DAVID G. MANDELBAUM
DIRECT DIAL 215 636-4675

August 27, 1987

FEDERAL EXPRESS

Ms. Ruth Mancos
United States Environmental
Protection Agency
Region V
CERCLA Enforcement Section (5HE-12)
230 South Dearborn Street
Chicago, IL 60604

Re: Sanitary Landfill Company (IWD) Site
1855 Cardington Road, Montgomery County,
Moraine, Ohio--Response of P.H. Glatfelter
Company to Request for Information

Dear Ms. Mancos:

This firm represents P.H. Glatfelter Company ("Glatfelter"). On July 31, 1987, Glatfelter received a letter from the United States Environmental Protection Agency ("EPA") over the signature of Basil G. Constantelos. That letter included a request for information pursuant to section 104 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") as amended, 42 U.S.C. § 9604, and pursuant to section 3007 of the Resource Conservation and Recovery Act ("RCRA") as amended, 42 U.S.C. § 6927. This letter constitutes Glatfelter's response to EPA's request for information pursuant to section 104 of CERCLA as set out on pages 2-4 of Mr. Constantelos' letter. This response has been reviewed by C. Neal Carter, Ph.D., the Technical and Environmental Control Director of Glatfelter. His certification that this response is true and accurate to the best of his knowledge and belief and that the appended documents are true and authentic copies accompanies this response.

EPA's inquiry relates only to wastes generated or transported by Glatfelter and disposed at the Sanitary Landfill Company (IWD) Site on Cardington Road, Moraine, Ohio ("Cardington

Road Site"). To the extent that Glatfelter generated or transported any such waste, the waste was not a "hazardous waste" within the meaning of RCRA. The West Carrollton Mill generated a paper mill wastewater sludge, and Glatfelter's records provide some indication that a relatively small quantity of this sludge was hauled to the Cardington Road Site, as discussed below. The paper mill wastewater sludge was not a hazardous waste. The West Carrollton Mill also generated fly ash and municipal waste which IWD hauled from the mill. Neither the fly ash, see 40 C.F.R. § 261.4(b)(4) (1986), nor the municipal waste constitutes hazardous waste. Moreover, Glatfelter's records do not include any references to disposal of fly ash or municipal waste at the Cardington Road Site.

Section 3007 of RCRA only authorizes EPA to request information concerning hazardous waste management. Accordingly, section 3007 imposes no obligation upon Glatfelter to provide the following information in response to Mr. Constantelos' letter. Glatfelter's response to EPA's inquiry under CERCLA should not be construed as an admission by Glatfelter that any of the activities described in this response are or were within the scope of Title C of RCRA, or that Glatfelter has any obligation to provide this information pursuant to RCRA.

Introductory Discussion

Between September 1972 and September 1984, with intermittent shut-downs, the Bergstrom Paper Company ("Bergstrom") or Glatfelter operated a paper mill in West Carrollton, Ohio ("West Carrollton Mill"). Pursuant to an agreement dated June 29, 1972, Bergstrom acquired the mill from Kimberly-Clark Corporation on August 31, 1972. Bergstrom merged into Glatfelter in January 1979. Glatfelter sold the West Carrollton Mill to Appleton Paper Company in 1984.

The West Carrollton Mill produces a paper mill wastewater sludge, some of which may have made its way to the Cardington Road Site on a few occasions and probably did make its way to the Cardington Road Site during a few months in 1979. The material from the West Carrollton Mill was sent to the Cardington Road Site only sporadically, and Glatfelter cannot identify any particular load of sludge known in fact to have gone to the Cardington Road Site. Further, if the paper mill wastewater sludge contained "hazardous substances" within the meaning of CERCLA, it did so only in very low concentrations. The paper mill wastewater sludge did not constitute a hazardous waste within the meaning of RCRA.

On September 1, 1970, Kimberly-Clark entered into a disposal agreement with North Sanitary Landfill Company, Inc., an entity of which B. G. Danis, Jr., was a principal. This agreement provided for disposal of paper mill wastewater sludge at the Hilltop disposal site, not the Cardington Road Site. Bergstrom apparently operated under this September 1, 1970, agreement with North Sanitary Landfill Company for the first few months that Bergstrom owned the West Carrollton Mill. On December 1, 1972, Bergstrom entered into a nearly identical agreement with North Sanitary Landfill Company for disposal of the paper mill wastewater sludge. Again, this agreement specifies disposal at the Hilltop disposal site. On a few occasions towards the end of Hilltop's useful life in 1979, conditions at the Hilltop disposal area may have rendered the site inaccessible. On those occasions, Glatfelter's trucks may have gone to the Cardington Road Site to dispose of sludge. Glatfelter cannot confirm that any particular load was disposed at the Cardington Road Site; while Glatfelter has invoices from North Sanitary Landfill Company specifying disposal at the Hilltop and other sites, it has no similar records reflecting disposal at the Cardington Road Site.

After Hilltop closed, Glatfelter used two principal disposal areas: the Carl Miller Landfill in Middletown, Ohio, and the Pinnacle Road site operated by North Sanitary Landfill, Inc. It is possible that during the transition period, some waste may have been sent to the Cardington Road Site after Hilltop's closure and before arrangements had been finalized with Carl Miller or Pinnacle Road.

Based upon a search of its records, Glatfelter has concluded that it and its predecessor Bergstrom could have sent relatively little sludge to the Cardington Road Site, and that this sludge contained at most very low concentrations of any hazardous substances, if any. The highest estimate, which Glatfelter believes to be an overestimate, for the amount of material sent to the Cardington Road Site comes from Gary McDowell, a former employee of Glatfelter at the West Carrollton Mill; Mr. McDowell is presently employed by Appleton Paper Company. Radian Corporation prepared a report in 1983 for Glatfelter's prospective environmental impairment liability insurance carrier. To provide factual background for that report, Mr. McDowell prepared an estimate of the volume of paper mill wastewater sludge generated by the West Carrollton Mill and disposed at a number of facilities, including the Cardington Road Site. Mr. McDowell based his estimates of both the volume of sludge sent to each site and the period of time during which each

site was used upon his own recollections and upon his conversations with other employees at the West Carrollton Mill. As reported by Radian Corporation, Mr. McDowell estimated that Glatfelter used the Cardington Road Site in 1979 and 1980 to dispose of 18,000 cubic yards of sludge.

As mentioned above, Glatfelter's records do not support an estimate as high as 18,000 cubic yards of sludge. Indeed, Glatfelter's invoices from North Sanitary Landfill Company reflect disposal at sites other than the Cardington Road Site for all periods other than October and November 1979. Invoices for these two months do not reflect the location of disposal; the invoices do not specify that the Cardington Road Site was used. In any event, the November invoice records disposal of 351 loads of 12 cubic yards each, or 4212 cubic yards of sludge. The November invoice records disposal of 3000 cubic yards of sludge. Thus, these invoices reflect a maximum disposal of 7212 cubic yards of sludge at the Cardington Road Site, and one cannot conclude from those invoices that all, or even any, of that sludge went to the Cardington Road Site. Accordingly, Mr. McDowell's estimate of 18,000 cubic yards, formed several years after the Cardington Road Site closed, appears to overestimate the amount of material sent to the Cardington Road Site from the West Carrollton Mill. Moreover, Glatfelter's best information indicates that the Cardington Road Site could no longer accept waste as early as December 10, 1979, so Mr. McDowell may also have overestimated the period during which Glatfelter might have used the West Carrollton Site by several months.

Response to Request for Information

Glatfelter responds to EPA's specific inquiries as follows:

1. Glatfelter has searched all files within its control and has uncovered no "contracts, agreements, purchase orders, requisitions, pick-up or delivery tickets, customs forms, freight bills, shipping memoranda, order forms, weight tickets, work orders, bills or any other similar documents that evidence discrete transactions involving shipment, or the arrangement for shipment, of waste materials to, through, or from" the Cardington Road Site. All "shipping documents" in Glatfelter's possession or control either refer to other disposal sites, as discussed above, or refer to no disposal site.

Glatfelter has uncovered six documents in its files responsive to EPA's request for "business documents relating to the transportation, storage and/or disposal of waste materials or substances at the" Cardington Road Site: (a) an internal Bergstrom (Glatfelter) memorandum from Ken McDaniel to RWW, LKW, and JSH, dated March 16, 1979; (b) two final pages from an internal Bergstrom (Glatfelter) memorandum, dated July 17, 1979, regarding "Ohio Environmental Meeting" (no other portions of this memorandum have been located); (c) an internal Bergstrom (Glatfelter) memorandum from S.B. Reifsnyder to Bill Swanson dated November 16, 1979; (d) an internal Bergstrom (Glatfelter) memorandum from S.B. Reifsnyder to Bill Swanson dated December 10, 1979; (e) a report of the Radian Corporation to the Hartford Steam Boiler Inspection and Insurance Company dated December 15, 1983, of which only portions of pages 5-44 through 5-46 are relevant to this inquiry; and (f) a copy of a table similar to Table 5-1 (page 5-45) of the Radian Corporation report containing handwritten notations. Copies of these documents accompany this response as Exhibit A.

Although not strictly responsive to EPA's request for information, Glatfelter has located a copy of Bergstrom's 1972 agreement with North Sanitary Landfill Company specifying use of the Hilltop disposal area, as well as a number of North Sanitary Landfill Company's invoices for disposal services during this period. Copies of these documents accompany this response as Exhibit B. While Glatfelter provides these documents in the spirit of cooperation and in order to substantiate its assertion that it did not sent substantial waste to the Cardington Road Site, Glatfelter does not intend provision of these documents to imply that Glatfelter has any obligation to produce these documents or any other documents pertinent to disposal at sites other than the Cardington Road Site.

2. The West Carrollton Mill wastewater sludge principally consists of paper fibers, inert clay-like filler materials, small amounts of titanium dioxide, and water. Glatfelter's files reflect six analyses of the sludge. First, a letter dated June 5, 1973, from the Ohio Environmental Protection Agency to the Montgomery County Health Department concludes that "the chemical constituency of the paper mill sludge is such that it would not adversely affect the ground water nor in any way be harmful to the public health." This letter refers to Kimberly-Clark sludge which, of course, was Bergstrom sludge by June 1973.

The first and second annual reports on "An Experimental High Ash Papermill Sludge Landfill," dated 1972 and 1973 respectively, describe an investigation of an experimental landfill constructed using the West Carrollton Mill's sludge by B. G. Danis, Inc. The reports were prepared by Michigan State University under EPA Grants R-EP-00685-01 and R801282. The studies generally conclude that leachate from the sludge is less noxious, and more amenable to renovation in soils, than leachate from municipal waste. Glatfelter has in its possession only portions of these reports.

In a June 7, 1979, report, Howard Laboratories, Inc., of Dayton, Ohio, analyzed a sludge sample received May 9, 1979, from the West Carrollton Mill. Based on this analysis, North Sanitary Landfill Company and Glatfelter were able to conclude that the sludge did not constitute a hazardous waste.

An unidentified analysis of paper mill wastewater sludge from the West Carrollton Mill found in Glatfelter's files reflects the presence of only minute quantities of priority pollutants in the sludge.

Finally, a sheet of handwritten notes describing the composition of the sludge was discovered in Glatfelter's files. C. Neal Carter, Technical and Environmental Control Director for Glatfelter, has recognized the handwriting of the principal document, but not that of the marginal notation, as his own. However, Dr. Carter cannot recall when or why he prepared these notes. Moreover, he has no reason to believe that they describe the West Carrollton Mill's sludge other than the notes' location in proximity to the other materials produced here.

Copies of these materials accompany this response as Exhibit C. The two reports prepared under EPA grants should already be in EPA's possession; Glatfelter has provided copies of those portions of these items in its possession.

The Radian report, accompanying this response in Exhibit A, and Dr. Carter's notes, accompanying this response in Exhibit C, require some clarification with respect to their characterization of the sludge. In 1979--the time at which Glatfelter's sludge was reported to have been disposed at the Cardington Road Site--the sludge from the West Carrollton Mill did not contain polychlorinated biphenyls ("PCBs"). The West Carrollton Mill recycles wastepaper as a source of fiber. Until 1972, some paper converters used PCB containing oils as lubricants in the production of certain papers, particularly

carbonless papers. Although neither Bergstrom nor Glatfelter used PCBs in its process, PCB containing papers did occasionally find their way into the West Carrollton Mill's wastepaper input stream, and therefore the mill's raw wastewater. The use of PCB containing oils by paper converters ceased in 1972. They therefore disappeared rapidly from the West Carrollton Mill's wastepaper input stream. Analyses of sludge from Glatfelter's Neenah, Wisconsin, Mill, which also recyles wastepaper as a primary source of fiber, indicate that PCBs disappeared from paper mill wastewater sludge well before 1979.

3. Glatfelter did not dispose or arrange for the disposal of any hazardous wastes at the Cardington Road Site. Further, Glatfelter cannot determine that it arranged for disposal of any hazardous substances at the Cardington Road Site. Glatfelter has no records of precise dates of shipments to the Cardington Road Site. Glatfelter's first record indicating possible shipment to that site suggests that shipments did not occur prior to March 16, 1979, nor could they have occurred after December 10, 1979, on which date Mr. Reifsnyder informed Mr. Swanson that the Cardington Road Site had closed. Similarly, because Glatfelter does not know for certain that any particular load of sludge was taken to the Cardington Road Site, Glatfelter cannot estimate the volume of sludge taken to that site. However, Mr. McDowell's estimate of 18,000 cubic yards (13,770 cubic meters) appears to overestimate the volume of sludge taken to the Cardington Road Site.

As one can see from Exhibit C, Glatfelter has been unable to locate a chemical analysis of the West Carrollton Mill's sludge in 1979. Glatfelter's experience has been that the sludge principally contains water, paper, clay-like filler materials, and small amounts of titanium dioxide. If hazardous substances appear in the sludge, they appear in only trace amounts. The only contaminants ever found in Glatfelter's fresh sludge amount to less than 100 parts per million by <u>weight</u>, and an even smaller proportion by <u>volume</u> because they have largely been metals. Accordingly, if Glatfelter and its predecessor Bergstrom disposed of hazardous substances at the Cardington Road Site, they disposed of a very small volume of those substances indeed and very low weights of these substances as well, weights below any reportable quantities established for releases under CERCLA even accepting Mr. McDowell's overestimate of 18,000 yards (4500 tons) and the worst analyses of fresh sludge in Exhibit C.

