DISPOSAL AREA MONITORING SYSTEM
PROGRESS REPORT
MARCH 15 - MAY 15, 1980

DAMOS CONTRIBUTION #13

SCIENCE APPLICATIONS, INC.

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1.0 INTRODUCTION

Because of funding and program definition requirements the FY80 DAMOS program was delayed until March 24, 1980. At that time the initial winter surveys were undertaken starting with the New London and Central Long Island Sound Disposal Sites from March 24 to April 2, 1980 and the Portland Disposal Site from April 8 - 11,1980. The Portland survey was conducted in conjunction with Innerstate Electronics Corporation to assist in the development of an Environmental Impact Statement for designation of the site as a regional disposal site by EPA.

This progress report will discuss the preliminary results of the March and April surveys, the overall progress that has been made on major portions of the program during the months prior to FY80 operations and future plans and schedules through the remainder of the year.

2.0 FIELD OPERATIONS

New London, CT April 24-26, 1980

- Conducted calibration of Loran-C 9960 chain
- Conducted bathymetric survey of disposal site (Figure 2.1)
  - results indicate disposal of material toward east margin of disposal area, therefore, recommended new buoy location:

    41°16.2'N, 72°04.35'W; L/C 14711.9,26133.4, 43975.2, 60118.0; Trisponder 5345,8608
- Sample Benthic Reference Station

  41°16.66'N 72°02'W; Trisponder Ranges 6441,11411, Sanple Labels NLR #1-10, Heavy Metals & Grain Size.

Central Long Island Sound Disposal Site

- Deployed Norwalk Buoy

  41°08.93'N, 72°53.48'W; L/C 15047.5,26549.7, 43998.9, 60083.0; Trisponder 11164,17825
- Conducted Survey of Norwalk Disposal Site - centered on buoy, 35 lanes, 700 m long, oriented E/W 25 m spacing; covers area of SP buoy permit dumping as well (Figure 2.2)
- Sampled 9 station grid and south reference station

- Conducted surveys of STHN-N and STNH-S disposal sites (Figures 2.3, 2.4). Both sites are as expected, no major change in North site, south site has maintained flat upper surface and shows evidence of additional disposal on east margin and 250 meters west of the disposal site where disposal under Loran-C control has taken place (see DAMOS contribution #12).

- Sampled Benthic stations on STNH-N mound

- Calibrated Loran-C, 9960 chain

Portland, Maine April 8-11, 1980

- Check position of disposal buoy; on site within ten meters

- Sample Benthic Reference Sation and IEC Reference Station

- Conduct Bathymetric survey (Figure 2.5), indicates shoaling of basin area but not distinct mound present

- Calibrate Loran-C, 9960 chain

- Sample chemistry station grid

- Collect mussels from reference station & deploy mussel cage at disposal site approximately 100 m North of buoy

- Obtain underwater TV and photographs at 11 station grid established by IEC including pictures at the disposal point.

Future plans include condition surveys at New London and Central Long Island Sound Disposal Sites during the week of June 9, 1980 and summer cruises scheduled for August. Monthly sampling of mussel cages has been initiated and the May samples were obtained.

3.0 BATHYMETRY (Dr. R.W. Morton)

Final plots and profiles of surveys made during the March-April cruises are being developed. The Norwalk and STNH-N surveys are straight forward and do not present problems. At New London and STNH-S, additional distance was added to each lane to cover disposal at new points, therefore, additional programming is required to develop contour difference plots and volume determinations. At Portland, errors resulted from measurements during a disposal operation, consequently additional lanes were run and must be integrated with the overall survey data.

