



GRADING, FENCE AND CLOSURE PLAN

FOR

CD AREA LANDFILL

NAVAL STATION, NORFOLK, VIRGINIA

NORFOLK, VIRGINIA

CONSTRUCTION CONTRACT NO. 62470-88-B-2501

FINAL SUBMITTAL

CLOSURE PLAN SUPPLEMENTAL REPORT

A & E COMMISSION NO. 7031.07

DECEMBER 1988

THE CEGG PARTNERSHIP

ARCHITECTS - ENGINEERS - SURVEYORS

CORPORATE CENTER TWO, SUITE 240

VIRGINIA BEACH, VIRGINIA



TABLE OF CONTENTS

Landfill Guidelines

Pertinent Correspondence

Soil Borings

Water Sample Report

Product Information

Separate Enclosures for Closure Plan Submission to Regional Consultant,
Department Waste Management: 1. Construction Plans and Specifications
2. Conceptual Design; Future Parking Lot



Closure Plan for CD Area Landfill
Hampton Boulevard, Norfolk, Virginia
Supplemental Report

Item numbers correspond to Department of Waste Management "Guidelines for Closure Plan Requirements on Landfills" attached.

1. Vicinity Map - see Plan.
2. Property Plat - see Plan.
3. No homes are located within 1000 feet of the waste disposal area.
4. Hydro-geologic Study - The closure plan includes five ground water monitoring stations. The Navy intends to monitor these wells over the next seven to ten years, establishing baseline criteria immediately after construction of the closure. See attached letters 16 June 1988 by M.L. Cannon, and Gordon J. Bosch.

Soil borings were made at the site and have been included on the plans.

5. Borrow materials for closure cap will be provided by contractor. Cap materials are covered in specification section 02200 "Earthwork" and Section 02201, "Liner System".
6. Soil Cover characterization: Soil cap consists of six inches of topsoil over one foot of general site fill over a flexible liner system. The flexible liner system consists of a bentonite layer encased in geotextile fabric. The bentonite layer provides layer with a permeability coefficient of 10^{-9} cm/sec. Product information from a conforming product is attached.

The closure cap incorporates a gas venting system. A network of perforated pipe located in a permeable layer beneath the impermeable cap is provided to vent rising gases from beneath the cap. The flexible liner system is flashed around the vent stacks to prevent surface water from infiltrating the cap. Perforated pipes are located at crests and tops of slopes to intercept rising gases. Lateral distances between pipes was limited to approximately 250 feet, therefore the maximum lateral distance that gas needs to travel to be intercepted is 125 feet. Vent stacks are fitted with vandal proof caps. Vent lines slope up to upstream vents. Vent lines are interconnected to provide redundancy. Downstream vent stacks are provided to enhance circulation of gases.

Approximate quantity of soil required to consummate closure plan is 50,000 cubic yards. Adequate supplies are available.

7. Final Grading Plan - see Plan. Existing cover and landfill materials are not to be disturbed in grading the site. Grading will be accomplished with borrow materials.



8. No surface leachate has been observed at the site.
9. Erosion Control Measures: see Plan.
10. Surface and Groundwater post closure monitoring: A post closure monitoring plan is anticipated. One surface water sample has been tested. See attached report.
11. Surface and Groundwater monitoring plan: Five groundwater monitoring wells and two surface water sampling stations are indicated on the plan. Monitoring program will comply with VR 672-20-10 Sec 5.2.D.6 (Phase II). Sampling and Testing will be done quarterly. Monitoring program will last a minimum of five years. Monitoring program will be discontinued only by agreement with the Department of Waste Management. Monitoring program shall evaluate the following parameters: Hardness, Sodium, Chloride, Iron, Lead, specific conductance, pH, TOC, TOX, the inorganic and organic constituents listed in VR 672-20-10 Sec 5.2.D.6.b.
12. A seven foot chain link fence encloses the site.
13. Appropriate signs are posted at the site.
14. A parking lot is contemplated as a post closure usage of the site. A conceptual design for the lot is attached. The proposed design maintains the integrity of the cap. Lighting and drainage features are proposed that do not penetrate the impermeable layer. The Navy anticipates that parking lot construction will not begin until the mid-1990's.
15. Plans have been sealed by the Registered Professional Engineer (at Final).
16. Three sets of plans to be submitted by Regional Consultant, Department of Waste Management.



LANDFILL GUIDELINES



COMMONWEALTH of VIRGINIA

DEPARTMENT OF WASTE MANAGEMENT
11th Floor, Monroe Building
101 N. 14th Street
Richmond, Va. 23219



GUIDELINES FOR CLOSURE PLAN REQUIREMENTS ON LANDFILLS

1. - Vicinity Map
2. - Plat with metes and bounds of the parcel
3. - Identify all homes within 1000' of the waste disposal area that have drinking water wells
4. - A hydro-geologic study should be conducted on the site. Data required from the study includes:
 - A. - Identify direction of Groundwater flow.
 - B. - Determine groundwater elevations around the waste disposal area.
 - C. - Construct a soil layer prism beneath the waste disposal area.
 - (1.)- Determine permeabilities of those layers which underlay the waste.
 - (2.)- Identify the transmissivity potential of the individual layers.
 - (3.)- Identify the presence of either synthetic, constructed clay, or natural existing impermeable soil layers.
- 5.- Identify a borrow source of soil to be used to construct closure cap. Approximate quantity of soils available in the borrow source and compare to quantities required for closure.
- 6.- Soil cover characterization. - Identify soil cap design to include a minimum of 6" of impermeable clay (1×10^{-7} cm/sec or less) and 18" minimum of soil to stimulate vegetative growth. Quantity of soil necessary to consummate closure plan should be approximated.
- 7.- Prepare final grading plan for the closure cap. Identify the following:
 - A.- Stable slope for cap area
 - B.- Slopes for sides of waste area (terrace, swales, straw bales, etc.)
 - C.- Grading and seeding details of cap.
- 8.- Make a surface leachate assessment of the area. If leachate is present, identify remedial action plan for collection and treatment.



Closure Plan
Page 2.

- 9.- Design sedimentation and erosion control plan for the site. Propose inspection sequence to assess post closure stabilization to identify need for remedial action due to erosion or excessive washing. Measures prescribed should conform to standards for the Soil and Water Conservation Commission.
- 10.- Assess the need for surface and/or groundwater post closure monitoring. (A minimum of 2-reports should be submitted to this office for the 1st year.)
 - A.- Do monitoring wells exist on the site?
 - (1.)-Identify location of each.
 - (2.)-Include any water quality data available
 - B.- Are additional groundwater wells necessary to monitor the site?
 - C.- Identify springs, creeks, or ponds in the area to be monitored.
 - D.- Identify any on site discharge points.
- 11.- Develop a groundwater and surface water monitoring plan.
 - A.- Specify the frequency for monitoring. (A 5 year-minimum program is desired, to be evaluated at that time.)
 - B.- Specify parameters to be monitored. (Key parameters and/or extended parameters, see attached list.)
- 12.- Design permanent feature to limit access to the facility
- 13.- Propose a post closure signing plan for the site.
- 14.- Identify any feasible post closure useages of the site.
- 15.- Plan shall be prepared and signed by a Registered Professional Engineer.
- 16.- Submit 3 sets of plans to the Regional Consultant Department of Waste Management in the region where the site to be closed is located. (see attached map for SWM regions and corresponding Regional Consultant for each area.)