4. During 1979 Glatfelter and its predecessor Bergstrom normally hauled their sludge in their own dump trucks.

Presumably, the same method would have been used for those loads of sludge which were sent to the Cardington Road Site.

5. Glatfelter and its predecessor Bergstrom transported only their own wastes to any site.

6. Materials responsive to this inquiry accompany this response as Exhibit C.

7. A list of insurance policies and a copy of those policies accompanies this response as Exhibit D.

8. Glatfelter cannot determine whether any particular load of its waste was sent to the Cardington Road Site. Further, Glatfelter cannot determine where such waste was placed at that site.

Conclusion

By this response, Glatfelter does not admit that it, or its predecessor Bergstrom, generated or transported hazardous substances that were disposed at the Cardington Road Site. Moreover, Glatfelter does not admit that it constitutes a "responsible party" for the Cardington Road Site within the meaning of CERCLA.

Glatfelter intends this document fully to respond to EPA's request for information under CERCLA as contained in Mr. Constantelos' letter. However, if these materials raise any questions, please do not hesitate to contact me.

Sincerely,

David G. Mandelbaum

David G. Mandelbaum

DGM:ct
Enclosures
cc: Mr. Richard W. Wand
C. Neal Carter, Ph.D.
Morris Cheston, Jr., Esquire

D32337

STATE OF WISCONSIN :
:
COUNTY OF WINNEBAGO : SS

CERTIFICATION

I, C. Neal Carter, Ph.D., hereby certify that I am the Technical and Environmental Control Director of P.H. Glatfelter Company, and that I am authorized to certify to the following on its behalf:

1. P.H. Glatfelter Company has made a diligent search of its records and a diligent inquiry of its officers, directors, and employees in order to formulate a response to the United States Environmental Protection Agency's request for information received July 31, 1987, with respect to the Sanitary Landfill Company (IWD) Site, 1855 Cardington Road, Moraine, Montgomery County, Ohio.

2. I have reviewed the foregoing response to the United States Environmental Protection Agency's request for information, and that response is true and accurate to the best of my knowledge and belief.

3. I have reviewed the documents accompanying the foregoing response to the Environmental Protection Agency's request for information, and the copies accompanying that response are true and authentic to the best of my knowledge and belief, although the documents themselves may contain inaccurate statements.

4. I make this certification pursuant to the penalties of 18 U.S.C. § 1001.

C Neal Carter
C. NEAL CARTER

Sworn to and subscribed before me
this 26th day of August, 1987.

Joan M. Lea
Notary Public

My commission expires:

MY COMMISSION EXPIRES MARCH 12, 1989

Exhibit A

BERGSTROM PAPER COMPANY
INTER-OFFICE MEMO

TO: RWW - LKW - JSH

FROM: Ken McDaniel

SUBJECT: Ohio Waste Disposal

DATE: March 16, 1979
Dict. 3/15/79

On Wednesday, March 14, Boyd Reifsnyder, Dennis Short and I met with John Gedhart, President and Ray Davis, Operating Manager for North Sanitary Landfill, Inc., a division of Industrial Waste Disposal, Inc. to review current problems and future outlook for disposal of waste from our Ohio mill.

Our most immediate problem was the backup of approximately 15-20 trucks of sludge at our waste treatment plant. Extremely wet and muddy conditions were preventing our trucks from unloading at the Hilltop Landfill site and our truck had been turned away from the Cardington Road site. IWD agreed to make arrangements that day for us to dump at Cardington until conditions had been corrected at Hilltop. They indicated they had not handled the Hilltop site correctly and that some regrading would be required to improve conditions. We will likely continue experiencing difficulties as long as extremely wet conditions persist.

We reviewed the long term outlook for sludge disposal which although improving is still a shakey situation. By IWD's calculations, the Hilltop Landfill site will be filled within 4-5 months. Hilltop had, some time ago, indicated other areas might be available to IWD; however, they were not specific and with IWD's efforts in other areas, Hilltop has not pursued further. The Cardington Road site will also be filled by year end. Gedhart indicated they have extended the life of this site several months by diverting appropriate materials to a hard fill site on Harshman Road, north of Dayton.

IWD has spent $300,000 and 2-1/2 years getting approval to develop a new site in Jefferson township, approximately 3-4 miles from our waste treatment plant. In fact, it is between Miami Paper Co.'s site and the Moraine city limits. This site is 101 acres, 17 of which are within Moraine city limits, the balance is in Jefferson township. Gedhart is extremely confident they can have this site operating in 90 days. They have successfully rezoned this area as a landfill site and are currently building an earthen bunker around the area to block its visibility from adjacent roads. Supporting his optimism, they have unanimous approval from the County Commission as well as approval from the state of Ohio and the federal EPA. They also claim to have backing of the County Health & Environmental Departments, all environmentalist groups, major local industry and the mayors, managers and township trustee's associations. The county needs this landfill site. The north incinerator will cut current thruput by 40% to come in compliance with EPA regulations and the south incinerator is to be closed entirely by July 15 and converted to a transfer site for materials destined to landfill. IWD anticipates receiving the contract to landfill this at the Jefferson twonship site. Currently the county's best alternative is a landfill near Sprinfield, Ohio, some 70 miles round-trip.

The future of the Jefferson township site is not all that simple, however, The City of Moraine has successfully annexed this area and within 60 days the entire 101 acres will be within the City of Moraine. Where Jefferson township was glad for the 9¢/ton royalty (approximately $36,000/year), the City of Moraine does not need the money and does not want the industrial park that IWD planned for this

area when the site was filled some 13-15 years in the future. The City of Moraine has filed suit to stop IWD on the following basis:

1.) Part of the site (17 acres) is within the city limits yet Moraine City Council was not properly notified of the original hearing.

2.) The regular zoning board denied the rezoning. It then required unanimous approval of the county commissioners; however, the county commissioners originally denied the petition (this came during and probably as a result of the bribery charges leveled against two commissioners). Moraine is claiming that the Commission cannot now reverse its position and that IWD must file an entirely new petition.

3.) By the time a new petition is filed, annexation will be completed and the city, not the county, will be the zoning authority. IWD claims the law reads that when the county rezones an area for landfill before annexation, this will hold for the life of the landfill site.

Moraine was denied a temporary restraining order and the hearing on this suit has been set for April 16. The judge in denying the restraining order warned IWD that if the court rules in favor of Moraine, IWD will be liable for any damages. Gedhart claims they are confident of the outcome of the hearing and are proceeding with site preparation.

There has also been a suite levied against IWD by two Jefferson township residents. One is 3/4 of a mile and the other a mile and a half from the site. The judge delayed this suit to be considered simultaneously with the April 16 hearing.

One additional obstacle--the site has EPA approval but the permit does not include sludge. IWD is confident they will be able to get the appropriate modification from the EPA but they do not want to file until the other legal battles are behind them.

The question is, if the Jefferson township site fails, or is substantially delayed, what does Bergstrom Paper do when Hilltop and Cardington give out?

1.) We might be able to go to the landfill site in Springfield, some 70 miles round-trip.

2.) We might be able to go to Rumpkin landfill in Cincinnati. This has a 50-60 year life but it is close to 100 miles round-trip.

3.) IWD has another site with EPA approval a few miles west of Moraine at the Penn Iron Auto Shredders but it is only 10 acres and needs a zoning change that they don't think they could get.

BERGSTROM PAPER COMPANY
INTER-OFFICE MEMO

TO: RWW - LKW - JSH FROM: Ken McDaniel

SUBJECT: Ohio Waste Disposal DATE: March 16, 1979
Dict. 3/15/79

4.) IWD has a site in Clayton township at Routes 49 & 40 north of Dayton. This has EPA approval for sludge; however, the County Commission already disapproved rezoning for landfill. Gedhart indicated they were confident they could get this ruling reversed.

Obviously, the alternatives are shakey at best and developments at the Jefferson township site for the next 90 days will be critical. Perhaps we should consider other potential actions: 1.) Gain EPA approval to use our empty lagoon as a temporary emergency landfill, 2.) Purchase of land to develop our own landfill site 3.) Enter the city waste disposal system.

Our final discussions with IWD covered the status of our solid waste pickup. We indicated to them that the startup of a second machine and increased emphasis on housecleaning would mean an increased load of solid waste. Davis said he would get us 10 additional containers this week. We currently have 30 containers plus 10 for the Jonsson screens. We are receiving 6 pickups per week and it was felt that this would be adequate with the additional containers. They are also to supply us with recommendations for the installation of one or more compactors. These would be at their expense, although I would think we could potentially have some building alteration costs.

One final note...Gedhart mentioned that their last increase was 3¢ two years ago. We are paying $.83/ton and when we go to the Cardington site, they are not making a profit (we, of course, also have the increased cost of hauling a greater distance). We can expect an increase from IWD when problems surrounding Jefferson township site are resolved.

KGM/ps
cc: SBR
DMS

BERGSTROM PAPER COMPA..
INTER-OFFICE MEMO

TO: _____ FROM: _____

SUBJECT: OHIO ENVIRONMENTAL MEETING (con't) DATE: July 17, 1979

Solid Waste

Jim Haney reviewed his notes from a meeting with representatives of the Ohio EPA on solid waste questions. It appears that Bergstrom can continue to dump at the Cardington Road site for a period ranging from two weeks to three months. IWD continues to be optimistic that the Pinnacle Road site will be licensed and operable on or about August 1, 1979. Leon Tyler will contact IWD to get a better projection on when that site will be licensed.

Haney advised that it was unlikely that the Ohio EPA would approve continued use of either sand or gravel quarries though it may be that the Hilltop project could get a variance in order to bring a portion of the site to final grade for final abandonment. This is very doubtful, but could be pursued in an emergency.

Samples of sludge have been sent to two different coal companies who have expressed interest in using our sludge for the reclamation of strip mines. Haney had contacted a representative of Southeast District Ohio EPA and asked for any information they could provide us on the use of paper mill sludges or other sludges as strip mine reclamation material. Apparently sludges are being used successfully in Ohio at this time. Haney was advised by OEPA's Steve Hamlin's office that an analysis of the sludge leachate would have to be approved by Dr. Ed Glod, a hazardous waste specialist in the Columbus office of the Ohio EPA, before it would be allowed to be utilized in Ohio's strip mines.

(Subsequent to the meeting, Jim Haney also contacted Ms. Christine Harrington in the Non-Hazardous Waste Section of the Kentucky Environmental Quality Office (502-564-2424). Ms. Harrington indicated that before paper mill sludges, or any other material, can be utilized to reclaim strip mine areas in Kentucky, considerable analysis must be done by various branches of her agency. She is in the process of sending Haney the current regulations from both the Environmental Quality Office and from the Division of Mine Reclamation Office. After we have had a chance to review these documents, we may wish to address questions to her or any of the following people: Hannah Leonard, Hazardous Waste Section; Clyde Baldwin, Water Quality Section; Ralph Waddel, Permit Section of the Division of Mine Reclamation; or Jim Villines, Standards Section of the Division of Mine Reclamation.)

Jim Haney will coordinate outlining the legal requirements necessary to qualify Bergstrom's sludge for a strip mine reclamation project. Leon Tyler will continue to be Bergstrom's liaison with the coal companies and will coordinate with Boyd Reifsnyder as necessary.

A decision was made to make due with the existing sludge truck until we determine what long-range alternatives we have for sludge disposal.

BERGSTROM PAPER COMPANY
INTER-OFFICE MEMO

TO: FROM:

SUBJECT: OHIO ENVIRONMENTAL MEETING (con't) DATE: July 17, 1979

Finally, reference was made that the Montgomery County solid waste people are undertaking an extensive study of the county to locate potential landfill sites. It was reported by Ohio EPA that some ninety tentative sites had been identified and that the number was being pared down by the staff. Tom Sager is responsible for this project. It was determined that Leon Tyler would work through Mr. Jody Ballard in the West Carrollton City Hall in an attempt to get from the County some indication of those areas that might be suitable for landfilling of paper mill sludges.

A brief discussion was held on the PCB marking and disposal regulations and Honken and Manning advised that there are no PCB-containing transformers at the Ohio Mill. Insofar as the existence of even contaminated transformer oils may subject our facility to the new PCB regulations, it is recommended that an inventory check be made to insure that PCBs are not on the premises. Jim Haney will send Jerry Honken a copy of the most recent Federal regulations on PCB labeling and disposal.

Following the general meeting, Jim Manning instructed Leon Tyler to schedule his time in order to make Ohio environmental matters his primary responsibility in the Company. Jim Haney will work with Leon in the orderly transfer of all environmental documents from Neenah to Ohio.

cc: Jim Manning
✓Leon Tyler
Jerry Honken
Sam Steadman
Clint Cook
Gary McDowell
Orv Ross

BERGSTROM PAPER

INTER-OFFICE MEMO

TO: Bill Swanson FROM: S. B. Reifsnyder

SUBJECT: Ohio Trip November 14-15 DATE: November 16, 1979

1. 11/14 Tom Creagan and myself met for lunch with Bob Berry, Art Pitts and Tom Jenkens of DPL. They advised their position had changed in that now they do not foresee any shortage of gas in the near future. This is due primarily to availability of Mexican gas. However, it will be expensive. Probably approaching 30¢ per therm. They also advised they had applied for a 100 million dollar increase on electric power rates. They expect the commission to approve about 70 million dollars which would take effect around mid year.