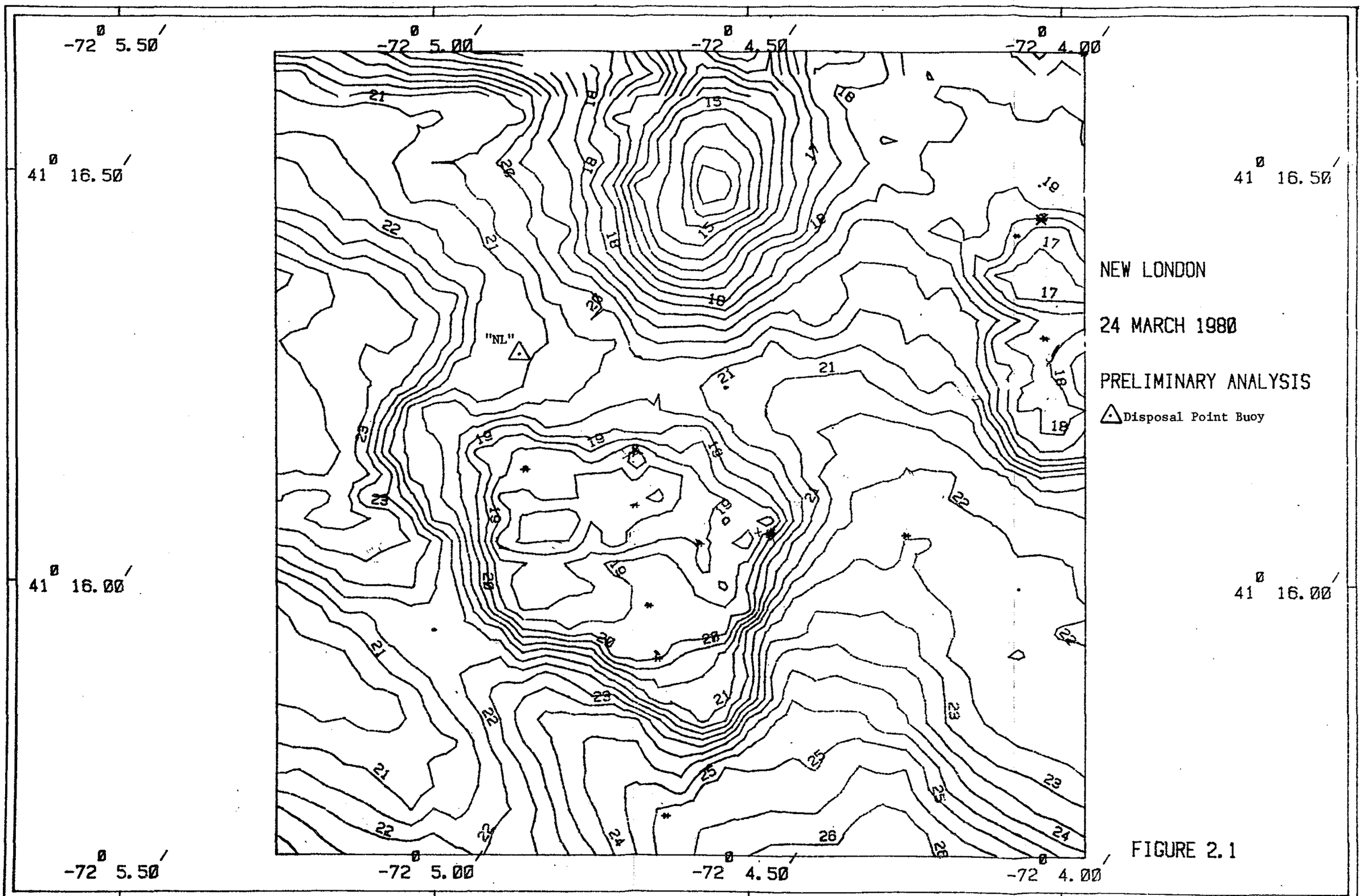