PERTINENT CORRESPONDENCE

DEPARTMENT OF THE NAVY

NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA 23511-6098

IN REPLY REFER TO

11000
ENG/C421/WPL
16 Jun 88

Commonwealth of Virginia
Department of Waste Management
ATTN: Mr. Berry F. Wright, Jr.
11th Floor, Monroe Building
101 North 14th Street
Richmond, Virginia 23219

CD AREA LANDFILL CLOSURE PLAN - STATE PERMIT #286

Confirming your telephone conversation with Mr. W. P. Landon of this office on June 9, 1988, it is our understanding that the State has no objection to our anticipated establishment of baseline criteria in conjunction with a groundwater monitoring program after construction, rather than during the design of the referenced work. Pursuantly, we will not conduct the "EP Extraction (Toxicity) Test" during the design phase of our project. We also understand that not less than three groundwater monitoring stations should be provided for sampling and tracking background water quality parameters and physical properties of the groundwater.

Thank you for your continued assistance, and should you have any questions concerning this correspondence contact Mr. W. P. Landon at (804)444-3765.



M. L. CANNON
By direction of
the Commanding Officer



DEPARTMENT OF THE NAVY
NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA 23511-6098

IN REPLY REFER TO:

6280
ENG/421/WPL

Commonwealth of Virginia
Department of Waste Management
Attn: Berry F. Wright, Jr.
11th Floor, Monroe Building
101 N. 14th Street
Richmond, Virginia 23219

Re: CD Area Landfill
Closure Plan
State Permit #286

Dear Mr. Wright,

The purpose for this correspondence is to confirm your telephone conversation with Mr. W. P. Landon, of this office, on Monday, May 23, 1988. Pursuantly, it is our understanding that Mr. K. T. Chestnut has reviewed with you items discussed during a meeting held at the Norfolk Naval Station on May 10, 1988 (see attached memo), and that the following should be provided for in the subject plan:

a. Testing is to be accomplished to determine presence of Methane in the landfill. If present, design details for handling this problem will be required.

b. Groundwater monitoring stations should be established during construction, and a monitoring program of from 7 to 10 years duration should be established. The "EP Extraction (Toxicity) Test" should be accomplished prior to design in order to determine a baseline for our monitoring program.

We also understand that you have received the several drawings, reports, and draft closure plans provided to Mr. Chestnut during the meeting of May 10, 1988.

Should you have any questions or desire elaboration of our current plans for the landfill, contact Mr. William P. Landon at (804) 444-3765.

Sincerely,

GORDON J. BOSCH, P.E.
Head, Engineering Department

Copy to:
Code 30
Code 400

Mr. H. J. Winer, Dept of Waste Management
Mr. T. J. Kolbrecki, NAVSTA, NORVA

BLIND COPY:

MS G. RAGHAMI, C-210



MEMORANDUM

Code 421/WPL
May 20, 1988

From: William P. Landon, Jr., Code 421

To: File

Subj: Closure Plan For CD-Area Landfill (State Permit 286) -
Meeting of 10 May 1988

Ref: (a) Naval Station Job Order Number 1648622, CD-Area Landfill
Closure with Future Use As A Parking Lot.
(b) Naval Station Job Order Number 1646674, CD-Area Landfill
Closure with No Anticipated Future Use.

Encl: (1) Site History
(2) Sketch showing approximate location of proposed 2,000
vehicle parking lot.
(3) Sketch showing approximate location of proposed Access
Road

1. The subject meeting was held in the second floor conference room of building Z-140 at 1345 hours, 10 May 1988. The following individuals participated as representatives of the Activities and Agencies indicated:

Ms. S.L. Hawkinson	- Norfolk Naval Base
Mr. T.J. Kolbrecki	- Naval Station
Mr. R.H. Waldo	- LANTDIV, Code 20
Ms. C. Barnett	- LANTDIV, Code 114
Ms. N. Johnson	- LANTDIV, Code 114
Mr. Bill Landon	- Norfolk PWC, Code 421
Mr. K.T. Chestnut	- Compliance Director, Virginia Department of Waste Management
Mr. H.J. Winer	- Regional Consultant, Virginia Department of Waste Management
Mr. Allen Gonyo	- Principal, CEGG Partnership
✓ Mr. J.M. Harris	- Project Engineer, CEGG Partnership

2. The meeting was called in order to determine specific current requirements of the Commonwealth of Virginia for closure of the permitted portion of the CD-Area Landfill in accordance with reference (a). The following includes a brief resume of matters discussed and determinations made:

a. Ms. Barnett gave a brief historic summary of use of the



a. Ms. Barnett gave a brief historic summary of use of the CD-area site by the Navy (see Enclosure 1). The review included both the pre-1979 landfill and the post-1979 (State permitted) landfill. She indicated that fly ash (top & bottom), and blast grit had been deposited in the landfill area. Surface water monitoring has indicated that Cadmium levels appear to be within acceptable limits at this time. (Note copies of test results were provided to State officials for perusal and their files.)

b. Mr. Landon indicated that the Navy intends to construct a 2,000 vehicle short-term parking lot (see Enclosure 2) on the subject site. It is anticipated that the parking lot will be constructed in the mid-1990's. To preclude disruption of the cap pursuant to parking lot construction, it is the desire of the Navy to grade the site to accommodate the proposed parking lot at the time of formal closure. To this end, the Navy seeks State advice relevant to specific closure requirements for incorporation in the closure plan by our consultant, CEGG Partnership.

c. Mr. Chestnut asked if groundwater monitoring had been conducted, and was advised that it had not. Ms Barnett advised that such monitoring had not been accomplished because groundwater is not used as a source of potable drinking water in the Naval Base area. She added that her office intends to conduct a formal Health Assessment in accordance with E.P.A. guidelines within the next few months. Mr. Chestnut indicated that he would discuss the situation with other State engineering officials, and advise the Navy of any specific need for groundwater monitoring associated with this project.

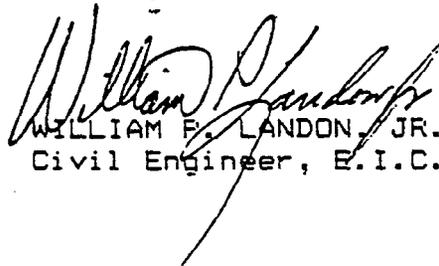
d. State officials were asked if any problems would be envisioned by our intention to construct an access road from the Navy's pass office to CD-area facilities across the pre-1979 fill area (see Enclosure 3). Both Messrs Chestnut and Winer ventured an opinion that since the pre-1979 landfill was not included under State permit 286, activities associated with that site would not impact the closure process for the post-1979 landfill. The matter was, however, left unresolved as it is an issue to be addressed by the joint Technical Review Committee, to which Mr. John Horin is the State's representative. Mr. Hornin is also an employee of the Department of Waste Management. They did indicate, however, that fencing would not be permitted to penetrate into the fill material of either landfill at the interface. Mr. Winer advised that surface installed concrete (i.e., "jersey" type) barriers would be acceptable at such a location.

e. Mr. Chestnut indicated that testing should be conducted to determine presence of methane gas in the landfill. It was felt that such testing should be conducted prior to construction in order that counter measures could be incorporated in the design of the cap, if encountered.



f. Mr. Gonyo suggested that in order to familiarize State officials with the topography and other site conditions, a copy of an earlier preliminary closure proposal, which did not address parking lot use, be provided to them for reference and preliminary review purposes only. Pursuantly, a copy of reference (b) documents (i.e., four preliminary drawings numbered 13142, 13142A, 13142B, 13142C, and a copy of a preliminary State closure plan proposal) was presented to Mr. Chestnut for such use.