2. 11/14 afternoon a meeting was held with North Sanitary Landfill Co. Those in attendance were:

B. G. "Tom" Danis - NSLC
Ray Davis - NSLC
Melvin Eifert, V.P. Systems Technology Corporation
Ralph Smith, Sys. Analyst Systems Technology Corporation
B. Reifsnyder - Bergstrom Paper Company
T. Creagan - Bergstrom Paper Company
L. Wilhelm - Bergstrom Paper Company
L. Tyler - Bergstrom Paper Company
G. McDowell - Bergstrom Paper Company
N. Carter - Glatfelter Company

The first item on the agenda was a presentation by Systems Technology Inc. in which they discussed a method of handling sludge through the use of enzymes. The method is still in the laboratory experimental stage. S.T.I.'s and NSLC's concern was whether or not this method had feasibility, and whether BPCO felt it should be persued as a possible way out of our sludge disposal problems. Because of the technical aspects of this method, either L. Tyler or L. Wilhelm should report on the method in detail. After the presentation and discussion L. Wilhelm and N. Carter were excused and the meeting was continued covering our current day to day problems, contracts, etc.

1. "Tom" Danis reported that city of Moraine is still doing everything possible to make life miserable for all sludge dumpers and haulers, but most specifically for NSLC. He stated that at the Cardington Road site we have 2 to 3 weeks left before the site would be full and unusable for further dumping. At this point, Hilltop Concrete is still refusing our sludge. He felt they would eventually allow us in. If so, that would be good for approximately 8 months. He also stated NSLC is trying to prevail on Miami Paper Co. to allow NSLC to build a landfill site on Miami's property. Should NSLC prevail, it would take more than a year to prepare the site. He assured us that although solutions to our problems are almost nil at the moment, NSLC would not let us down. Other alternatives would be to haul our sludge to either Springfield or Cincinnati-- both of which would be very expensive. Cincinnati for instance charges $3.00/ton for dumping. I think we currently produce 120-150 tons/day. In other words our costs would run $4-500/day plus hauling 50 miles.

BERGSTROM PAPER
INTER-OFFICE MEMO

O: Bill Swanson FROM: S. B. Reifsnyder

UBJECT: Ohio Trip November 14-15 DATE: November 16, 1979

I personally feel we should continue to persue the backhauling of sludge to the Kentucky strip-mines. Our original trials @$125.00 per truck appeared to be too expensive. A couple of drivers have told Gary McDowell that this charge could be reduced maybe to $80.00 per truck on a six or seven day per week basis.

2. Ray Davis submitted copies of sludge and Fly Ash analyses (copies attached) done by Howard Laboratories. Again, I would defer the discussion of the analyses to L. Tyler.

3. Ray Davis advised that the problems of fires being started by our Flyash have disappeared. He acknowledged that NSLC had given S. Steadman some bad service with respect to pick up of Flyash boxes. As a result, Sam had overreacted and in a couple of instances had requested pick ups before the ash had had sufficient time to cool down.

4. Ray Davis is to submit for review by SBR updated prices, terms etc. with respect to our contract for sludge and solid waste disposal.

11/15 A.M. was spent primarily in the office discussing purchasing and and storeroom personnel, problems, long range planning for #92 etc. Rather than write a long dissertation here, I think it better that at your convenience, we kick it around face to face.

11/15 P.M.

A good portion of the afternoon was spent with G. Honken discussing "contractor withdrawals" from the Storeroom, the procedure for writing ATS's and descriptions of items to be put on the computor, "Not to Exceed" contracts, Job Change Notices" etc. I came away with the feeling that we were in agreement (of course, I've had that feeling before.) Again I prefer to discuss this with you personally rather than submit a long dissertation here.

11/15 P.M.

Tom Creagan and I met with Clarence Lopshire of New River Fuel. Clarence feels he can move the 650 tons of junk coal we have to Delco. We were unable to discuss price as Delco's P.A. was away this week, and as you know, I will be gone next week. No doubt we will take a sizable write off. However, if we try to burn it, the possible problems could cost much more.

Other than the above, the trip was uneventful.

cc: L. Tyler
L. Wilhelm
T. Creagan

BERGSTROM PAPER
INTER-OFFICE MEMO

file

Bill Swanson FROM: S. B. Reifsnyder

SUBJECT: Sludge Disposal Costs - Ohio DATE: December 10, 1979

I. BPCO - Self-haul to North Sanitary Landfill Co.'s Pinnacle Road landfill site

Availability?

$4.00/yd. per G. McDowell = $600.00/day

Above based on using our present truck which is in very bad condition and requires considerable maintenance. If we go to Pinnacle Road, we wouldn't need as heavy a truck. G. McDowell recommends a tandem axle, aluminum bed, small diesel engine, automatic transmission truck.

II. H. Gaines - Contract haul to NSLC's Pinnacle Road landfill site:

Availability?

Hauling	-	$1.56/yd.		
Dumping	-	$1.65/yd.		
		$3.21/yd.	=	$481.50/day

Above based on $25.00/hr. - 12 yds per truck

III. IWD - Contract haul to NSLC's Pinnacle Road landfill site:

Hauling	-	$3.00/yd.		
Dump Charge	-	$1.65/yd.		
		$4.65	=	$697.50/day

Above based on using 25 yd. pusher trucks

IV. C. Miller contract haul to Miller Landfill, Middletown, Ohio.

Hauling	-	$3.125/yd.		
Dumping	-	$3.125/yd.		
		$6.25/yd.	=	$937.50/day

Above based on 16 yds. per load.

ok. C. Miller
Advised Miller on 12/14/79!

The logical place for BPCO to haul sludge to is Pinnacle Road. It is approximately four miles from our effluent plant and is a well designed, developed and managed landfill. However, we have not been approved by the State of Ohio.

The C. Miller site in Middletown is a beautiful natural site. However, Carl Miller is a novice at landfill management and the sight at present is very poorly developed.

Beyond the above statements we are "between a rock and a hard place." The Cardington Road site is full; the Ohio EPA has not approved us for Pinnacle Road; we are not permitted into Hilltop; and, Carl Miller wants an answer now.

RADIAN
CORPORATION

DCN 83-203-008-46-01

REPORT ON P. H. GLATFELTER COMPANY

Prepared for:

Hartford Steam Boiler Inspection and
Insurance Company

Hartford, Connecticut

Prepared by:

Radian Corporation
Austin, Texas

15 December 1983

8501 Mo-Pac Blvd. / P.O. Box 9948 / Austin, Texas 78766 / (512)454-4797

TABLE OF CONTENTS

Section		Page
1.0	INTRODUCTION	1-1
2.0	DISCLAIMER	2-1
3.0	RISK ASSESSMENT	3-1
4.0	OVERALL OPERATIONS OF THE COMPANY	4-1
	4.1 Business Description	4-1
	4.2 Corporate Environmental Management Program	4-1
5.0	FACILITY SPECIFIC OPERATIONS	5-1
	5.1 Spring Grove Plant, Spring Grove, Pennsylvania	5-1
	5.2 Neenah Plant, Neenah, Wisconsin	5-18
	5.3 West Carrollton Plant, West Carrollton, Ohio	5-36
6.0	THE SURVEY	6-1

APPENDICES

Appendix 5-1:	List of Raw Materials Used at the Spring Grove Mill	A-1
Appendix 5-2:	SPCC Plan for the Neenah Mill	B-1
Appendix 5-3:	Raw Materials Inventory for the Neenah Mill	C-1
Appendix 5-4:	WPDES Permit for the Neenah Mill	D-1
Appendix 5-5:	Air Quality Permit for the Chlorine Source at the Neenah Mill	E-1
Appendix 5-6:	Raw Materials Inventory for the West Carrollton Mill	F-1
Appendix 5-7:	NPDES Permit for the Wastewater Treatment Plant of the West Carrollton Mill	G-1
Appendix 5-8:	Air Quality Permits for the West Carrollton Mill	H-1

5.3.2.2.2 Solid Waste

One of the principle solid waste streams from the West Carrollton mill is the sludge from the wastewater treatment plant, which is produced at a rate of about 25,000 tons per year at a solids content of 40 percent. At present, the sludge is disposed of at the North sanitary landfill, which receives municipal waste from Dayton as well as other sources. According to PHG, this landfill is properly permitted for the types of wastes it receives. The sludge is considered to be nonhazardous.

Another major type of solid waste from the mill is the fly ash and bottom ash from the No. 2 and No. 4 coal-fired boilers. Currently, the bottom ash is disposed of at the wastewater treatment plant at one end of the aeration lagoon that is not used for waste treatment. The fly ash is sent to the North sanitary landfill for disposal. Plant trash is also sent to the North sanitary landfill.

Previously, other disposal sites have been used for the sludge and power plant ash; these are listed in Table 5-1. It is likely that sludges with high PCB content have been sent to these sites in past years as was the case for the Neenah mill. None of these sites is monitored by PHG at present.

[Irrelevant material omitted.]

TABLE 5-1. DISPOSAL SITES USED IN THE PAST FOR WASTEWATER TREATMENT SLUDGE FROM THE WEST CARROLLTON PLANT

SLUDGE LANDFILL SITES 10/21/82

A. WTP 4000 Hydraulic Road
1961-63
48,000 Cu. Yds.

B. Hydraulic Road
1.1 miles of the old Hydraulic Canal
1963-67
120,000 Cu. Yds.

C. Vance Road
Behind Frank Nicholas School
1968-69
60,000 Cu. Yds.

D. Hilltop Gravel Pit
1969-75
Farmersville West Carrollton Road
1976-79
380,000 Cu. Yds.

E. Cardington Road
1979-March 1980
18,000 Cu. Yds.

F. Carl Miller
7580 Meyer Road
Middletown, Ohio
1980 March to Now
96,000 Cu. Yds.

G. North Sanitary Landfill
Pinnacle Road
Present (fly ash only)

[Irrelevant material omitted.]

No hazardous wastes are currently generated at the West Carrollton plant, and the plant has not registered with the U.S. EPA as a hazardous waste generator. PCB contaminated materials, mostly capacitors, were disposed of about 1 1/2 years ago by shipment to General Electric Service in Cincinnati. The final disposition of the materials is not known by PHG. There are currently four remaining PCB-containing transformers on the plant; three are on a roof and one is on the ground. During the survey, the transformer on the ground was found to have soil in the curbed catchment area, and it appeared that runoff entering this catchment area was uncontrolled and was free to flow into the coal storge area.

[Irrelevant material omitted.]

AGREEMENT

THIS AGREEMENT, entered into this first day of December, 1972 by and between Bergstrom Paper Company ("BPCo"), a Wisconsin corporation with manufacturing facilities known as the Moraine Mill located at West Carrollton, Ohio, and NORTH SANITARY LANDFILL COMPANY, INC. ("NSLC"), an Ohio corporation with its principal offices at 200 Valleycrest Drive, Dayton, Ohio.

W I T N E S S E T H:

WHEREAS, an effluent treatment system at the BPCo Moraine Mill includes two large clarifiers by means of which particles are settled out of the mill effluent and then dewatered, the resulting product being substantial amounts of sludge which is about 33% bone dry, and

WHEREAS, BPCo wishes to dispose of the sludge and NSLC has facilities for such disposal,

NOW, THEREFORE, the parties hereby agree as follows:

1. Type and Quantity of Materials. The materials involved will be principally paper mill effluent, partially dewatered; there may also be substantial quantities of other solid fill material of such nature not requiring a landfill permit. At such time as a landfill permit may be obtained by NSLC, BPCo may elect to deliver other waste materials from the plant site as would be permissible under such permit.

   NSLC agrees to accept such quantities of the kinds of materials specified above from the Moraine Mill which BPCo elects to

deliver to the Hilltop disposal area and not to accept materials from others for this area in quantities sufficient to prevent BPCo from disposing of up to 10,000 cubic yards per month for the full term of this contract. BPCo does not agree to deliver any specific amount of material.

2. Method of Disposal. BPCo will deliver the materials from time to time to the Hilltop disposal site. NSLC will maintain access roads in good usable condition during all seasons and weather variations, so that BPCo may deliver the materials daily if desirable in connection with its operations. NSLC will arrange for the areas to be accessible on a 24-hour basis. Any need for truck towing service at the Hilltop disposal site made necessary by improperly maintained access roads will be at the expense of NSLC.

3. Operation of Areas. NSLC will, at its entire expense, operate the landfill area, providing all necessary labor and materials, in such a way as to comply at all times with all laws, regulations, rules and requirements of all governmental bodies, federal, state and local, and NSLC will hold BPCo harmless against any loss or expense in connection with anything done or omitted to be done by NSLC after the materials have been delivered to the area.

4. Liability for Injury or Damage to Others. BPCo will be liable for all injury and damage to others in connection with anything done on the BPCo premises, or in connection with the operation of the vehicles delivering the materials except injury or damage resulting from any act or failure to act on NSLC's part, for

which NSLC will be liable, and NSLC will also be liable for all injury and damage to others from failure on its part to fulfill its obligations hereunder or any other act or failure to act on its part. Upon request, NSLC will furnish to BPCo a certificate showing that NSLC has insured risks with respect to its liability hereunder and otherwise with respect to the area designated with an insurer acceptable to BPCo and with limits of at least $500,000 each person, $1,000,000 each accident for bodily injury and at least $150,000 each owner, $300,000 each accident for property damage liabilities, such certificate to contain a provision that the insurance will not be terminated by the insurer without at least 30 days prior written notice to BPCo.

5. Damage to Your Property or Ours. NSLC will be liable for all damage to its own property and BPCo's and for injury to NSLC's and BPCo's officers, agents, representatives and employees resulting from any act or failure to act on NSLC's part in connection with the operation of the area it designates or otherwise in connection herewith and BPCo will be liable for such damage and injury resulting from any act or failure to act on its part in such respect.

6. Prices. The price for everything provided by NSLC will be:

September 1972 to September 1973 - $.55 per yard

September 1973 to September 1974 - $.60 per yard

September 1974 to September 1975 - Price to be negotiated but such price not to exceed 62-1/2 cents per yard.

Thereafter, the price will be such as BPCo and NSLC may mutually agree for succeeding periods. Approximately 90 days prior to the end of this contract period and each subsequent contract period, the parties hereto will endeavor to mutually agree on a price for the subsequent period. If the parties have not been able to reach agreement prior to the end of the contract period, either may give notice of termination, to be effective 90 days thereafter. The parties shall continue to make every effort to reach an agreement prior to termination, such agreement to be retroactive to the first day of the new contract period.

The amount of materials delivered by BPCo to NSLC will be determined from the records kept by BPCo and payment will be made within 30 days after the end of each month. BPCo will make such records freely available to NSLC and its representatives for inspection, upon request of NSLC and during usual business hours.