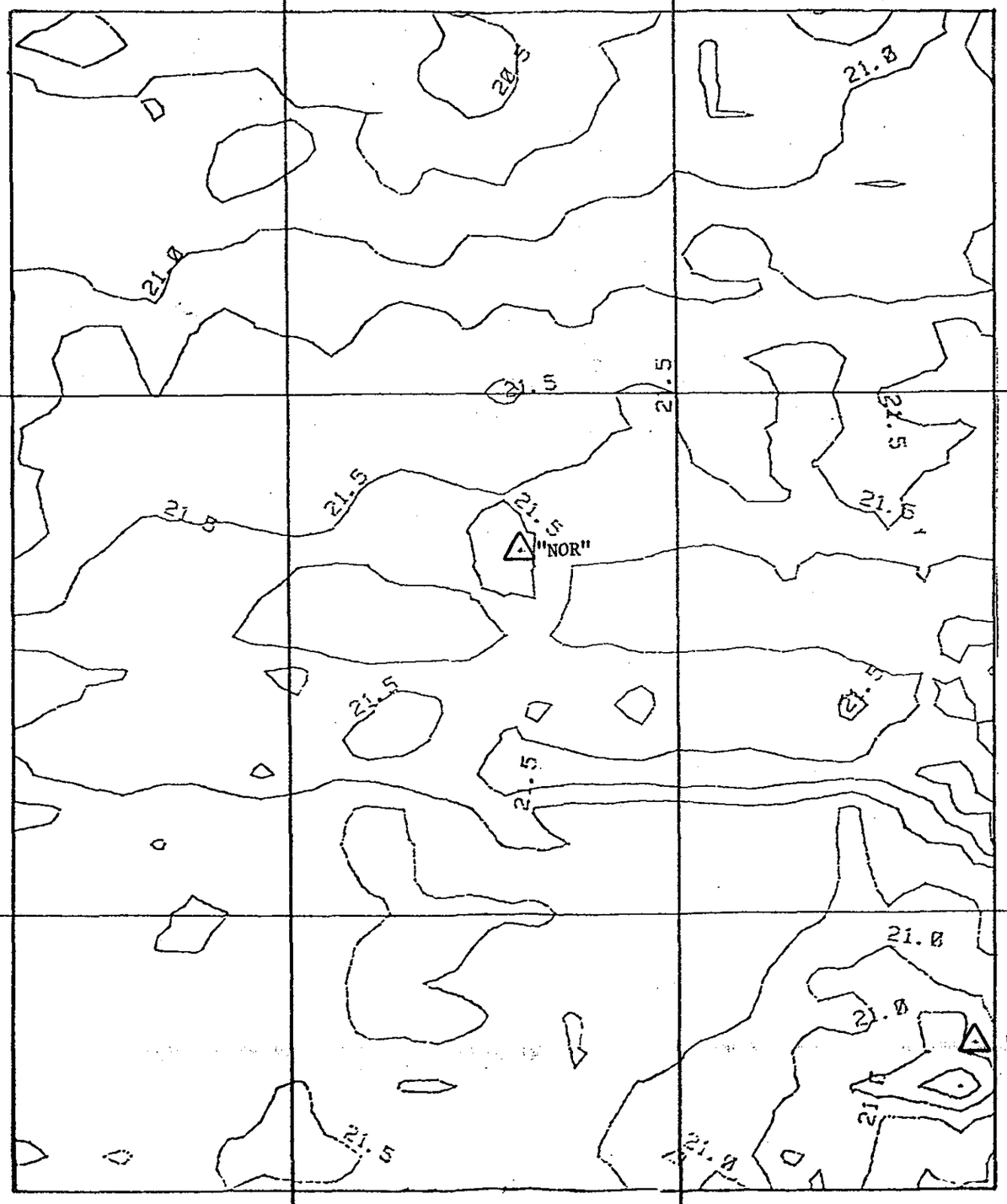