3. Should attendees discover errors, misstatements, or omissions in the above, advise the writer (4-7514/3765), immediately.


WILLIAM F. LANDON, JR., P.E.
Civil Engineer, E.I.C.

cc:
each Attendee
Code 30
Code 400
Code 401
Code 420
Code 421

10 : 10:00 AM



SITE HISTORY

- 1974 - Navy acquired property; commenced landfilling
- 1979 - Portion of fill relocated to allow for runway expansion
State issued permit for five-acre fill area
Landfilling of ash ceased
- 1981 - Landfilling of sandblasting grit ceased
- 1983 - Site included in IR program as past HW disposal site;
surface water/sediment sampling commenced
- 1987 - Landfilling operations ceased; NAVSTA initiated closure
- 1988 - Confirmation Study (RI/FS Interim Report) to be forwarded
to state, other TRC members for review

ENCL #1.

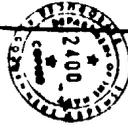
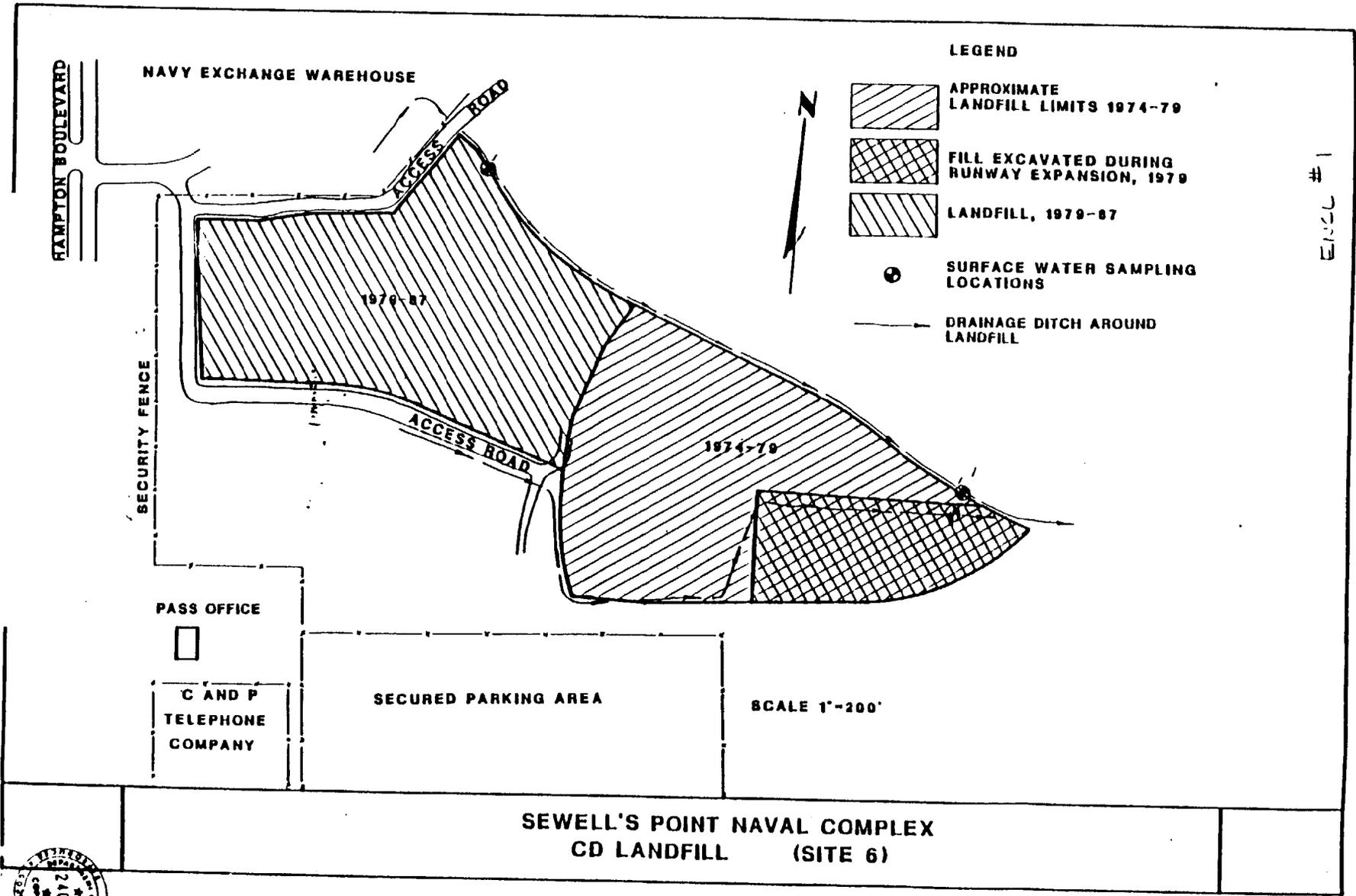


FIGURE 2



CEGG THE CEGG PARTNERSHIP
ARCHITECTS · ENGINEERS · SURVEYORS

CORPORATE CENTER TWO, SUITE 240
VIRGINIA BEACH, VA. 23462
804 499 4562

SUMMARY OF PHONE CONVERSATION
GRADING, FENCE, AND CLOSURE PLAN
FOR CD AREA LANDFILL
A & E COMMISSION NO. 7031.07
SEPTEMBER 29, 1988

FOR COMMONWEALTH OF VIRGINIA

Mr. Berry F. Wright, Jr., P.E.

FOR THE CEGG PARTNERSHIP

Mr. Thomas G. Urso

Mr. Urso asked the following questions to Mr. Wright:

1. We have a landfill that is going to be capped. Why remove and transport solid and hazardous waste to another site?
2. Is a product like "Claymax" acceptable as an impermeable layer?

In substance Mr. Wright's responses were:

1. Material that stays buried can remain but solid or hazardous waste exposed in the course of work has to be removed from the ground and sent to approved site.
 - a) Hazardous waste has to be manifested, removed from ground, placed in special containers and shipped to an approved site by a contractor that specializes in hazardous waste. There are no approved hazardous waste disposal sites in Virginia.
 - b) Solid waste has to be removed to an approved sanitary landfill.
 - c) Excavation and grading of the existing materials should be kept to a minimum. Mr. Wright suggested just covering the existing with the cap section, limiting the risk of exposing hazardous materials.



SUMMARY OF PHONE CONVERSATION
GRADING, FENCE AND CLOSURE PLAN
FOR CD AREA LANDFILL
A & E COMMISSION NO. 7031.07
SEPTEMBER 29, 1988
PAGE 2

2. "Claymax is acceptable. Put a minimum of 8" of rolled and compacted soil for leveling, then "Claymax", and 18" of cover over "Claymax".

Prepared by:

THE CEGG PARTNERSHIP

A handwritten signature in black ink, appearing to read "Thomas G. Urso".