If, under part 8 of this agreement, NSLC provides an alternate site less economically accessible to BPCo, this shall be reason to reopen the contract for the purpose of price negotiation.

7. Term. Both BPCo and NSLC will be bound for 3 years, commencing September 1, 1972 and ending August 31, 1975; thereafter, the arrangement will continue in effect from year to year unless either BPCo or NSLC gives the other written notice of termination at least 90 days before the end of the first 3-year period or any subsequent contract period, and the arrangement

shall then terminate on the anniversary following the giving of the notice. This agreement may be terminated by BPCo at any time by giving 90-day prior notice in writing and by paying to NSLC a sum equal to $150 per month for each remaining month of the term of this contract or of the term of the contract between Industrial Waste Disposal Company, Inc. (of which NSLC is a subsidiary) and Hilltop Concrete Corporation, the terms of which are hereby incorporated by reference herein, whichever period shall be the shorter.

8. Force Majeure. Either BPCo or NSLC or both will be excused from performing obligations hereunder to the extent prevented by Act of God, fire, flood, other natural catastrophe, war, riot, civil insurrection, strike, governmental action or any other cause beyond the reasonable control of the party or parties prevented, provided the party or parties prevented take reasonable steps to resume performance as soon as possible; if performance is prevented for more than 60 days, the party which is not prevented from performing may, at its option, terminate these arrangements without liability. In case of termination of the contract between Industrial Waste Disposal Company, Inc. and Hilltop Concrete Corporation previously referenced, NSLC will provide BPCo an alternate dumping site for a period of at least six months after the effective date of such cancellation with no other change in terms of this contract for that period.

9. Independent Contractor Status. BPCo will look to NSLC only for the result and will not have the right to control the manner in which NSLC performs its obligations hereunder, and NSLC shall at all times be and remain an independent contractor with no powers of agency; none of NSLC's directors, officers, agents, representatives or employes will, by reason of anything done in connection with these arrangements be deemed to be an employee of or otherwise authorized to act on behalf of BPCo.

10. Prohibition Against Assignment. Neither NSLC nor BPCo will have any right to assign or transfer any right, title or interest hereunder without the prior written consent of the other, which consent shall not be unreasonably withheld.

11. Bankruptcy, Insolvency, Etc. BPCo may, at its option, terminate this Agreement upon giving at least 10 days written notice if NSLC shall file a petition in bankruptcy, if a petition in bankruptcy is filed against NSLC and it is adjudged bankrupt, if a receiver shall be appointed for NSLC shall enter into reorganization proceedings under any bankruptcy or similar law, or if NSLC shall voluntarily or involuntarily become subject to the provisions of any law pertaining to relief of insolvent debtors.

BERGSTROM PAPER COMPANY

BY _____
Mill Manager

NORTH SANITARY LANDFILL COMPANY, INC

BY _____

60846

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

12/~~[illegible]~~

INVOICE NUMBER
940104

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

9570-3390

ACCOUNT NO.	INVOICE DATE
05800-000-3	11-30-76

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	~~3892~~ 3543-76-0		940104	11-30-76

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,804 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	3,157.32
TOTAL AMOUNT DUE	$3,157.32*

PRICES CK'D. lp
EXTEN. CK'D. pj
REC'D. VIA
DATE REC'D.
FRT. CHGS.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

60840

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

11/17

INVOICE NUMBER
940095

BILL TO
BERGSTROM PAPER COMPANY
P.O. BOX 488
NEENAH, WI 54956

ACCOUNT NO. 05800-000-3

INVOICE DATE 10-31-76

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

9570-3390

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3892-76-0		940095	10-31-76

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
4,308 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	3,575.64
...D CK'D. PJ	
...EN. CK'D. PJ — TOTAL AMOUNT THIS INVOICE	3,575.64**
...'D. VIA	
...TE REC'D.	
...T. CHGS.	

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

#60840

15
10/

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER COMPANY
BERGSTROM ROAD
NEENAH, WISCONSIN 54956

INVOICE NUMBER
940087

ACCOUNT NO. | INVOICE DATE
05800-000-3 | 9-30-76

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

- 9570 - 3390

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
BERGSTROM PAPER COMPANY MORAINE MILL	3543-76-0		940087	9-30-76

DESCRIPTION	AMOUNT
CHARGES FOR SLUDGE DISPOSAL FROM YOUR WASTE TREATMENT PLANT	
3,660 CU YD @ $0.83 PER CU YD	3,037.80
...ES CK'D. RLP	
...EN. CK'D.	
...D. VIA	
TOTAL AMOUNT DUE	$3,037.80*
...TE REC'D.	
... CHGS.	
recap sheet	

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821 NSL-1-3/75

NOTE

I HAVE SENT A COPY TO NORTH SANITARY LANDFILL AND WILL DO SO MONTHLY FROM NOW ON IF THIS IS AGREEABLE.

SSS

Bergstrom Paper Company
Effluent Plant, Ohio Mill
West Carrollton, Ohio 45449

Attn: Water Treatment Supervisor

PURCHASE ORDER

NO. 3543-76-0

MONTH September 19 76

3,660 CU. YDS. SLUDGE FROM WASTE TREATMENT PLANT TO HILLTOP DISPOSAL SITE,

144 CU. YDS. ASHES FROM POWER PLANT TO HILLTOP DISPOSAL SITE.

IT IS REQUESTED THAT ONE COPY BE RETURNED TO NORTH SANITARY LANDFILL, INC. NO LATER THAN 10TH OF MONTH.

North Sanitary Landfill, Inc.
P. O. Box 1453
Dayton, Ohio 45414

6084

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

w/o 9570-3390

ORIGINAL INVOICE

10/4

INVOICE NUMBER
940081

BILL TO BERGSTROM PAPER COMPANY
BERGSTROMM ORAD
NEENAH, WISCONSIN 54956

9570-3390

ACCOUNT NO. 05800-000-3

INVOICE DATE 9-01-76

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
BERGSTROM PAPER COMPANY MORAINE MILL	3892-76-0		940081	9-01-76

DESCRIPTION	AMOUNT
CHARGES FOR SLUDGE DISPOSAL FROM YOUR WASTE TREATMENT PLANT 4,188 CU YD @ $.83 PER CU YD	3,476.04
TOTAL AMOUNT DUE	3,476.04**

...ES CK'D. DLL
...TEN. CK'D. PJ
...D. VIA
...ATE REC'D.
...RT. CHGS.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

Bergstrom Paper Company
Effluent Plant, Ohio Mill
West Carrollton, Ohio 45449

Attn: Water Treatment Supervisor

PURCHASE ORDER

NO. 3543-76-0

MONTH August 1976

4,188 CU. YDS. SLUDGE FROM WASTE TREATMENT PLANT TO HILLTOP DISPOSAL SITE,

132 CU. YDS. ASHES FROM POWER PLANT TO HILLTOP DISPOSAL SITE.

IT IS REQUESTED THAT ONE COPY BE RETURNED TO NORTH SANITARY LANDFILL, INC. NO LATER THAN 10TH OF MONTH.

North Sanitary Landfill, Inc.
P. O. Box 1453
Dayton, Ohio 45414

#60540

ORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

8/27

BILL TO
BERGSTROM PAPER CPMPANY
BERGSTROM ROAD
NEENAH, WI 54956

9570-3390

INVOICE NUMBER 940074

ACCOUNT NO. 05800-000-3

INVOICE DATE 7-31-76

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
DUMPING CHARGES FOR JUNE, 1976	3543-76-0		940074	7-31-76

DESCRIPTION	AMOUNT
DUMPING CHARGES FOR USE OF NORTH SANITARY LANDFILL AT HILLTOP CONCRETE SITE: 3864 CU YD @ $.80 PER CU YD FOR JUNE 1976.	3091.20
TOTAL AMOUNT DUE	3091.20***

PRICES CK'D. _____
EXTEN. CK'D. _____
REC'D. VIA _____
DATE REC'D. _____
FRT. CHGS. _____

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

#60840

ORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE
6/1/76

9570-3390

BILL TO
BERGSTROM PAPER COMPANY
BERGSTROM ROAD
NEENAH WISCONSIN 54956

INVOICE NUMBER
940064

ACCOUNT NO.	INVOICE DATE
05800-000-3	5-31-76

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
BERGSTROM PAPER COMPANY EFFLUENT PLANT OHIO MILL WEST CARROLLTON OH 45449	3543 76 0		940064	5-31-76

DESCRIPTION	AMOUNT
4584 ~~5,584~~ CU YDS SLUDGE FROM WASTE TREATMENT PLANT TO HILLTOP DISPOSAL	
SITE @ $0.80/ CU YD	3,667.20
AMOUNT OF THIS INVOICE	3,667.20*

PRICES CK'D. MS
EXTEN. CK'D. CAS
REC'D. VIA
DATE REC'D.
FRT. CHGS.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

#60540

ORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

570-3390

ORIGINAL INVOICE

5/19

BILL TO
BERGSTROM PAPER COMPANY
BERGSTROM ROAD
NEENAH WISCONSIN 54956

PRICES CK'D. up
EXTEN. CK'D. up
REC'D. VIA
DATE REC'D. OK
FRT. CHGS.

INVOICE NUMBER 940060

ACCOUNT NO. 05800-000-3

INVOICE DATE 5-01-76

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
BERGSTROM PAPER COMPANY EFFLUENT PLANT OHIO MILL WEST CARROLLTON OH 45449	3543 76 0		940060	5-01-76

DESCRIPTION	AMOUNT
4,404 CU YDS SLUDGE FROM WASTE TREATMENT PLANT TO HILLTOP DISPOSAL SITE @ $0.80/CU YD	3,523.20
AMOUNT OF THIS INVOICE	$3,523.20*

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

#60840

ORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE
12/18

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

9570-3390

INVOICE NUMBER
940170

ACCOUNT NO.	INVOICE DAT
05800-000-3	12-08-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3543-76-0		940170	12-08-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,112 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,752.96
...S CK'D. lp	
...TEN. CK'D. pj	
...EC'D. VIA _____ TOTAL AMOUNT DUE	1,752.96*
...ATE REC'D. _____	
...T. CHGS. _____	

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

#60840

RTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

11/20

9570-3390

BILL TO BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

INVOICE NUMBER
M 940163

ACCOUNT NO.	INVOICE DATE
05800-000-3	11-10-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3543-76-0		940163	11-10-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,556 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,121.48
RICES CK'D. lup	
XTEN. CK'D. lup	
EC'D. VIA OK	
DATE REC'D.	
RT CHGS.	
TOTAL AMOUNT DUE	2,121.48*

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

#60840

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE
10/17

INVOICE NUMBER
940158

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

9570-3390

ACCOUNT NO. 05800-000-3

INVOICE DATE 9-30-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3543-76-0		940158	9-30-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,424 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,011.92
ICES CK'D. tji	
TEN. CK'D. tji	
C'D. VIA	
TOTAL AMOUNT DUE	2,011.92*
ATE REC'D.	
T CHGS	

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

#66540

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

INVOICE NUMBER 940147

ACCOUNT NO.	INVOICE DATE
05800-000-3	7-31-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
9570-3390	3543-76-0		940147	7-31-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,812 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,503.96
PRICES CK'D. TOTAL AMOUNT DUE	1,503.96*
EXTEN. CK'D.	
REC'D. VIA	
DATE REC'D.	

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Phone: 278-0821

ORIGINAL INVOICE

9/29

INVOICE NUMBER
940153

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

9570-3390

ACCOUNT NO.	INVOICE DATE
05800-000-3	8-31-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3543-76-0		940153	8-31-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,568 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OHIO TO HILLTOP DISPOSAL SITE @ $ 0.83 PER CU YD	2,131.44
TOTAL AMOUNT DUE	2,131.44*

...ES CK'D. pj
...TEN. CK'D. pj
...C'D. VIA
...TE REC'D.
...CHGS

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

TH SANITARY LANDFILL, INC.

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Phone: 278-0821

ORIGINAL INVOICE

INVOICE NUMBER 940136

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

9570-3390

ACCOUNT NO.	INVOICE DATE
05800-000-3	6-30-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
May	3543-76-0		940136	6-30-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,456 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,868.40
TRANS CK'D.	
GEN. CK'D.	
REC'D. VIA	
DATE REC'D.	
DT. CHGS.	
TOTAL AMOUNT DUE	$2,868.40*

2868.40

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821 NSL-1-3/75

#6 08410

ORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

5/1

INVOICE NUMBER 940131

BILL TO BERGSTROM PAPER COMPANY"
PO BOX 488
NEENAH WI 54956

9570-3390

ACCOUNT NO. 05800-000-3

INVOICE DA 4-30-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
April	3543-76-0		940131	4-30-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,540 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,938.20
TOTAL AMOUJT DUE	2,938.20*

RICES CK'D. pj
XTEN. CK'D. pj
EC'D. VIA
DATE REC'D.
RT. CHGS

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NSL-1-3/75

#60840

ORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

4/17

INVOICE NUMBER
940125

BILL TO
BERGSTROM PAPER COMPANY
P.O. BOX 488
NEEHAN WISCONSIN 54956

ACCOUNT NO.	INVOICE DATE
05800-000-3	4-1-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3543-76-0		940125	4-1-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT: 9570-3390	
3,720 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	3,087.60
RICES CK'D. tjs	
XTEN. CK'D. tjs	
EC'D. VIA	
ATE REC'D.	
TOTAL AMOUNT DUE	$3,087.60*

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

3/19

INVOICE NUMBER
940117

BILL TO
BERGSTROM PAPER COMPANY
P.O. BOX 488
NEEHAN, WISCONSIN 54956

9570-3390

ACCOUNT NO. 05800-000-3

INVOICE DATE 3-1-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3543-76-0		940117	3-1-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
4,092 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	$ 3,396.36
PRICES CK'D. lup	
EXTEN. CK'D. tgi	
TOTAL AMOUNT DUE	$ 3,396.36***
REC'D. VIA	
DATE REC'D.	
SPT. CHGS	

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821 NSL-1-3/75

#-60841

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

2/22

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

9510-3390

INVOICE NUMBER
940112

ACCOUNT NO.	INVOICE DATE
05800-000-3	1-31-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3543-76-0		940112	1-31-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,252 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON, OHIO	
TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,699.16
TOTAL AMOUNT DUE	$2,699.16*

CK'D. tjs
EN. CK'D. tjs
C'D. VIA
ATE REC'D.
T CHGS.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

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ORTH SANITARY LANDFILL, INC.