-72° 5.50′
-72° 5.00′
-72° 4.50′
-72° 4.00′
41° 16.50′
41° 16.00′
"NL"
NEW LONDON
24 MARCH 1980
PRELIMINARY ANALYSIS
Disposal Point Buoy

FIGURE 2.1

72 53.8 72 53.6 72 53.4 72 53.2

41 09.0 41 09.0



NORWALK

1 APRIL 1980

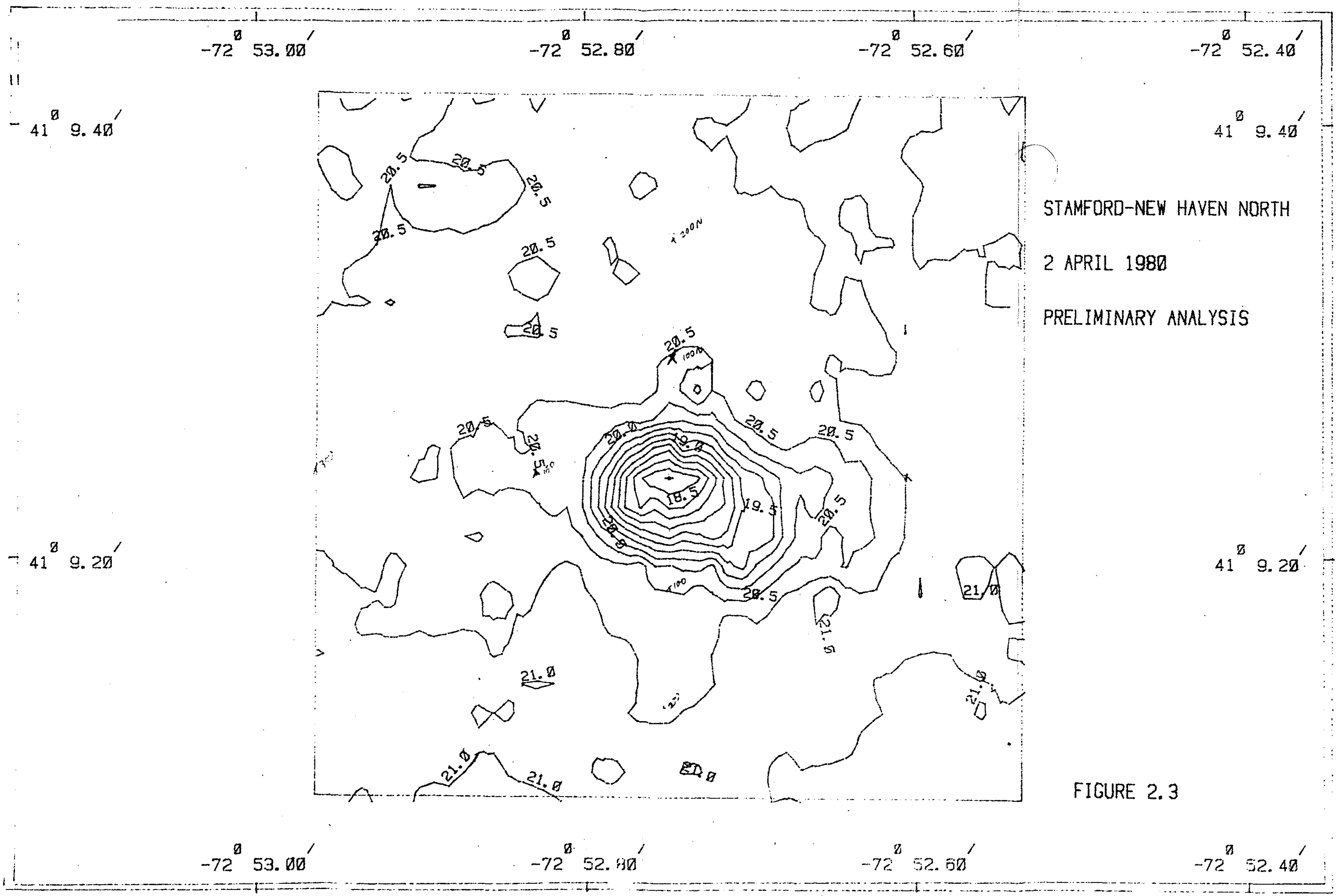
PRELIMINARY ANALYSIS