Thomas G. Urso

TGU/sar



CEGG THE CEGG PARTNERSHIP
ARCHITECTS · ENGINEERS · SURVEYORS

CORPORATE CENTER TWO, SUITE 240
VIRGINIA BEACH, VA. 23462
804 499 4562

SUMMARY OF PHONE CONVERSATION
GRADING, FENCE, AND CLOSURE PLAN
FOR CD AREA LANDFILL
A & E COMMISSION NO. 7031.07
OCTOBER 3, 1988

FOR LANDDIV, CODE 114

Mr. Paul Raowski, 445-2936

FOR THE CEGG PARTNERSHIP

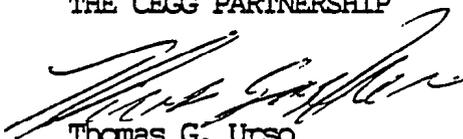
Mr. Thomas G. Urso

The following items of discussion agreement and direction were discussed:

1. Mr. Urso discussed the requirements to remove solid or hazardous waste exposed in the course of work with Mr. Raowski. Mr. Raowski concurred with Mr. Wright that excavation and grading of the existing landfill materials should be minimized.
2. Mr. Urso explained that if no excavation was allowed in the landfill, the cap would infringe on the existing roads. Mr. Raowski did not know of any reason for the roads to remain.

Prepared by:

THE CEGG PARTNERSHIP


Thomas G. Urso

TGU/sar



SOIL BORINGS



McCallum Testing Laboratories, Inc.

BORING NO. B-1
 LOCATION Norfolk, VA
 PROJECT Naval Station Landfill

CHESAPEAKE, VIRGINIA 23325
 LOG OF BORINGS

OUR FILE NO. L-1330-3
 CLIENT'S ORDER _____
 DATE STARTED 12/7/87

SURF. ELEV. _____ WATER ELEV: IMMEDIATE 6' AFTER _____ HRS. _____ DATE COMPLETED 12/7/87

Elev.	Casing Blows	Samp. No.	Std. Pent. (N)*	Depth	Mati. & Color Change	DESCRIPTION
				0	6"	Topsoil
		1	2-4-5-3	2		Dark brown silty clayey fine sand with trace of organics, moist, loose, SC
		2	4-4-4-5	4		Same - tan
		3	1-1-1-1	6		Same - saturated, very loose
		4	2-3-4-4	8	7.0	Tan silty fine sand, wet, loose, SM
		5	1-1-1-1	10		Same - saturated, very loose
		6	WOH/12" 1	15		Same - saturated, very loose
		7	2-2-2	20		Same - saturated, very loose
				24.5		
		8	3-5-4	25	25.5	Tan silty fine sand with clay, saturated, loose SM-SC

Grout Seal

*STANDARD PENETRATION INDICATED FOR EACH 6 INCHES OF DRIVE OF SPLIT TUBE SAMPLED. Bottom of Boring 25.5 ft.
 Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our letters and reports apply only to the sample tested and/or inspected, and are not necessarily indicative of the qualities of apparently identical or similar products.



McCallum Testing Laboratories, Inc.

BORING NO. B-2
 LOCATION Norfolk, VA
 PROJECT Naval Station Landfill
 SURF. ELEV. _____

CHESAPEAKE, VIRGINIA 23325
 LOG OF BORINGS

OUR FILE NO. L-1330-3
 CLIENT'S ORDER _____
 DATE STARTED 12/7/87
 DATE COMPLETED 12/7/87

WATER ELEV: IMMEDIATE 7' AFTER _____ HRS. _____

Elev.	Casing Blows	Samp. No.	Std. Pent. (N)*	Depth	Matl. & Color Change	DESCRIPTION
				0		
		1	16-16-12-9	2	2.5	Black, silty clayey fine sand with trace of organics and fine gravel, moist, medium compact, SC-Fill
		2	10-10-6-4	4	4.5	Tan silty fine sand, wet, medium compact, SM
Grout Seal		3	1-1-1-3	6		Tan silty clayey fine sand, saturated, very loose, SC
		4	2-3-3-2	8	7.0	Tan silty fine sand, saturated, loose, SM
		5	1-1-1-1	10		Same - very loose
					12.0	
		6	WOH/18"	15		Tan silty clayey fine sand, saturated, very loose, SC
					19.5	
		7	2-5-6	20		Tan silty fine sand, saturated, medium compact, SM
					22.0	
		8	5-5-7	25	25.5	Tan fine to medium sand with fine gravel, saturated, medium compact, SP

*STANDARD PENETRATION INDICATED FOR EACH 6 INCHES OF DRIVE OF SPLIT TUBE SAMPLED. Bottom of Boring 25.5 ft.
 Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our letters and reports apply only to the sample tested and/or inspected, and are not necessarily indicative of the qualities of apparently identical or similar pro-



McCallum Testing Laboratories, Inc.

BORING NO. B-3
 LOCATION Norfolk, VA
 PROJECT Naval Station Landfill
 SURF. ELEV. _____

CHESAPEAKE, VIRGINIA 23325
 LOG OF BORINGS

OUR FILE NO. L-1330-3
 CLIENT'S ORDER _____
 DATE STARTED 12/7/87
 DATE COMPLETED 12/7/87

WATER ELEV: IMMEDIATE 7' AFTER _____ HRS.

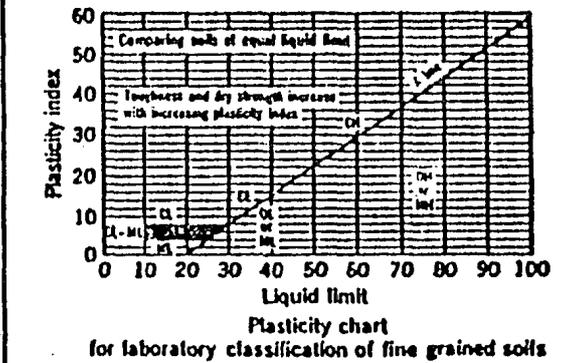
Elev.	Casing Blows	Samp. No.	Std. Pent. (N)*	Depth	Matt. & Color Change	DESCRIPTION
				0	6"	Topsoil
		1	7-7-9-7	2		Tan silty fine sand with clay, moist, medium compact, SM-SC
		2	5-5-5-4	4	3.0	Tan silty fine sand, moist, loose, SM
Grout Seal		3	1-2-2-1	6	5.0	Tan silty fine sand with clay, saturated, very loose, SM-SC
		4	2-2-2-4	8		Same - wet
		5	2-1-1-2	10		Same
			6	5-7-20	15	15.0
					19.5	
		7	1-1-1	20		Grey silty clay, wet, very soft, CH
		8	2-2-2	25	25.5	Same - soft

*STANDARD PENETRATION INDICATED FOR EACH 6 INCHES OF DRIVE OF SPLIT TUBE SAMPLED. Bottom of Boring 25.5 ft. Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our letters and reports apply only to the sample tested and/or inspected, and are not necessarily indicative of the qualities of apparently identical or similar products.