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Phone: 278-0821

1/14

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

9570-3390

INVOICE NUMBER
940108

ACCOUNT NO.	INVOICE DAT
05800-000-3	12-31-76

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	3543-76-0		940108	12-31-76

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,756 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLTON, OHIO TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	3,117.48
TOTAL AMOUNT DUE	$3,117.48*

...ICES CK'D. lep
...XTEN. CK'D. lep
...C'D. VIA
...ATE REC'D. OK.
...RT CHGS

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

60540

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER CO
PO BOX 488
NEENAH WISCONSIN 54956

9570-3390

INVOICE NUMBER 940310

ACCOUNT NO. 03600-003-3

INVOICE DATE 11-30-78

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940310	11-30-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,100 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,743.00
PRICES CK'D.	
EXTEN. CK'D. TOTAL AMOUNT DUE	1,743.00*
REC'D. VIA	
DATE REC'D.	

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RTH SANITARY LANDFILL, INC.

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Phone: 278-0821

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER CO
PO BOX 488
NEENAH WI 54956

9570-3370

INVOICE NUMBER 940303

ACCOUNT NO.	INVOICE DAT
05800-003-3	10-31-78

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE 11/2

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940303	10-31-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,716 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,424.28
PRICES CK'D.	
EXTEN. CK'D.	
TOTAL AMOUNT DUE	1,424.28*
REC'D. VIA	
DATE REC'D.	
FRT. CHGS	

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

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Phone: 278-0821

BILL TO
BERGSTROM PAPER CO
PO BOX 488
NEENAH WI 54956

9570-3390

INVOICE NUMBER
940291

ACCOUNT NO. 05800-003-3

INVOICE DA 9-30-78

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940291	9-30-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,764 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,464.12
TOTAL AMOUNT DUE	1,464.12*

PRICES CK'D.
EXTEN. CK'D.
REC'D. VIA
DATE REC'D.
EDIT CHGS

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER CO
PO BOX 488
NEENAH WI 54956

INVOICE NUMBER 940286

ACCOUNT NO. 05800-003-3

INVOICE DATE 9-21-78

9570-3390

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940286	9-21-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,992 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER UU YD	1,653.35
PRICES CKD. tjs	
EXTENS. CKD. tjs	
SHIP. VIA	
DATE REC'D.	
TOTAL AMOUNT DUE	1,653.35*

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

#6084

ORIGINAL INVOICE
8/16

INVOICE NUMBER
940273

BILL TO
BERGSTROM PAPER CO
PO BOX 488
NEENAH WI 54956

9570-3390

ACCOUNT NO. 05800-000-3

INVOICE DATE 7-31-78

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940273	7-31-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,304 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,912.32
TOTAL AMOUNT DUE	1,912.32*

ICES CK'D. Gjs
XTEN. CK'D. Gjs
EC'D. VIA
DATE REC'D.
RT CHGS.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

WSL-1-3/78

#60540

7/29

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER CO
PO BOX 188
NEENAH WI 54956

INVOICE NUMBER
940254

ACCOUNT NO.	INVOICE DATE
05800-000-3	6-30-78

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940254	6-30-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,028 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD1	1,683.24
PRICES CK'D.	
EXTEN. CK'D.	
REC'D. VIA	
TOTAL AMOUNT DUE	1,683.24*
DATE REC'D.	
FRT. CHGS.	

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

#60840

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

INVOICE NUMBER 940247

BILL TO
BERTSTROM PAPER CO
P.O. BOX 488
NEENAH WI 54956

ACCOUNT NO.	INVOICE DATE
05800-000-3	5-31-78

9570-3390

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940247	5-31-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,860 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,543.80
TOTAL AMOUNT DUE	1,543.80*

PRICES CK'D.
EXTEN. CK'D.
REC'D. VIA
DATE REC'D.
CHGS.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

RTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

#60540

5/18

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

INVOICE NUMBER
940240

ACCOUNT NO.	INVOICE DATE
05800-000-3	5-8-78

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

4570-3390

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940240	5-8-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,644 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,364.53
TOTAL AMOUNT DUE	1,364.53*

PRICES CK'D. OK
EXTEN. CK'D. OK
REC'D. VIA
DATE REC'D.
ST. CHGS

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821 58001

NSL-1-3/75

#60840

ORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

4/1

INVOICE NUMBER
940187

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

ACCOUNT NO.	INVOICE DATE
05800-000-3	3-31-78

9570-3390

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940187	3-31-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,920 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,593.60
TOTAL AMOUNT DUE	1,593.60*

RICES CK'D. tjs
XTEN. CK'D. tjs
EC'D. VIA
DATE REC'D.
T CHGS.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75 5800

1# 60890

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE
2/10

INVOICE NUMBER
940183

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

9570 · 3390

ACCOUNT NO.	INVOICE DATE
05800-000-3	1-31-78

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940183	1-31-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,932 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,603.56
TOTAL AMOUNT DUE	1,603.56*

PRICES CK'D. RJ
EXTEN. CK'D. RJ
'C'D. VIA
REC'D.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

60840

NORTH SANITARY LANDFILL, INC.

P. O. Box ~~1453~~, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER COMPANY
PO BOX 488
NEENAH WI 54956

INVOICE NUMBER
940173

ACCOUNT NO.	INVOICE DATE
05800-000-3	12-31-77

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
9570-3390			940173	12-31-77

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,244 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,862.52
TOTAL AMOUNT DUE	1,862.52*

...ICES CK'D. Gs
...TEN. CK'D. Gs
...C'D. VIA
...TE REC'D.
... CHGS.

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

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#40840

ORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

BILL TO

BERGSTROM PAPER CO
PO BOX 488
NEENAH WISCONSIN 54956

9570-3390

INVOICE NUMBER 940316

ACCOUNT NO. 05800-000-3

INVOICE DATE 12-31-78

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940316	12-31-78

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
1,464 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,215.12
PRICES CK'D. tgs	
EXTEN. CK'D. tgs	
REC'D. VIA	
TOTAL AMOUNT DUE	1,215.12* ✓
DATE REC'D.	
FRT. CHGS.	

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

TH SANITARY LANDFILL INC
O BOX 1453
DAYTON OH 45414

#6-0840

ORIGINAL INVOICE

INVOICE NUMBER
940324

BILL TO
BERGSTROM PAPER CO
PO BOX 488
NEENAH WISCONSIN 54956

ACCOUNT NO.	INVOICE DATE
05800-000-3	1-31-79

9570-3390

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE

AMOUNT ENCLOSED $

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940324	1-31-79

DESCRIPTION	AMOUNT
1,728 CU YDS SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1,434.24
TOTAL AMOUNT DUE	1,434.24* ✓

PRICES CHKD. tyi
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REC'D. VIA
DATE REC'D.
FRT. CHGS.

#60840

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

3/16

INVOICE NUMBER

940331

BILL TO

BERGSTROM PAPER CO
PO BOX 488
NEENAH WISCONSIN 54956

9570-3390

ACCOUNT NO.	INVOICE DATE
05800-000-3	2-28-79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940331	2-28-79

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACOUNT:	
1,716 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	1424.28
TOTAL AMOUNT DUE	1424.28* ✓

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...XTEN. CK'D. Ags
...EC'D. VIA
...ATE REC'D.
... CHGS

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

NORTH SANITARY LANDFILL INC
PO BOX 1145
DAYTON OH 45414

#40840
ORIGINAL INVOICE

INVOICE NUMBER 4/1
940340

BILL TO
BERGSTROM PAPER CO
PO BOX 1[illegible]
NEENAH WISCONSIN 54956

9570-3390

ACCOUNT NO.	INVOICE DATE
05800-000-3	3-31-79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE

AMOUNT ENCLOSED $

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940340	3-31-79

DESCRIPTION	AMOUNT
3,348 CU YDS SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,778.84
TOTAL AMOUNT DUE	2,778.84*

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[illegible]C'D. VIA
[illegible]ATE REC'D.
[illegible]T CHGS.

NORTH SANITARY LANDFILL INC
PO BOX 1453
DAYTON OH 45414

#40840

ORIGINAL INVOICE

INVOICE NUMBER 940350

9570-3390

BILL TO
BERGSTROM PAPER CO
PO BOX 488
NEENAH WISCONSIN 54956

ACCOUNT NO.	INVOICE DATE
05800-000-3	4-30-79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT, RETURN THIS UPPER PORTION WITH YOUR REMITTANCE

AMOUNT ENCLOSED $ _____

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940350	4-30-79

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,324 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,758.92
TOTAL AMOUNT DUE	2,758.92*

ICES CK'D. _____
XTEN. CK'D. _____
C'D. VIA _____
TE REC'D. _____

NORTH SANITARY LANDFILL INC
PO BOX 1453
DAYTON OH 45414

~~440840~~
ORIGINAL INVOICE
5/30
INVOICE NUMBER
940342

BILL TO
BERGSTROM PAPER CO
ATTN DENNIS SART
PO BOX 488
NEENAH WISCONSIN 54956 9570-5252

ACCOUNT NO.	INVOICE DATE
05800-000-3	4-17-79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE

AMOUNT ENCLOSED $

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940342	4-17-79

DESCRIPTION		AMOUNT
WE CHARGE YOUR ACCOUNT:		
LABOR AND DOZER RENTAL ON THE FOLLOWING DATES:		
3-28 3-29 3-31		
LABOR	140.00	
DOZER	230.00	
TOTAL AMOUNT DUE		370.00*

PRICES CK'D.
EXTEN. CK'D.
REC'D. VIA
DATE REC'D. 4/19
CHGS

NORTH SANITARY LANDFILL INC
PO BOX 1453
DAYTON OH 45414

460240

ORIGINAL INVOICE

7/5

INVOICE NUMBER

940363

9570-3390

BILL TO

BERGSTROM PAPER CO
PO BOX 488
NEENAH WISCONSIN 54956

ACCOUNT NO.	INVOICE DATE
05800-000-3	6-30-79

TERMS: NET 10 DAYS AFTER RECEIPT OR INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE

AMOUNT ENCLOSED $ _____

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940363	6-30-79

DESCRIPTIONS	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,060 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,539.80
TOTAL AMOUNT DUE	2,539.80*

CK'D. _____
TEN. CK'D. _____
C'D. VIA _____
ATE REC'D. _____
T CHGS. _____

NORTH SANITARY LANDFILL, INC.
PO BOX 1453
DAYTON OH 45414
513-278-0821

#60540

ORIGINAL INVOICE

8/17

INVOICE NUMBER
940366

BERGSTROM PAPER CO
PO BOX 488
NEENAH WISCONSIN 54956

9570-3390

ACCOUNT NO.	INVOICE DATE
05800-000-3	6-30-79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT, RETURN THIS UPPER PORTION WITH YOUR REMITTANCE

AMOUNT ENCLOSED $ _____

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940366	6-30-79

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,024 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,539.80
TOTAL AMOUNT DUE	2,539.80*
	2509.92 ✓

ICES CK'D. _____
XTEN. CK'D. _____
EC'D. VIA _____
TE REC'D. _____
CHGS. _____

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

60840

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER CO
PO BOX 488
NEENAH WISCONSIN 54956

9570-3390

INVOICE NUMBER 940376 12/21

ACCOUNT NO.	INVOICE DATE
05800-000-3	8-31-79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940376	8-31-79

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
3,216 CU YD SLUDGE FROM WASTE TREATMENT PLANT IN WEST CARROLLTON OH TO HILLTOP DISPOSAL SITE @ $0.83 PER CU YD	2,669.28
RICES CK'D.	
XTEN. CK'D.	
EC'D. VIA	
ATE REC'D.	
T CHGS	
TOTAL AMOUNT DUE	2,669.28*

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

60840

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

BILL TO
BERGSTROM PAPER COMPANY
P.O. Box 488
NEENAH, WISCONSIN 54956

9570-3390

INVOICE NUMBER 940393 1/2

ACCOUNT NO.	INVOICE DATE
1006715	09/18/79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
BERGSTROM PAPER	2931-79-0		940393	09/18/79

DESCRIPTION	AMOUNT
WE CHARGE YOUR ACCOUNT:	
2,424 CUBIC YARDS SLUDGE @ 12.00 CU. YD./ LOAD=202 LOADS 202 LOADS @ 20.00 PER LOAD	4040.00
TOTAL AMOUNT DUE THIS INVOICE	4040.00*

Bergstrom Paper Company
Effluent Plant, Ohio Mill
West Carrollton, Ohio 45449

Attention Water Treatment Supervisor

PURCHASE ORDER

NO. 1637-79-0

MONTH August 19 79

2,424 CU. YDS. SLUDGE FROM

WASTE TREATMENT PLANT TO HILLTOP DISPOSAL SITE.

0 CU. YDS. ASHES FROM

POWER PLANT TO HILLTOP DISPOSAL SITE.

IT IS REQUESTED THAT ONE COPY BE RETURNED TO NORTH SANITARY LANDFILL, INC. NO LATER THAN 10TH OF MONTH.

North Sanitary Landfill, Inc.
P. O. Box 1453
Dayton, Ohio 45414

NORTH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

INVOICE NUMBER 940399

BERGSTROM PAPER COMPANY
P.O. BOX 488
NEENAH, WISCONSIN 54956

ACCOUNT NO.	INVOICE DATE
1006715	10/02/79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
BERGSTROM PAPER COMPANY WEST CARROLLTON, OHIO	1637-79-0		940399	10/02/

DESCRIPTION	AMOUNT
496 LOADS @ $20.00 PER LOAD	9,920.00
TOTAL AMOUNT DUE THIS INVOICE	9,920.00*

ICES CK'D.
TEN. CK'D.
EC'D. VIA
ATE REC'D.
T CHGS.