△ DISPOSAL POINT BUOYS

41 08.8 41 08.8

72 53.8 72 53.6 72 53.4 72 53.2

FIGURE 2.2

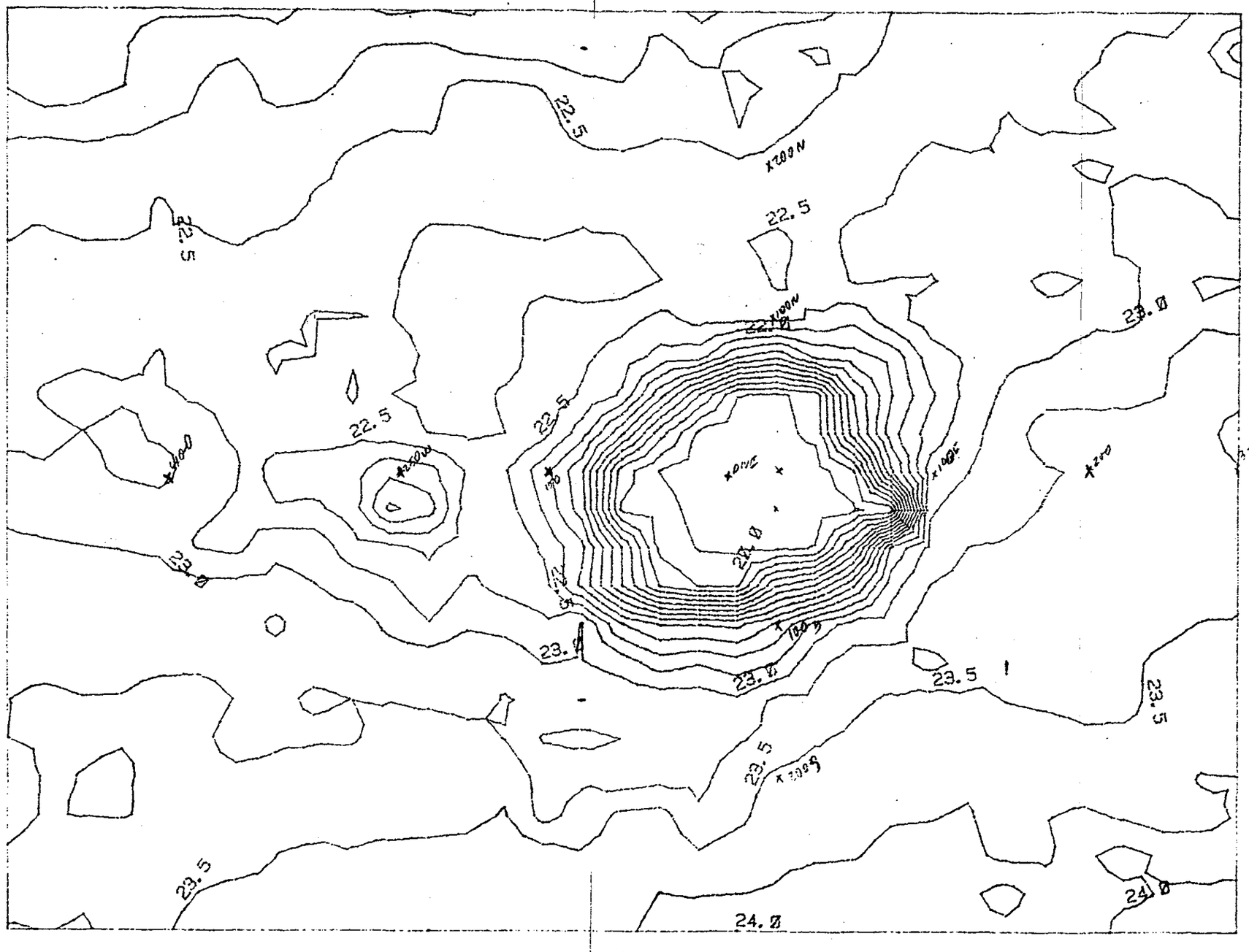


-72° 53.ØØ'
-72° 52.8Ø'
-72° 52.6Ø'
-72° 52.4Ø'
41° 9.4Ø'
41° 9.2Ø'
STAMFORD-NEW HAVEN NORTH
2 APRIL 198Ø
PRELIMINARY ANALYSIS
2Ø.5
2Ø.Ø
19.Ø
18.5
19.5
21.Ø
21.5