Field Identification Procedures (Including particles larger than 75 µm and noting fractions on estimated weight)				Group Symbols ^a	Typical Names	Laboratory Classification Criteria	
Coarse-grained soils More than half of coarse fraction is larger than 75 µm sieve size ^b	Gravels More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{(D_{30})^3}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for GW Atterberg limits below "A" line, or <i>P_L</i> less than 4 Atterberg limits above "A" line, with <i>P_L</i> greater than 7 Above "A" line with <i>P_L</i> between 4 and 7 and <i>P_U</i> greater than 7 are borderline cases requiring use of dual symbols	
			Predominantly one size or a range of sizes with some intermediate sizes missing	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		
	Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see <i>ML</i> below)	GW	Silty gravels, poorly graded gravel-sand-silt mixtures			
			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures			
	Sands More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	SW	Well graded sands, gravelly sands, little or no fines		
			Predominantly one size or a range of sizes with some intermediate sizes missing	SP	Poorly graded sands, gravelly sands, little or no fines		
Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see <i>ML</i> below)	SW	Silty sands, poorly graded sand-silt mixtures				
		SC	Clayey sands, poorly graded sand-clay mixtures				
Fine-grained soils More than half of material is smaller than 75 µm sieve size (The 75 µm sieve size is based on the smallest particle visible to naked eye)	Identification Procedures on Fraction Smaller than 300 µm Sieve Size						
	Silt and clays Liquid limit less than 50	Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)			
		None to slight	Quick to slow	None	<i>ML</i>	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	
		Medium to high	None to very slow	Medium	<i>CL</i>	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	Silt and clays Liquid limit greater than 50	Slight to medium	Slow	Slight	<i>OL</i>	Organic silts and organic silts of low plasticity	
		Slight to medium	Slow to none	Slight to medium	<i>MH</i>	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	<i>CH</i>	Inorganic clays of high plasticity, fat clays	
	Highly Organic Soils	Medium to high	None to very slow	Slight to medium	<i>OH</i>	Organic clays of medium to high plasticity	
		Readily identified by colour, odour, spongy feel and frequently by fibrous texture			<i>PI</i>	Peat and other highly organic soils	

Determine percentages of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than 75 µm sieve size) coarse-grained soils are classified as follows: GW, GP, SW, SP, GM, GC, SM, SC. More than 12% fines require use of dual symbols. Borderline cases requiring use of dual symbols.



UNIFIED SOIL CLASSIFICATION SYSTEM (U.S.C.S.)

^a Boundary classifications. Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
^b All sieve sizes on this chart are U.S. standard.



WATER SAMPLE
REPORT



COMMONWEALTH of VIRGINIA

STATE WATER CONTROL BOARD
2111 Hamilton Street

Richard N. Burton
Executive Director

Post Office Box 11143
Richmond, Virginia 23230-1143
(804) 257-0056

Please Reply to:
Tidewater Regional Office
Pembroke Two - Suite 310
Virginia Beach, VA 23462
804/499-8742

December 9, 1986

Mr. Harold Winer
Regional Consultant
Department of Waste Management
Suite 203, 5700 Thurston Avenue
Virginia Beach, VA 23455

RE: U.S. Navy Debris Landfill, Norfolk

Dear Harold:

As you had requested, I am enclosing my recommendations for closure monitoring at the subject debris landfill on Hampton Boulevard. Bill Landon and David Yow with the Naval Public Work Center, you, and I made an inspection of the currently permitted site and the old site filled prior to 1979 on November 12, 1986.

I agree with your suggestion to delineate the extent of landfilling at the permitted site and the adjacent previously filled site using shallow soil borings. Once the landfilled areas have been delineated, at least one surface water sample should be taken from the major drainage coming off the landfill site. The sample should be analyzed for laboratory pH, total suspended solids, total dissolved solids, total kjeldahl nitrogen, sulfate, total organic carbon, chloride, hardness, conductivity, copper, iron, lead, zinc, chromium, and arsenic. If contamination is indicated by this one time sample, then additional surface water samples and ground water monitoring well samples may be required. I would like to review the proposed surface water location prior to sampling.

If you have any questions or comments, please contact me.

Sincerely,

Eugene A. Siudyla
Regional Geologist



EAS/tc

cc: P. F. Jackson



interscience research, inc.

2614 wyoming ave. norfolk, Va 23513 (804)853-8813

December 11, 1987

The C E G G Partnership
Corporate Center Two
Suite 240
Virginia Beach, VA 23462
Attn: Mr. Alan Ganyo

Sample: One(1) sample of surface water from a landfill outside of
Norfolk Naval Base
Source: J. M. Harris
Date Received: 12-03-87
Analysts: J. Hedrick; F. A. Fernandez

REPORT OF LABORATORY ANALYSIS

<u>TEST</u>	<u>RESULT</u>
Iron	8.9ppm
Copper	<0.1ppm
Lead	<0.2ppm
Zinc	0.4ppm
Chromium	<0.1ppm
Arsenic	0.01ppm
Chloride	14.9ppm
Total Organic Carbon	5.0ppm
Sulphate	226.4ppm
Total Kjeldahl Nitrogen	0.72ppm
Total Dissolved solids	640ppm
Total Suspended Solids	283ppm
pH	6.88
Hardness	243 mg equiv. CaCO ₃ /l
Conductivity	106µmhos

REPORT PREPARED BY:

Joseph H. Guth Ph.D.
Joseph H. Guth, Ph. D.
Laboratory Director

Dec. 11, 1987



PRODUCT INFORMATION

SPEC DATA

This Spec-Data sheet conforms to editorial style prescribed by The Construction Specifications Institute. The manufacturer is responsible for technical accuracy.



PRODUCT NAME
CLAYMAX LC™, CLAYMAX CR™
 Liner System for Liquid Containment

(Formerly ENVIROMAT)

2. MANUFACTURER

Clem Environmental Corporation (CEC)
 P.O. Box 88, Gordon Road
 Fairmount, Georgia 30139
 Phone: (404) 337-5316/17

(312) 321-6255/56 (in IL)

Telex: 543408

Fax: (404) 337-2215

(312) 321-6258 (in IL)

Jas Squarison

required and CLAYMAX LC™'s flexibility speeds installation. The material can be cut with a utility knife to fit around protrusions (pipes, tanks, etc.).

CLAYMAX LC™ is designed for fast installation with a minimum of manpower, equipment and site preparation on both large and

PONDS AND RESERVOIRS
Impermeable Liner System

2

3. PRODUCT DESCRIPTION

Basic Use: CLAYMAX LC™ is a specially constructed, flexible, impermeable liner system which utilizes the mineral sodium bentonite clay and the geotextile polypropylene. Sodium bentonite is a high swelling smectite which gives CLAYMAX LC™ the ability to heal itself if ripped or punctured. In a hydrated (swollen) state, the clay has tremendous impermeability and a great resistance to all chemicals: acids, bases and hydrocarbons. The bentonite swells to form an impermeable barrier upon contact with fresh water.

CLAYMAX LC™ liner system can be used in construction applications for the containment or exclusion of liquid. These applications include fresh water ponds, waste lagoons, municipal landfills (including caps), tank farm containments, earthen irrigation canals, industrial containments and earthen dams. Seaming is accomplished by a simple overlap with adjoining material since the hydrated bentonite swells to form an impermeable bond. Minor damage is self-healing and major cuts or tears are easily and effectively repaired using patches of CLAYMAX LC™ material.