Bergstrom Paper Company
Effluent Plant, Ohio Mill
West Carrollton, Ohio 45449

Attention Water Treatment Supervisor

PURCHASE ORDER

NO. 1637-79-0

MONTH September 19 79

5,952 CU. YDS. SLUDGE FROM

WASTE TREATMENT PLANT TO HILLTOP DISPOSAL SITE,

0 CU. YDS. ASHES FROM

POWER PLANT TO HILLTOP DISPOSAL SITE.

IT IS REQUESTED THAT ONE COPY BE RETURNED TO NORTH SANITARY LANDFILL, INC. NO LATER THAN 10TH OF MONTH.

North Sanitary Landfill, Inc.
P. O. Box 1453
Dayton, Ohio 45414

INVOICE:

496 LOADS @ $20.00 = 9920.00

J 60840

TH SANITARY LANDFILL, INC.

P. O. Box 1453, Dayton, Ohio 45414
Phone: 278-0821

ORIGINAL INVOICE

BILL TO BERGSTROM PAPER COMPANY
P.O. BOX 488
NEENAH WISCONSIN 54956

7620-32-71800
~~9570-3390~~

INVOICE NUMBER 940414 3/5

ACCOUNT NO.	INVOICE DATE
1006715	10/31/79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
EFFLUENT PLANT, OHIO MILL WEST CARROLLTON, OHIO	1637-79-0		940414	10/31/79

DESCRIPTION	AMOUNT
351 LOADS AT 20.00 EACH	7,020.00
TOTAL AMOUNT DUE THIS INVOICE	7,020.00*

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...TEN. CK'D. [illegible]
...C'D. VIA
...TE REC'D.
... CHGS.

Fair October

NORTH SANITARY LANDFILL, INC., P.O. BOX 1453, DAYTON, OHIO 45414 - 278-0821

NSL-1-3/75

NORTH SANITARY LANDFILL COMPANY, INC.
P.O. BOX 1453
DAYTON, OHIO 45414

ORIGINAL INVOICE

BERGSTROM PAPER COMPANY

INVOICE NUMBER 940422

BILL TO
BERGSTROM PAPER COMPANY
P.O. BOX 488
NEENAH WISCONSIN 54956

9570-3390

ACCOUNT NO.	INVOICE DATE
1006715	12/17/79

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT, RETURN THIS UPPER PORTION WITH YOUR REMITTANCE.

AMOUNT ENCLOSED $

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940422	12/17/79

DESCRIPTION	AMOUNT
3,000 CUBIC YARDS SLUDGE AT 12 CUBIC YARDS PER LOAD	
250 LOADS OF SLUDGE AT 20 PER LOAD	5,000.00
TOTAL AMOUNT DUE THIS INVOICE	5,000.00*

now

Bergstrom Paper Company
Effluent Plant, Ohio Mill
West Carrollton, Ohio 45449

Attention Water Treatment Supervisor

PURCHASE ORDER

NO. 1637-79-0

MONTH NOVEMBER 19 79

3,000 CU. YDS. SLUDGE FROM

WASTE TREATMENT PLANT TO ~~XXXXXXX~~ DISPOSAL SITE,

NONE CU. YDS. ASHES FROM

POWER PLANT TO ~~XXXXXXXX~~ DISPOSAL SITE.

IT IS REQUESTED THAT ONE COPY BE RETURNED TO NORTH SANITARY LANDFILL, INC. NO LATER THAN 10TH OF MONTH.

North Sanitary Landfill, Inc.
P. O. Box 1453
Dayton, Ohio 45414

NORTH SANITARY LANDFILL COMPANY
P.O. BOX 1453, DAYTON, OHIO 45414

F 6340

ORIGINAL INVOICE

Bergstrom Paper Company

INVOICE NUMBER
940439

BILL TO
Bergstrom Paper Company
Neenah Mill
P.O. Box 488
Neenah, Wisconsin 54956

7620-32-71F00

ACCOUNT NO.	INVOICE DATE
1014495	01/31/80

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT, RETURN THIS UPPER PORTION WITH YOUR REMITTANCE

AMOUNT ENCLOSED $ _____

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
	1637-79-0		940439	01/31/80

DESCRIPTION	AMOUNT
Refuse dumping - Pinnacle Road Site	
643 Cubic Yards at $3.00 per yard	1,929.00
Refuse Dumping - Snyder Road Site	
1,740 cubic yards = 145 loads at $20.00 each	2,900.00
Total amount due	4,829.00

CK'D. _____
TEN. CK'D. _____
C'D. VIA _____
ATE REC'D. _____
CHGS. _____

Bergstrom Paper Company
Effluent Plant, Ohio Mill
West Carrollton, Ohio 45449

Attention Water Treatment Supervisor

PURCHASE ORDER

NO. 1637-79-0

MONTH DECEMBER 19 79

Snyder Pinnacle Rd.

$2900. = $20/@ 145 = +12 1,740 636 CU. YDS. SLUDGE FROM

#1 Truck, 21 yd Bed
#2 Truck 16 yd Bed

WASTE TREATMENT PLANT TO ~~XXXXXXX~~ DISPOSAL SITE,

NONE CU. YDS. ASHES FROM

POWER PLANT TO ~~XXXXXX~~ DISPOSAL SITE.

1014495

IT IS REQUESTED THAT ONE COPY BE RETURNED TO NORTH SANITARY LANDFILL, INC. NO LATER THAN 10TH OF MONTH.

North Sanitary Landfill, Inc.
P. O. Box 1453
Dayton, Ohio 45414

TO BE BILLED FROM 6 3 4 5 x $3 PLUS $1929
Pinnacle R.O. SITE

30 23

North Sanitary Landfill
P.O. Box 1453
Dayton, Ohio 45414

+ 60840

ORIGINAL INVOICE

Bergstrom Paper Company

INVOICE NUMBER
940443

76-20-32-71800

BILL TO
Bergstrom Paper Company
P.O. Box 488
Neenah, Wisconsin 54956

ACCOUNT NO.	INVOICE DATE
1006715	01/31/80

3/11

TERMS: NET 10 DAYS AFTER RECEIPT OF INVOICE

TO INSURE PROPER CREDIT, RETURN THIS UPPER PORTION WITH YOUR REMITTANCE

AMOUNT ENCLOSED $ _____

SERVICE LOCATION	P.O. NO.	REF. NO.	INVOICE NO.	DATE
			940443	013/1/8

DESCRIPTION	AMOUNT
Landfill charge for the month of January	
3,604 cubic yards sludge at $3.00 per cubic yard	10,812.00
Total amount due	10,812.00*

CES CK'D. _____
TEN. CK'D. _____
EC'D. VIA _____
ATE REC'D. _____
T CHGS. _____

BERGSTROM PAPER
A DIVISION OF P. H. GLATFELTER COMPANY
1030 SOUTH ALEX ROAD
WEST CARROLLTON, OHIO 45449

TO: North Sanitary Landfill, Inc.
P. O. Box 1453
Dayton, Ohio 45414

WASTE REPORT

PURCHASE ORDER
NO. _____

Kim,
Bill Bergstrom
In 3604 c.y. @
$3.00 = $10,812

MONTH January 19 80

(OUR TRUCK)	(GAINES)	
1,547	2,057	CU. YDS. SLUDGE FROM

WASTE TREATMENT PLANT HYDRAULIC ROAD TO PINNACLE ROAD DISPOSAL SITE.

NONE CU. YDS. ASHES FROM POWER PLANT ALEX-BELL ROAD TO PINNACLE ROAD DISPOSAL SITE.

* Bill for amount of sludge

Yours truly,
Gary McDowell
Gary McDowell
Environmental Supervisor

June 5, 1973

Southwest District Office
40 South Main Street
Dayton, Ohio 45402

Re: Montgomery County
Jefferson Township
Kimberly Clark Company
Paper Mill Sludge

Mr. John Bindeman
Bureau Supervisor
Montgomery County Health Department
451 West Third Street
Dayton, Ohio 45402

Dear Mr. Bindeman:

In response to your inquiry as to our position on the disposal of paper mill sludge from the Kimberly Clark Company, we contacted Mr. Sheldon Darity, chemist, with our Division of Waste Management and Engineering, who has worked with paper manufacturing plants for several years.

Mr. Darity stated that the chemical constituency of the paper mill sludge is such that it would not adversely affect the ground water nor in any way be harmful to the public health.

Therefore, the disposal of the Kimberly Clark paper mill sludge is not considered to be under the scope of the solid waste disposal laws and regulations.

Sincerely yours,

Larry Dietrick

Larry Dietrick
Acting Assistant Chief
Division of Surveillance

mlk

Annual Report
R-E100625-01
Environmental Protection Agency
Cincinnati, Ohio

AN EXPERIMENTAL HIGH ASH PAPERMILL SURFACE LANDFILL

Division of Engineering Research
MICHIGAN STATE UNIVERSITY
East Lansing, Michigan

AN EXPERIMENTAL HIGH ASH PAPERMILL SLUDGE LANDFILL

First Annual Report

Prepared by

O. B. Andersland,[+] Robert P. Vallee,[+] and Timothy A. Armstrong*

[+]Department of Civil Engineering, Michigan State University, and

*National Council of the Paper Industry for Air and Stream Improvement, Inc.

under Research Grant R-EP00685-01

U.S. ENVIRONMENTAL PROTECTION AGENCY

1972

ABSTRACT

An experimental papermill sludge landfill was constructed and monitored to obtain engineering information essential to the development of guidelines and recommendations for the design and operation of solid papermill waste landfills. The experimental landfill consisted of 2 sludge layers, each initially 10 ft thick, with sand drainage blankets at the top, middle, and bottom. An earth dike provided lateral confinement of the soft sludge both during and after construction. A surface load, consisting of 3 ft of natural soil, was placed immediately after construction. The landfill was instrumented with 32 settlement plates, 16 piezometers, 3 total pressure cells, and 10 thermistors. Field data obtained during the first year included settlements, pore water pressures, vertical and lateral earth pressures, temperature, sludge unit weights, specific gravity, and water contents. Laboratory work included consistency limits, ash contents, and consolidation tests. A detailed description of the field behavior is given in the report along with predictions based on laboratory results and soil mechanics theory. Sampling of leachate from the sludge landfill at weekly intervals and laboratory analysis according to standard methods for the examination of water and wastewater provided documentation as to leachate composition. A lysimeter study provides information on changes in quality of the leachate when passed through selected natural soils.

It is shown that soil mechanics theory can be used to accurately model the sludge consolidation behavior for different conditions of loading. Ultimate primary settlements can be reasonably estimated if appropriate pore pressure changes and void ratio considerations are included in the settlement analysis. Secondary compression is difficult to predict from laboratory parameters. The time-rate of settlement is accurately modeled by Terzaghi's (1943) theory when a representative value for the coefficient of consolidation is used. Laboratory consolidation tests underestimated this parameter by a factor of about four. Consolidation theory can be used to predict pore pressures up to about 70 percent dissipation. Residual pore pressures were observed in the sludge at the completion of primary compression. Pore pressures generated during construction were in general agreement with predicted values based on Gibson's (1958) theory. The coefficient of lateral stress decreased from an initial value close to

0.65 immediately after sludge placement to about 0.32 for the final stages of consolidation. The lysimeter study showed that passage of leachate through a minimal depth of soil should render the percolate innocuous.

PREFACE

This annual report covers phase I of an experimental high ash papermill sludge landfill project. The work described was made possible by Research Grant R-EP00685-01 from the U.S. Environmental Protection Agency, under agreement with Michigan State University.

Robert P. Vallee, research assistant in soil mechanics, was responsible for the supervision of construction at the site, instrumentation, and monitoring of the landfill, and carried out experimental laboratory work in the Soil Mechanics Laboratory of the Department of Civil Engineering at Michigan State University. Timothy A. Armstrong, Research Engineer for the National Council of the Paper Industry for Air and Stream Improvement, Inc., performed the leachate analysis and lysimeter study. Dr. O.B. Andersland, Professor of Civil Engineering, supervised the research and the preparation of this report. The landfill site and dewatered sludge were furnished by the Kimberly Clark Corporation-Morraine Mill, West Carrollton, Ohio. The B.G. Danis Co., Dayton, Ohio, carried out the construction of the landfill.

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the U.S. Environmental Protection Agency.

Chapter VII. SUMMARY AND CONCLUSIONS

Field Consolidation

An experimental papermill sludge landfill was constructed and monitored to obtain engineering information essential to developing guidelines and recommendations for the design and operation of solid papermill waste landfills. The landfill consisted of 2 sludge layers, initially 10 ft thick, with sand drainage blankets at the top, middle, and bottom. An earth dike provided lateral confinement for the soft sludge during and after construction, and the surface load consisted of 3 ft of natural soil. The landfill was instrumented with 32 settlement plates, 16 piezometers, 3 total pressure cells, and 10 thermistors. Field data were obtained, during the year, on settlement, pore water pressures, vertical and lateral earth pressures, temperature, sludge unit weights, specific gravity, and water contents. Laboratory work included consistency limits, ash contents, and consolidation tests. Comparisons have been made between field settlement behavior and predicted behavior using laboratory test parameters, backfigured field parameters, and soil mechanics theories, including those on consolidation and pore pressure dissipation. Conclusions are given under the following headings: (1) settlement, (2) pore pressures, and (3) stress and temperature conditions.

Settlement.

1. Reasonable estimates of ultimate primary settlement for the sludge can be obtained using equation 6.2, provided that both the initial and residual pore pressures are used in computing effective stresses. A laboratory value for the compression index C_c appears to be appropriate, and the initial void ratio e_o for the field sludge layer may be taken from a laboratory void ratio-logarithm of pressure curve at the appropriate stress level.

2. MacFarlane's (1969) method, using data from a single increment laboratory consolidation test, overestimates primary settlement. Results for this method gave estimates of primary settlement that were closer to the actual total settlement of each sludge layer. This may be due to the high initial void ratio of the laboratory samples.

3. Gibson and Lo's (1961) theory provides an accurate estimate of total settlement under instantaneous loading conditions. Careful laboratory tests were required to determine the parameters used in this theory.