FIGURE 2.3

-72° 53.00′ -72° 52.80′ -72° 52.60′

41° 8.60′



41° 8.60′

STAMFORD-
NEW HAVEN
SOUTH

2 APRIL 1980

PRELIMINARY
ANALYSIS

41° 8.40′

41° 8.40′

FIGURE 2.4

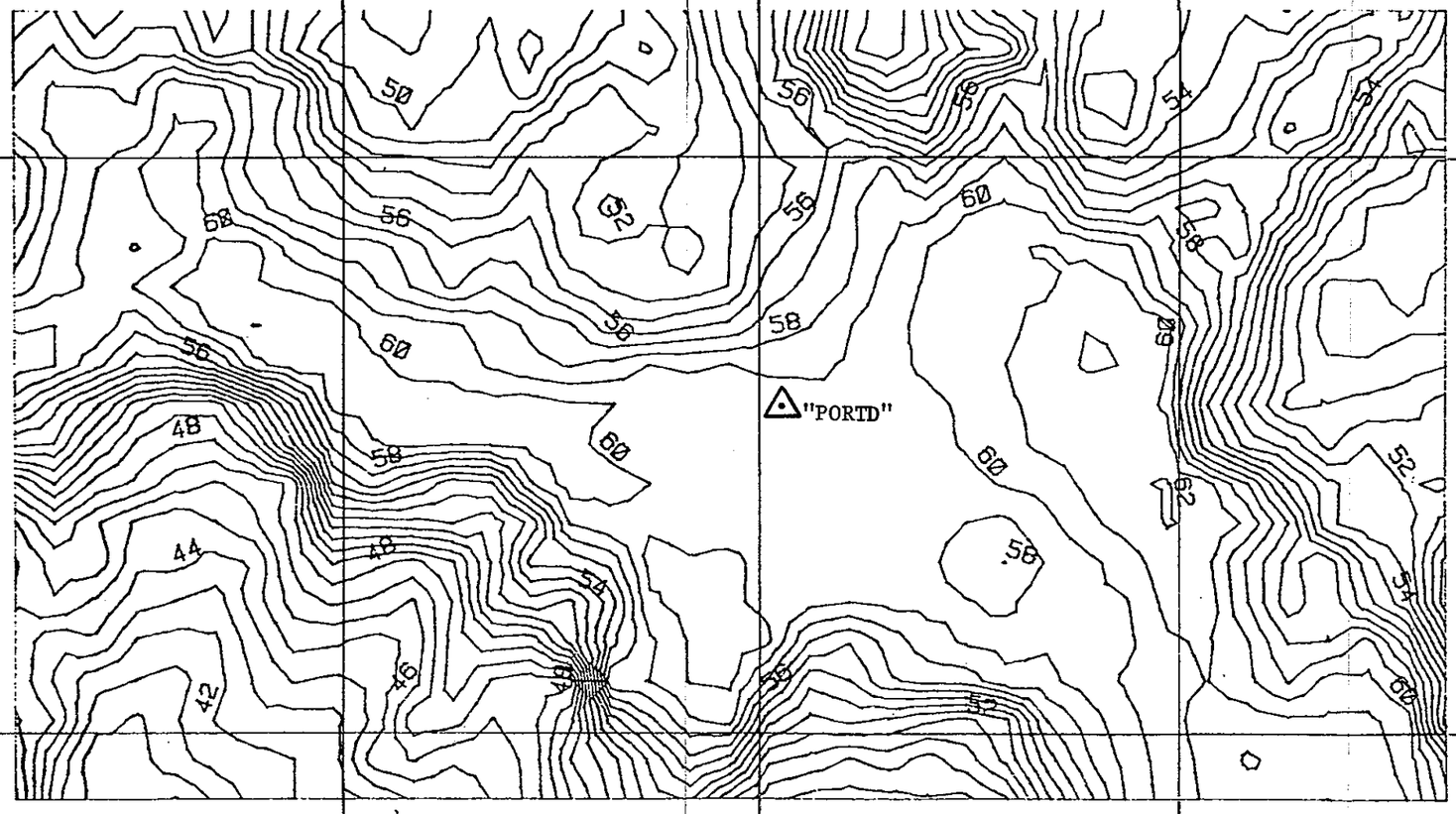
-72° 53.00′ -72° 52.80′ -72° 52.60′

70 02.4 | 70 02.2 | 70 02.0 | 70 01.8 | 70 01.6

Portland, Me.
April, 1980

△ Disposal Point Buoy

43 34.2



43 34.0

Preliminary Analysis
Contour Interval: 1 m
Datum: MLW

70 02.4 | 70 02.2 | 70 02.0 | 70 01.8 | 70 01.6

Additional work is being accomplished to increase the resolution of the analysis technique through use of different computers and hardware utilizing disk data stroage. Final plots and volume determination should be completed shortly.

4.0 BOUNDARY LAYER TURBULENCE SYSTEM (Dr. J. Ianiello)

Since funding of this portion of the program was not available until May, primary emphasis has been placed on planning for the remainder of the year with emphasis on recording turbulence parameters in association with the nephelometer and suspended sediment instrumentation.

4.1 Principal Goals for Summer 1980

- make simultaneous measurements of the turbulent velocity field and the suspended material concentrations using BOLT in conjunction with simultaneously recording nephelometers provided by F. Bohlen. Experiments will be conducted at New London or possibly New Haven. The purpose is to find in-situ relationships between turbulent stress levels and erosive capability.

- Conduct an intensive study of the turbulent flow over the New London dumpsite. Measurements will be taken at 3 stations on a transect up one face of the mound. Data will be taken continuously over a tidal cycle at each station using the unidirectional triad. The meters will be retrieved to change the tape cassettes; meanwhile divers will re-orient the meters for the next half tidal cycle. The experiment will require three days, one at each station. The nephelometers will be used during this experiment. The purpose of this test is to characterize the spatial and temporal variability of the turbulence on a rough mound.