CLAYMAX LC™ is manufactured 13.5 feet wide and 82 feet long, rolled onto cores. This allows for easy handling at the job site. Longer material can be furnished upon request. No special installation tools or fasteners are

Product Specification (Typical)—CLAYMAX LC™		
Bentonite Content	1.0 lbs. per square foot Liner	
Thickness	¼ inch	
Liner Dimensions	13.5 feet x 82 feet	
Effective Area Covered	1059.5 square feet (assume 6" overlap along one side and one end)	
Roll Weight/Unit	1130 lbs. (minimum)	
Permeability Coefficient	1 x 10 ⁻⁹ cm per second @ 35' head pressure	
*Longer rolls available on special order.		
Laboratory Test Data		
Procedure—Six inches of sand covering CLAYMAX LC™ in a triaxial cell under thirty-five feet of water head pressure.		
Group	Permeant	Permeability
Water	De-Aired Water	2 x 10 ⁻¹⁰ cm/sec.
Alkali	20% Hydrated Lime (pH 14)	6 x 10 ⁻¹⁰ cm/sec.
Acid	1% Acetic Acid (pH 1)	2 x 10 ⁻¹⁰ cm/sec.
Calcium	Calcium Chloride (10%)	2 x 10 ⁻⁹ cm/sec.
Alcohol	Ethyl Alcohol (10%)	2 x 10 ⁻⁹ cm/sec.
Petrols	Unleaded Gasoline	4 x 10 ⁻¹⁰ cm/sec.
Petrols	No. 6 Fuel Oil	3 x 10 ⁻⁹ cm/sec.
Petrols	10% Ethanol Gasohol	3 x 10 ⁻⁹ cm/sec.
Petrols	9.5% Butyl Gasohol	3 x 10 ⁻⁹ cm/sec.
Petrols	100% Benzene	4 x 10 ⁻¹⁰ cm/sec.
The above test performance data were produced under laboratory conditions. The actual performance characteristics may vary. No performance warranty is express or implied.		
Roll Content		Packaging and Shipping
Roll Weight	1107.0 square feet	
Roll Size	1135 lbs. (approx.) wrapped	
	14.5 feet long (PVC wrapped) x 18" diameter (approx.)	
Material Specifications		
Primary Backing (Typical Properties) —Polypropylene is nonbiodegradable and inert to most chemicals, acids and alkalis.		
Color	Natural white	
Filler Fiber	Nylon	
Substrate	24 x 10 Delustered woven polypropylene, non-toxic, water permeable	
Weight	4 oz. per square yard	
Tensile Strength	78 lbs. per inch (minimum)	
Grab Strength (ASTM D-1682)	Warp 95 lbs., Fill 70 lbs.	
Mullen Burst Strength (ASTM D774)	250.25 lbs. per square inch	
Puncture Strength (% mandril ASTM D3787 MOD.)	249 lbs.	
Melting Point	329° F	
Elongation (ASTM D-1682)	Warp 15%, Fill 18%	
Shrinkage		
Hot Water	Nil	
Dry (20 min @ 270°F)	2%	
Cover Fabric	100% spunlace polyester; open weave allows for expansion of bentonite	
Weight	1 oz. per square yard	
Grab Strength	Warp 30 lbs., Fill 13.6 lbs.	
Burst Strength	35 lbs. per square inch	
Bentonite (Sodium Montmorillonite)		
Sizing	Specially graded, 6 mesh and 30 mesh granules	
Mineralogical Composition	90% Montmorillonite (min.)	
Adhesive	Water soluble, non-toxic	
Storage	On dry ground under roof or other protective covering	
The manufacturer reserves the right to change product specifications and instructions/limitations without notice. Information contained herein supersedes previously printed material (11/87).		

Clem Environmental Corporation
May 1988
(Supersedes November 1987)

2

PONDS AND RESERVOIRS
Impermeable Liner System

The ten-point Spec-Data® format has been reproduced from publications copyrighted by CSI 1964 1965 1966 1967, and used by permission of The Construction Specifications Institute, Inc., Alexandria VA 22314



Installation sites. It affords a maximum of containment protection while solving the problems usually associated with other liner products. CLAYMAX™ is flexible, requires no special seam sealing, is self-healing and self-sealing while being extremely resilient and damage resistant.

Composition of Materials: CLAYMAX LC™ is a multi-layered liner system consisting of a layer of tough, durable and flexible heavy woven polypropylene, (on one side) coated with sodium bentonite clay. The bentonite is covered with a layer of thin polyester scrim which protects the bentonite layer during transportation and installation.

Sizes: CLAYMAX LC™ is supplied in rolled sheets. The material is 13.5 feet wide and 82 feet long. The material is rolled on 3½ inch roll cores. Special lengths may be ordered.

4. TECHNICAL DATA

Refer to Specification Table on page 1.

CLAYMAX LC™'s active ingredient, natural sodium bentonite, has the ability to swell in the presence of water to a volumetric expansion of 15 times resulting in a 6 fold increase in weight. Actual installation swelling is minimized by weight of aggregate cover material to only 2 to 3 times the original volume. Further expansion is possible into any voids in the material.

Limitations: CLAYMAX LC™ liner material **MUST** be protected with 6-12 inches (max. 12 inches on slopes) of backfill or aggregate cover material. If backfill is used, it should be compacted with wheeled, rolling equipment.

Containment installations, with slopes greater than two to one should be discussed with CEC.

CLAYMAX LC™ must be stored in a dry place.

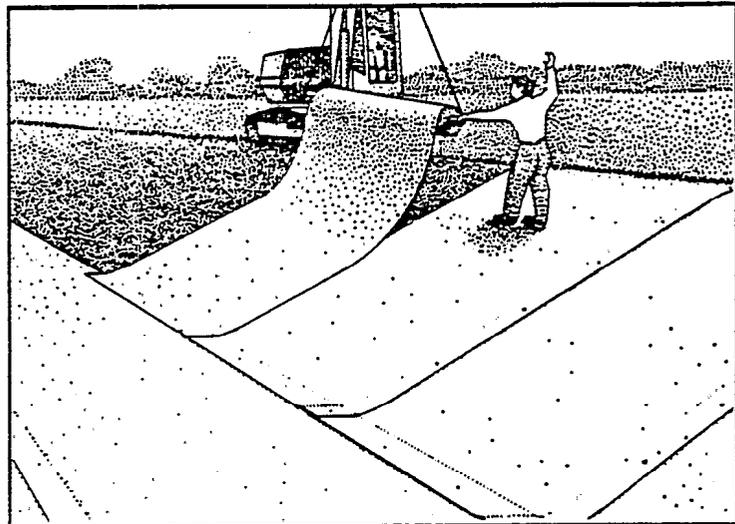
In soils of high alkalinity, acidity or brine condition (or other ground water contamination), samples should be submitted to CEC for analysis and CEC will issue any necessary special installation instructions.

Where installation of CLAYMAX LC™ sheets must resist extreme hydrostatic pressure, a double layer may be required. Please

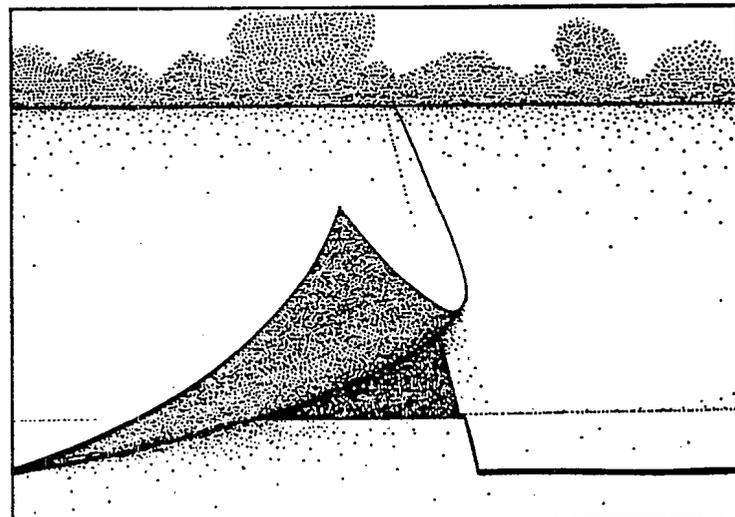
Advantages: • Flexibility allows rapid and easy installation • A small crew can easily perform the installation • All seams are simple overlap seals • CLAYMAX provides for complete inspectibility of liner seal integrity prior to covering • Liner is sufficiently resilient to support installation personnel and light-weight equipment • Liner can be cut and trimmed with a utility knife