4. The field settlement versus logarithm of time curves exhibit a decreasing secondary compression rate with time. This behavior was observed for both the upper and lower sludge layers, although it was not experienced with any of the samples tested in the laboratory.

5. Estimates of secondary compression based on equation 6.5 are too low for laboratory values of the coefficient of secondary compression C_α. Backfigured field parameters yielded appropriate estimates for the upper sludge layer, while a somewhat arbitrary value of time t_p had to be assumed for the lower sludge layer.

6. Terzaghi's (1943) theory appears to adequately predict the time-settlement relation for the sludge, provided that an appropriate value for the coefficient of consolidation, c_v, is used in the theory. Satisfactory results were obtained for both the upper and lower sludge layers for different conditions of loading. The coefficient of consolidation appears to decrease with an increase in field consolidation similar to the decrease shown by laboratory tests. Environmental factors (surface drying, etc.) influenced the time-settlement relation for the upper sludge layer in the landfill.

7. Settlement rates for the landfill gave a good estimate of the flow rate for leachate draining from the papermill sludge.

Pore Pressures.

1. Gibson's (1958) theory gives estimates of pore pressures generated during sludge placement that are in accordance with field observations. Pore pressures in the sludge were influenced by excess pore pressures in the middle sand drainage blanket due to incomplete drainage caused by greater settlement in the test portion of the landfill.

2. Terzaghi's (1943) theory accurately predicted pore pressures in the sludge up to about 70 percent dissipation, provided that an appropriate value for the coefficient of consolidation was used. This was true for the different loading conditions experienced by the upper and lower sludge layers. After 70 percent dissipation, the pore pressures decrease at a slower rate and eventually appear to stabilize at some residual value.

This indicates that a threshold gradient exists for the sludge in the landfill, below which little or no flow of pore water can occur. Pore pressures may also be influenced by environmental factors, as demonstrated by the pore pressure fluctuations of the upper sludge layer with time.

3. The assumption of a uniform initial excess pore pressure for use with Terzaghi's theory appears to be reasonable because of the closeness in magnitude between the initial pore pressures generated during sludge placement and the residual pore pressures.

Stress and Temperature Conditions.

1. The undrained shear strength of the sludge increased considerably during consolidation and is greatest at points in the landfill that are under greater effective stress. A linear relationship between undrained strength and consolidation pressure was indicated by the data shown in Figure 5.4. Sensitivity of the sludge in terms of the ratio of undisturbed to remolded vane strengths was less than two.

2. The vertical stress measured close to the mid-depth of the lower sludge layer by the total pressure cells was in fair agreement with the stress calculated on the basis of material unit weights, indicating that the measured lateral stresses should be equally accurate.

3. The coefficient of lateral stress, K, based on total stress and pore pressure data, decreased from about 0.65 immediately after sludge placement to about 0.32 for the final stage of consolidation. This final value of K does not fit the empirical relationship between the lateral stress ratio at rest and the angle of internal friction associated with normally consolidated inorganic clays.

4. Temperature increase due to increased biological activity peaked about 50 days after completion of the landfill giving a maximum temperature rise close to 7°C in the upper half of the lower sludge layer. Thereafter sludge temperatures were determined by ground and seasonal air temperatures.

Leachate Analysis and Lysimeter Study

Leachate from the experimental sludge landfill was collected via the drain pipe from the lower sand drainage blanket and from the middle sand blanket via a pipe and well point. Analyses conducted on the leachate

included biological oxygen demand, chemical oxygen demand, color, odor, pH, suspended solids, specific conductivity, dissolved solids, total solids, nitrogen and phosphorus. The lysimeter study, which included both aerobic and anaerobic conditions and flow rates approximating field conditions, provided information on changes in quality of the leachate when passed through three natural soils. Conclusions based on this portion of the study are given below.

1. As shown by the results of BOD, COD, and color analyses, all soil columns exhibited excellent organic removal. Sand was slightly less efficient. The organic loam columns exhibited color of their own.
2. An adaptation period was necessary in all cases before peak efficiency of organic removal was obtained. The organic loam required less time for adaptation since it was biologically active in the beginning.
3. None of the three-foot soil columns showed any signs of having their organic removal capacity exhausted during the 160-day observation period.
4. Anaerobic conditions are less efficient than aerobic conditions in the removal of organics.
5. All soil columns showed some decrease in the level of inorganics as compared to the leachate.
6. Clay exhibited the best inorganic retention. This was probably due to greater ion exchange capacity for the clay.
7. With the exception of the clay column, all columns showed an increase of inorganic content in the percolate but none as high as the leachate. However, the increasing trends indicate the columns were slowly becoming exhausted in their ability to retain inorganics.
8. Nitrogen and phosphorus values for the leachate were very low. This was expected since paper wastes are nutrient deficient.
9. Turbidity for the leachate was not extremely high and all soil columns reduced turbidity to low values.
10. Leachate has a significant organic and inorganic content as it leaves the fill but this is an order of magnitude less than that expected from a sanitary landfill.
11. Results from the lysimeter study indicate that passage of leachate through a minimal depth of natural soil should render the percolate innocuous.

BERGSTROM PAPER COMPANY
INTER-OFFICE MEMO

cc: EWG TMH RAL JPC

TO: O. H. Ross FROM: W. M. Laing

SUBJECT: MORAINE SLUDGE DISPOSAL SITE DATE: January 31, 1974

More on same subject.

Today I received a copy of MSU's second annual report on High Ash Paper Mill Sludge Landfill. This 1973 EPA publication contains 259 pages, and is identified as research grant R-801282. It covers our landfill project. With this information you can identify the publication should you want to get a copy for your own use.

This report appears to confirm opinions that our sludge:

1. Conforms to soil mechanics theory.

2. Is consolidated rapidly.

3. Provides good stability, with sufficient sheer strength to be deposited mounded above ground level, and not only dumped in gravel pits.

4. Provides leachate which will not be detrimental to adjacent water supplies.

   (a) Can be underdrained/collected then treated prior to discharge to surface water.

   (b) Will be cleansed adequately on percolation through a suitable depth of soil, for groundwater recharge.

WML/mb

Attach.

AN EXPERIMENTAL HIGH ASH PAPERMILL SLUDGE LANDFILL

Second Annual Report

Prepared by

O. B. Andersland[+], Wayne A. Charlie[+], Robert P. Vallee[+], and Duane W. Marshall[*]

[+]Department of Civil Engineering, Michigan State University, and

[*]National Council of the Paper Industry for Air and Stream Improvement, Inc.

under Research Grant R-801282

U. S. ENVIRONMENTAL PROTECTION AGENCY

1973

Second Annual Report
[illegible]-801232
Environmental Protection Agency
Cincinnati, Ohio

[illegible]

[illegible] of Engineering [illegible]
[illegible] STATE UNIVERSITY
[illegible], Michigan

ABSTRACT

For the slope stability study conducted during the second year of the project, the experimental papermill sludge landfill was altered by removal of the north dike. Next the landfill was excavated to form a 3:4 slope and two weeks later was trimmed to a 1:8 slope. Prior to the above construction, vane shear strength and Dutch cone resistance data were obtained at one foot intervals of depth. Seven slope indicator casings and additional piezometers were installed in preparation for the slope stability study. Earlier instrumentation remained operative and monitoring was continued throughout the year. Undisturbed block samples of consolidated sludge and field water contents were taken at the time of slope excavation. Laboratory work included consolidation tests on undisturbed sludge samples. Triaxial tests were run on fresh sludge samples using istropic consolidation and on undisturbed sludge samples using anisotropic consolidation. Unconfined compression tests were run with the sample axis oriented at 0, 45, and 90 degrees to the horizontal so as to provide information on the anisotropy of the consolidated sludge. Leachate sampling and analysis documented changes occurring during the second year of the project.

It was shown that soil mechanics theory can be used to predict the stability of slopes excavated in a sludge landfill. The significant increase in shear strength of the papermill sludge as a direct consequence of consolidation resulted in a stable 3:4 slope with small observed lateral movements. This behavior was in contrast to the very soft, almost fluid behavior of the fresh sludge placed in the landfill during construction. Lateral movements increased rapidly after excavation to the 1:8 slope. Rate of movement decreased with time suggesting that creep behavior was responsible for a large portion of the final 6 inches of movement at the surface. Development of failure zones for the 1:8 slope was studied using the finite element method of analysis and laboratory triaxial test data. Stability analysis of the 1:8 slope, using Janbu's method for a composite failure surface, gave excellent agreement between the actual factor of safety and the computed factor of safety. The vane shear strength, corrected for deformation rate and sludge anisotropy effects,

appeared to give the better representation of the undrained field shear strength for the sludge.

Additional information on physical properties of the sludge shows the dependence of liquid and plastic limits on the organic content of the sludge. The papermill sludge has properties in many respects similar to peaty soils. The low permeability of the high ash papermill sludge together with a decreasing rate of leachate flow associated with fill consolidation exerted a moderating effect on the quantity of leachate leaving the landfill. The leachate analyses showed that the quantities of sulfate, Kjeldahl nitrogen, phosphorous, iron, and chloride were well below values cited for municipal refuse. Concentrations of mineral salts and hardness were similar to those for leachate originating in landfills of municipal refuse.

PREFACE

This annual report covers phase (2) of an experimental high ash papermill sludge landfill project. Data for phase (1), not available during preparation of the first annual report, are also presented, analyzed, and discussed in this report. The work described was made possible by Research Grant R801282 from the U. S. Environmental Protection Agency, under agreement with Michigan State University.

Wayne A. Charlie and Robert P. Vallee, research assistants in soil mechanics, were responsible for the supervision of construction at the site, instrumentation and monitoring of the landfill, and carried out experimental laboratory work in the Soil Mechanics Laboratory of the Department of Civil Engineering at Michigan State University. Timothy A. Armstrong, Research Associate for the National Council of the Paper Industry for Air and Stream Improvement, Inc., performed the leachate analysis. Dr. O. B. Andersland, Professor of Civil Engineering, supervised the research and preparation of this report. The B. G. Danis Company, Dayton, Ohio, carried out construction for the project and the Bowser-Morner Testing Laboratories, Inc., Dayton, Ohio, provided equipment and services needed to install additional instrumentation.

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the U. S. Environmental Protection Agency.

CHAPTER VII. SUMMARY AND CONCLUSIONS

The summary and conclusions are presented under five headings: (1) engineering properties of the sludge, (2) sludge landfill settlement, (3) slope stability of the consolidated sludge, (4) leachate analysis, and (5) practical implications of the investigation. Conclusions given in the First Annual Report are not repeated.

Engineering Properties of the Sludge

Both physical properties and stress-deformation characteristics of the papermill sludge were determined relative to evaluating the consolidation behavior and slope stability of the experimental sludge landfill. Physical properties included water content, unit weight, specific gravity of the sludge solids, ash (or organic) content, and consistency limits. Stress-deformation characteristics refer to consolidation behavior and shear strength parameters of both fresh sludge and undisturbed samples from the consolidated landfill. The following conclusions refer to the engineering properties of the papermill sludge.

1. Physical properties of the papermill sludge are dependent on composition which may vary with production changes at the mill. An increase in organic content gives the sludge a higher water retention and lower unit weights for the same consolidation pressure. Liquid limits and plastic limits both increase with higher organic contents.

2. Relatively small consolidation loads produce a significant decrease in water content and increase in shearing strength of the papermill sludge. Vane strengths increased from less than 1 T/m^2 for the fresh sludge to almost 20 T/m^2 at the bottom of the consolidated lower sludge layer.

3. Consolidation tests on undisturbed sludge samples from the landfill gave void ratio-logarithm of pressure curves similar to inorganic clays. These tests provided data on the coefficient of consolidation c_v, primary compression ratio r, coefficient of secondary compression C_α, and the compression index C_c. Using the Casagrande construction, reasonable estimates were obtained for the preconsolidation pressures which were in agreement with existing overburden pressures.

4. Triaxial test data show that the strength of papermill sludge is essentially frictional and in accordance with the principle of effective stress. The angle of internal friction appears to vary linearly with organic content when comparisons are made using data obtained by a given test procedure. Extrapolation to zero organic content gave a value for the angle of internal friction very close to that of kaolin clay, the major inert component of the sludge.

5. For a given organic content, anisotropic consolidation increased the angle of internal friction when the direction of compression was normal to the plane in which fibers would tend to be aligned. Unconfined compressive strengths were also greatest for sample compression in the vertical direction. Lower values for the angle of internal friction and the unconfined compressive strength were observed when the direction of compression was in the plane of maximum fiber alignment (horizontal).

6. The undrained strength was directly related to consolidation pressure for papermill sludges having essentially the same composition. Hence the undrained strength of a fairly uniform normally consolidated sludge may be characterized by the ratio of undrained strength to effective overburden pressure, c_u/p.

Sludge Landfill Settlement

The experimental papermill sludge landfill consisted of 2 sludge layers, initially 10 ft thick, with sand drainage blankets at the top, middle, and bottom. An earth dike provided lateral confinement for the soft sludge during and after construction, and the surface load consisted of 3 ft of earth fill material. Instrumentation included settlement plates and piezometers placed at a number of locations in the landfill. Field and laboratory data, not available during preparation of the First Annual Report, and additional theoretical analyses are presented in this report. The following conclusions are in addition to those on settlement and pore pressures in the First Annual Report.

1. Gibson and Lo's (1961) theory provides an accurate estimate of total settlement and time-rate of settlement under instantaneous loading conditions. The time-settlement relation was dependent on the value of c_v and predicts that the ultimate settlement should be reached without the development of a linear (with log time) secondary compression curve.

Careful laboratory tests were required to determine the parameters a, b, and λ used in this theory.

2. Wahls' (1962) theory appears to adequately predict the hydrodynamic portion of the time-settlement relation for the sludge, provided that an appropriate value for the coefficient of consolidation, c_v, has been used in the theory. Estimates of secondary compression, based on Wahls' (1962) theory, are too low when based on laboratory values for the coefficient of secondary compression, C_α.

3. Consolidation theory may be used to estimate volume requirements for a papermill sludge landfill when consolidation parameters are known and when consolidation loads in the proposed landfill can be reasonably predicted.