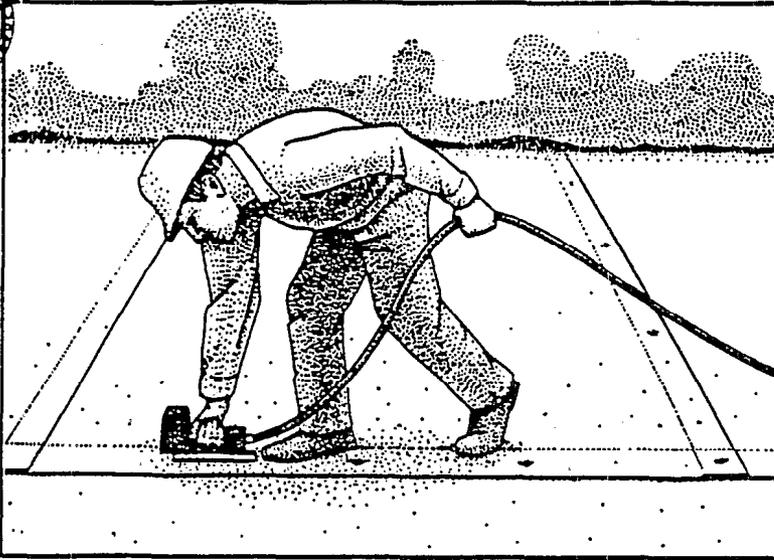
Site Preparation: Excavation should be well contoured; all rocks, vegetation and protrusions larger than 2 inches in diameter should be removed.



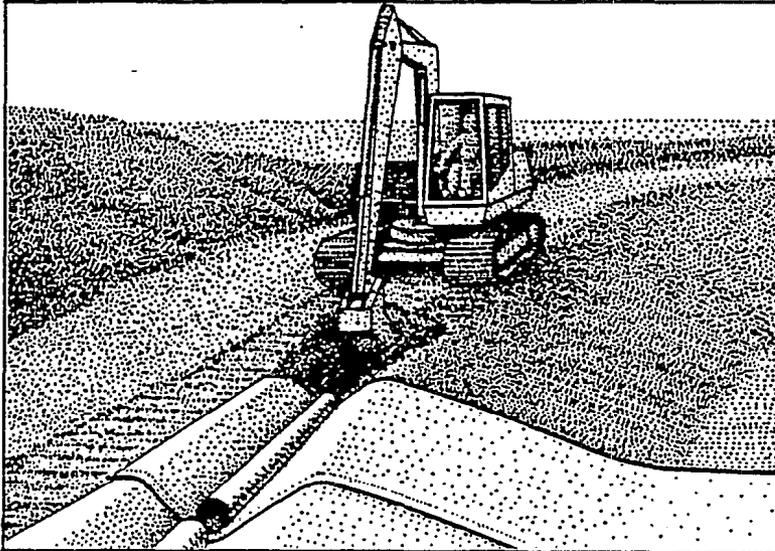
Installing adjoining rolls of CLAYMAX requires a 6-inch overlap. All seaming on slopes must be vertical and perpendicular to the base.



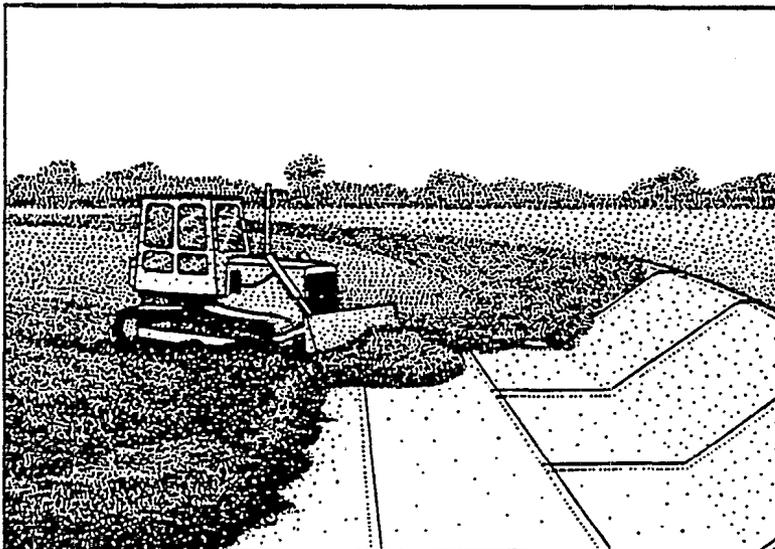
Detail of the 6-inch overlap; all soil must be removed from the overlap area of the liner to ensure a monolithic seal.



The 6-inch seams may be stapled or pinned to base soil to prevent seam opening during the backfill process.



Anchoring: Each CLAYMAX roll must be locked into trenches at the top of the slope, covered with fill and compacted to prevent slippage.



Covering: Backfill should always be pushed forward with equipment operating on the backfill. Cover material (other than aggregate) should be compacted after placement.

consult CEC or your local distributor when this condition exists.

Special installation application procedures for CLAYMAX™ must be approved in writing by the manufacturer prior to installation.

CLAYMAX LC™ which has been damaged by precipitation prior to backfill protection **MUST BE REPLACED** if seal integrity is to be maintained.

5. INSTALLATION

Site Preparation: The pond, lagoon, tank farm enclosure or canal excavation dimensions should be determined allowing for final addition of not more than the required 6-12 inches of soil or aggregate cover material. Ideally, the excavation should be well contoured with slopes that are a maximum of three to one. All vegetation, protrusions and rocks larger than 2 inches in diameter should be removed and the entire excavation should be compacted to 90% optimum density. Minor surface irregularities, however, can be accommodated. Compaction can be accomplished using either conventional rolling equipment or wheeled vehicles. Use of sheepsfoot rolling equipment is not recommended. A liner locking trench must be provided at the top of all slopes.

Orientation: It is essential to install CLAYMAX LC™ so that all seams of the material laid on slopes are perpendicular to the pond bottom. This will prevent seam displacement during cover material placement.

Anchoring: All CLAYMAX LC™ "runs" must be locked into trenches at the top of the slopes, covered with fill and compacted to prevent slippage. The locking trench should be 24 inches back horizontally from the top of the slope. The trench should have a minimum depth of 18 inches and a width of at least 12 inches for slopes up to three to one. Greater slopes would require a revised locking trench design.

Seaming: It is essential that the first and succeeding rolls of CLAYMAX LC™ be pulled tight to smooth out creases or irregularities in the "runs". CLAYMAX LC™ should always be installed with the polypropylene side up,



ing the stenciled trademark CLAYMAX™. Once the first "run" has been laid adjoining "runs" need only be laid with a 6-inch overlap on each side. Be certain that all dirt is removed from the overlap area of the mat. The 6-inch seams may be stapled (with uncrimped staples) or pinned to the base soil to prevent seam openings during the installation process.

Repairing: Irregular shapes, cuts or tears in installed CLAYMAX LC™ are easily accommodated by covering such areas with sufficient CLAYMAX™ to provide a 6-inch overlap on all adjoining CLAYMAX™. These repair pieces should be pinned in place to hold the material until cover material has been placed.

Covering: Cover material (no more than 6-12 inches of aggregate or backfill) should be applied as roll "runs" are completed to afford maximum protection against damage from personnel or equipment. Correctly installed, CLAYMAX™ is sufficiently resilient to support installation personnel. Care should be exercised to prevent seam damage or "run" slippage, and backfill should always be pushed forward with equipment operating on the backfill. Cover material (other than aggregate) should be compacted after placement.

Handling Suggestions: CLAYMAX LC™ MUST be pulled from the top of the roll and installed polypropylene side UP (stenciled

CLAYMAX™ this side). The liner can be either pulled from a roll suspended at the top of a slope or the free end may first be secured and the suspended roll can be backed down the slope and across the excavation by the supporting vehicle. Suspending and unrolling CLAYMAX LC™ is facilitated by inserting a heavy-duty 3-inch diameter steel pipe through the 3½ inch roll core on which CLAYMAX™ is shipped. This pipe should be 16 or 17 feet long to accommodate the hoisting chains from the lifting vehicle which may be wheeled power equipment with either forks or front-end bucket. A spreader bar may be required to ensure roll clearance and to prevent damage to roll edges.

Installation Precautions: CAUTION—*CLAYMAX LC™ should not be installed in standing water or while heavy rain is falling.

6. AVAILABILITY AND COST

Availability: CLAYMAX LC™ liquid containment system is available through a worldwide network of distributors and approved installers. Contact the manufacturer, or your local CLAYMAX LC™ representative, to order.

Cost: Material cost will vary depending on such factors as "point-of-use location." For current cost information, contact your local CLAYMAX™ representative. For the name, address and

telephone number of the representative in your area, contact the manufacturer.

7. WARRANTY

CLAYMAX LC™ waterproofing system is normally warranted by the installing contractor who can make specific details available upon request.

8. MAINTENANCE

No maintenance is required when CLAYMAX LC™ is installed in accordance with the manufacturer's instructions; however, the protective cover layer (backfill) must be maintained and repaired as necessary.

9. TECHNICAL SERVICES

Clem Environmental Corporation (CEC), will provide, on request, necessary technical assistance in the evaluation of installation applicability. On-site installation assistance is also available from the manufacturer.

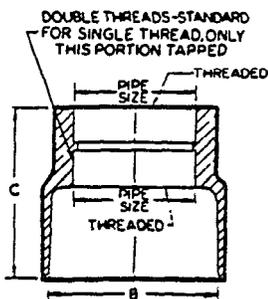
10. FILING SYSTEMS

SPEC-DATA® II
Sweet's 02770/AIM, Buyline 3526

Additional information is available from the manufacturer upon request.

The information and recommendations contained herein are based on data which is believed to be reliable but all such information and recommendations are given without guarantee or warranty.

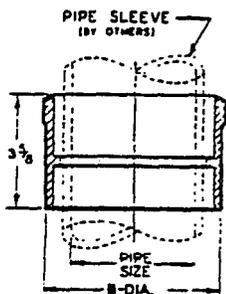
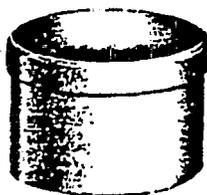
STACK FLASHING FITTING



SERIES NO.	PIPE SIZE	LIST PRICE	
		Cast Iron	-20 Galvanized Cast Iron
26440	1 1/2, 2	\$22.90	\$42.00
	3	26.60	45.70
	4	34.30	53.40
	5	49.60	68.70
	6	49.60	68.70
FOR OPTIONS ADD		-20 Galvanized Cast Iron Parts ABOVE Single Thread Can Be Furnished When Specified on Order.	
TYPE NO.	PIPE SIZE	B	LBS.
26441-1/2	1-1/2	3-1/4	5-3/8 4
26442	2	3-1/4	5-3/8 3
26443	3	4-1/4	5-3/8 4
26444	4	5-1/2	5-3/8 6
26445	5	6-1/2	5-3/8 10
26446	6	7-1/2	5-3/8 10

SPECIFICATION: JOSAM 26440 Series coated cast iron Stack Fitting with counterflashing recess, threaded stack and extension connections.

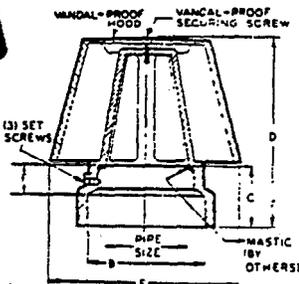
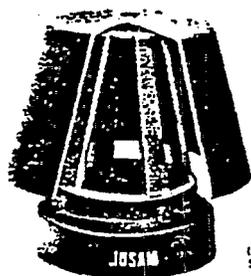
VENT STACK FLASHING SLEEVE



SERIES NO.	PIPE SIZE	LIST PRICE	
		Cast Iron	-20 Galvanized Cast Iron
26450	1 1/2	\$ 7.60	\$15.20
	2	7.60	15.20
	3	13.30	20.90
	4	15.20	22.80
	5	19.10	26.70
	6	38.10	45.70
FOR OPTIONS ADD		-20 Galvanized Cast Iron Parts ABOVE	
TYPE NO.	PIPE SIZE	B DIA.	LBS.
26451-1/2	1-1/2	3	3
26452	2	3-1/2	3
26453	3	4-3/4	5
26454	4	5-5/8	6
26455	5	6-3/4	8
26456	6	7-3/4	9

SPECIFICATION: JOSAM 26450 Series coated cast iron Stack Sleeve, with counterflashing and caulking recesses.

VANDAL-PROOF VENT CAP



SERIES NO.	PIPE SIZE	LIST PRICE						
		Cast Iron	-20 Galv. C. I.	-63 Rgh. Bronze	-65 Rgh. Nikaloy			
26700	1 1/2	\$43.40	\$61.70	\$ 95.90	\$100.50			
	2	50.40	68.60	100.50	105.20			
	2 1/2	57.20	75.40	109.70	114.20			
	3	57.20	75.40	109.70	114.20			
	4	64.00	82.50	114.20	118.80			
	5	73.10	91.40	121.10	128.00			
6	80.00	98.50	128.00	137.10				
FOR OPTIONS ADD		-20 Galvanized Cast Iron Parts ABOVE -63 All Rough Bronze ABOVE -65 All Rough Nikaloy ABOVE						
TYPE NO.	PIPE SIZE	DOME FREE AREA SQ. IN.	B	C	D	E	F	LBS.
26701-1/2	1-1/2	3.7	2-5/8	2	4-1/2	5-3/4	1	4
26702	2	6.8	3-1/4	2	5-1/4	5-3/4	1	5
26702-1/2	2-1/2	15.3	4-3/8	2-1/2	6-7/8	8-1/4	3/4	12
26703	3	15.3	4-3/8	2-1/2	6-7/8	8-1/4	1-1/8	12
26704	4	27.4	5-1/2	2-1/2	8	8-1/4	1-1/8	13
26705	5	41.6	6-1/2	2-1/2	10-1/8	11-3/4	1-1/8	22
26706	6	58.0	7-1/2	2-3/4	11-3/4	11-3/4	1-1/8	23

SPECIFICATION: JOSAM 26700 Series coated cast iron Vandal-Proof hooded Vent Cap, with large frost-proof openings, counterflashing collar, deep protective hood and recessed securing screws.

S
2
O
TY
2
2
2
2
2
SERIE
286
FO: OPTIC ADI
TYPE N
28602
28603
28604
28605
28606