Slope Stability of the Consolidated Sludge

After consolidation of the sludge under the 3 ft earth surcharge, seven slope indicator casings and additional piezometers were installed in preparation for the slope stability study. Earlier instrumentation remained operative and monitoring was continued. At this stage the north dike was removed and the sludge was excavated to a 3:4 slope. After about 10 days it was apparent that the slope was stable since little lateral movement had occurred. Next the 1:8 slope was excavated with subsequent events leading to an initial slope failure in the top sludge layer about four days later. Relatively large lateral movements were recorded prior to failure causing tension cracks to form in the earth surcharge. The following conclusions refer to lateral movements, slope stability, and methods of analysis.

1. The significant increase in shear strength of the papermill sludge as a direct consequence of consolidation resulted in a stable 3:4 slope with small observed lateral movements, less than one inch at the surface. This behavior was in contrast to the very soft, almost fluid behavior of the fresh sludge placed in the landfill during construction.

2. Lateral movements in the sludge landfill increased rapidly after excavation of the 1:8 slope. Rate of movement decreased with time suggesting that creep behavior of the sludge was responsible for a large portion of the final 6 inches of movement at the surface. The amount of movement decreased with depth.

3. Computed stresses, based on measured sludge properties and a simulated excavation to 6, 10, and 14 ft, show a failure zone developing behind the 1:8 slope. A tension zone behind the slope crest increased in size with more excavation. Failure along the unsupported slope would have been predicted and did occur.

4. The vane shear test appears to be appropriate for in situ measurements of the undrained shear strength of the soft papermill sludge. Uncertainties with regard to sludge disturbance during sampling and preparation for laboratory testing were avoided. This vane strength must be corrected for deformation rate and sludge anisotropy effects before use in a stability analysis.

5. Stability analysis of the 1:8 slope, using Janbu's method for a composite failure surface, gave excellent agreement between the actual factor of safety and the computed factor of safety when vane shear strengths were corrected to field strengths. The correction factor (Bjerrum, 1972) was selected on the basis of experience with soft clays and the measured plasticity index of the papermill sludge.

6. Some lateral movement, less than 0.9 inch at the upper sludge surface, was measured during the five months of observation after the planned slope failure. The slope remained intact with only local surface changes due to snow or ice development.

Leachate Analysis

Leachate samples obtained periodically from the landfill were analyzed for those parameters considered to be of significance to groundwater quality and consistent with the nature of the landfill material. Variation among samples appears to be related primarily to rainfall entering the drainage blanket and diluting the leachate. Fluid from the pressed sludge sample gives an indication of leachate which could leave the sludge if additional consolidation were induced by greater surface loads. The following conclusions are in addition to those presented in the First Annual Report.

1. Concentrations of dissolved organic matter, mineral salts, and hardness were within the broad range of those reported for leachates originating in landfills of municipal refuse. However, on a mass basis,

the leachate constituents associated with high ash papermill sludge were significantly less. These substances are those most likely to prove objectionable should the landfill leachate become a part of the groundwater.

2. Sulfate, Kjeldahl nitrogen, and phosphorous were present in only negligible quantities. Leachate concentrations of those constituents, as well as iron and chloride were well below values cited for municipal refuse.

3. The low permeability of high ash papermill sludge together with a decreasing rate of leachate flow, associated with fill consolidation, exerted a moderating effect upon the quantity of leachate leaving the landfill.

Practical Implications of the Investigation

Soil mechanics theory was effective in predicting the settlement of the papermill sludge on the basis of laboratory data. This settlement or reduction in volume of the sludge, when properly accounted for, will permit significantly larger volumes of sludge to be placed in a landfill designed for a particular use, whether it be a green area, or for recreational, agricultural, or for light construction purposes.

The field rate of primary compression of the sludge was very rapid (high coefficient of consolidation, c_v) suggesting that preloading may be an effective way for stabilization and minimizing long-term compression. About 30 days was required for primary consolidation of a 10 ft sludge layer drained at the top and bottom surfaces. The preload, consisting of an earth surcharge, must be of sufficient magnitude and duration to cause compression of the sludge which would normally occur under the proposed design load over the expected life of the structure. The magnitude of the preload may be limited by stability considerations which are largely governed by the rate of porewater pressure dissipation. A method for estimating the magnitude and duration of a preload on highly organic soils has been given by MacFarlane (1969).

Sludge unit weights increased from 69.7 pcf for the fresh dewatered sludge to about 88 pcf at the bottom of the lower sludge layer. This fact combined with the relatively high stability of the consolidated sludge landfill suggests its use as a lightweight fill material for earth embankments

and other special needs such as sound deflecting barriers. The fresh dewatered sludge from a mill could be deposited in a landfill which includes drainage blankets and a surcharge load. After sufficient time for primary consolidation the surcharge could be removed and the consolidated sludge removed for use as a lightweight fill material in another location.

The considerable increase in shear strength of the papermill sludge resulting from consolidation combined with the observed stability of the experimental 3:4 slope suggests that a landfill could be contoured so as to provide a golf course or coasting ramp during the summer and a toboggan run or ski hill during the winter. A soil cover capable of growing vegetation would serve to make the area suitable both as a recreational area as well as a green area.

Sand or gravel blankets and/or tile drains used in connection with a papermill sludge landfill can serve a dual purpose. With proper placement they will shorten the drainage path within the sludge thereby reducing the time needed for primary consolidation and drainage. Hence, much of the settlement under an earth surcharge could be accelerated permitting more options for operation and final use of a papermill sludge landfill. These drains could also be utilized to collect leachate for subsequent treatment by conventional means, should that alternative represent the optimum or most suitable method for protection of groundwater quality. The demonstrated capacity of soil percolation to effect a degree of renovation equivalent or superior to conventional treatment requires that it be considered as an alternate to collection and treatment. The success of percolation is contingent upon the existence or provision of a suitable soil of sufficient depth and distribution to provide the necessary changes in quality of the leachate prior to groundwater utilization. Further sludge dewatering, consistent with technological capability, remains as an additional option for minimizing the quantity of leachate to be renovated. The options available suggest that any selection be made on a case by case basis as opposed to a single universal approach to groundwater protection from landfill leachate intrusion.

HOWARD
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June 7, 1979

ANALYTICAL RESULTS

No. 2299

BERGSTROM PAPER COMPANY

Samples: Sludge Sample Received 5-9-79 - P. O. # 21214

Analyses of Extract per USEPA Extraction Procedure (40 CFR 250.13):

	mg/l
Arsenic	< 0.010
Barium	0.25
Cadmium	0.001
Chromium	0.029
Fluoride	0.171
Lead	0.055
Mercury	0.14 ug/l
Nitrate	0.331
Selenium	< 0.01
Silver	< 0.001
Endrin	ND
Lindane	ND
Methoxychlor	ND
Toxaphene	ND
2,4 - D	ND
2, 4, 5 - TP	ND

(ND - None detected at Detection Limit: < 0.001 mg/l)

Acid Digestion Analysis:

	mg/kg Dry Weight
Cadmium	0.529
Chromium	26.5
Lead	26.1
Nickel	14.91
Zinc	438.0
Mercury	0.063
Copper	31.22
Dry Weight	28.34 %

Nutrients Analysis:

	mg/kg Dry Weight
TKN	1,468
Phosphorus	<1.59*
Potassium	105

TOC Degradation Study:

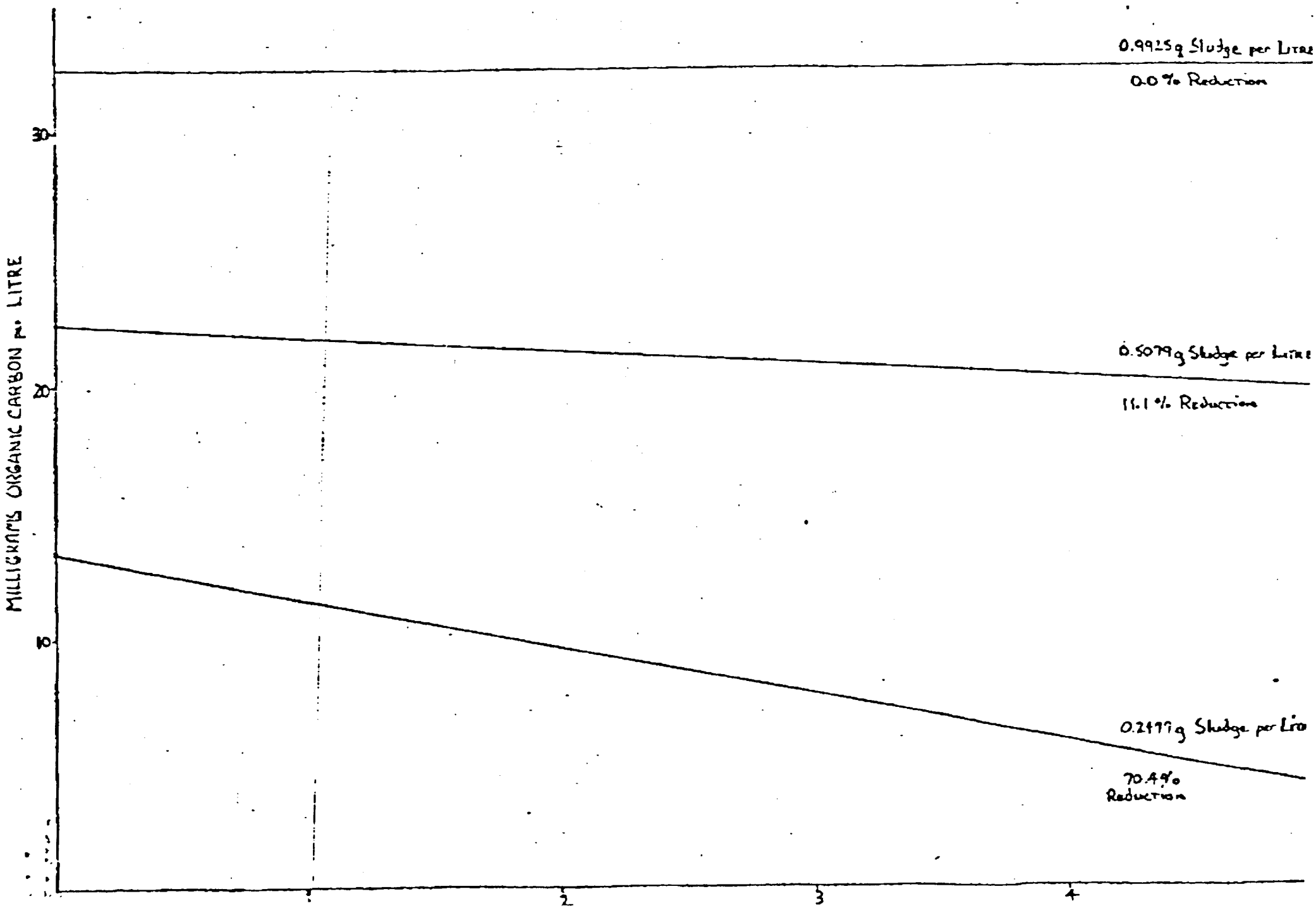
See Degradation Chart Attached.

*Detection limit due to composition of sample.

Approved

DLH:dm

Attachment


0.9925g Sludge per Litre
0.0% Reduction
0.5079g Sludge per Litre
11.1% Reduction
0.2977g Sludge per Litre
70.4% Reduction
MILLIGRAMS ORGANIC CARBON PER LITRE
30
20
10
2
3
4

BERGSTROM PAPER COMPANY
A Division of P.H. Glatfelter Company
West Carrollton, Ohio

Clean Water Act

PRIORITY POLLUTANT LEVELS IN SELECTED SLUDGE SOURCES FROM THE WEST CARROLLTON MILL

Pollutants 1. PRIORITY POLLUTANTS	U.S. EPA Priority Pollutant No.	Fresh Sludge mg/kg	Landfill Sludge mg/kg
A. Volatile Organics			
1,1,1 Trichloroethane	11	0.106	0.703
Methylene Chloride	44	0.623	1.349
Trichloroethylene	87	0.038	0.242
B. Base Neutral Fraction			
Diethylphthalate	70	0.203	0.368
Acenaphthylene	77	0.183	0.689
Phenanthrene	81	0.021	0.132
C. Acid Extractables			
2,4,6 Trichlorophenol	21	0.067	0.330
2 Chlorophenol	24	< 0.010	NR
4 Nitrophenol	58	0.079	NR
Pentachlorophenol	64	3.075	4.852
D. Pesticides			
Aldrin	89	NR (1)	.011
Chlordane	91	NR	.022
4,4 DDE	93	NR	.003
Heptachlor	100	1.303	.051
δ BHC	102	NR	.004
Heavy Metals and Other Compounds			
Cyanide, Cn	121	< 0.4	0.85
Beryllium, Be	117	< 0.1	< 0.2
Thallium, Tl	127	0.14	0.77
Silver, Ag	126	0.10	0.40
Antimony, Sb	114	0.25	1.54
Arsenic, As	115	0.48	4.55
Selenium, Se	125	0.06	0.25
Copper, Cu	120	1.9	14.7
Lead, Pb	122	1.3	22-9
Chromium, Cr	119	0.2	4.90
Zinc, Zn	128	84.0	151.0
Mercury, Hg	123	0.06	0.25
Nickel, Ni	124	1.5	151.0
Cadmium, Cd	118	0.20	0.60
Total Phenol	-	0.15	6.49

NR = None Reported

(1) None reported being present in the sample.

(2) Standards were not available for these compounds.

(3) None detected at an approximate sensitivity of d=350 ppb, g=550 ppb, h=700 ppb.

Current Typical Sludge Analysis

Moisture – 65%

Fiber – 41%

Filler – 55%

TiO_2 – 4%

PCB's – 10 ppm probably lower 1 ppm or lower.

Leachate Analysis – 1972

COD – 5,000 ppm

BOD_5 – 4000 ppm

pH – 7.5

Conductivity – 3500 micromhos

Turbidity – 15 JTU

Color – 200

Total Solids – 6000 ppm

Dissolved Solids – 6000 ppm

Chloride ions – 150 ppm