4.2 Milestones

June 1980	develop method of reading BOLT cassettes to replace J. Roklan's services
	initial 3 day deployment and checkout of nephelometers/BOLT (New London site preferred)
July 1980	intensive study of turbulence at New London. Nephelometers also deployed
August 1980	Additional BOLT/Nephelometer measurements as necessary
	begin data analysis

Sept 1980 complete data analysis

begin report

5.0 SUSPENDED SEDIMENT (Dr. W.F. Bohlen)

During the first year of this investigation an instrumentation array designed to provide quantitative, in situ observations of sediment movement in the vicinity of selected dredge spoil disposal areas was designed and constructed. This array, shown schematically in Figure 5.1, contains a variety of instruments and is intended to monitor both long term average conditions and short term, storm induced events. Primary control is provided by the data logger (Sea Data Model 651-8) which also supplies power and serves to record the output signals from the nephelometers forming the optical array, the current meter and a complementary pair of temperature and salinity sensors. The system also serves to synchronize the photographic sequence provided by the 8mm lapsed time camera. The pump and associated filtration unit is designed to function independently providing a single daily sample at a rate controlled by a separate internal clock. No effort is made to synchronize this clock with that contained within the data logger.

Testing, calibration and assembly of the instrumentation array was completed during early December 1979. All units tested satisfactorily with the exception of the pump-filtration unit which displayed several weaknesses including aberrant timing, leaks within the suction system and an inability to document the sample volume passing through the filter. Although those faults, remaining despite the manufacturer's efforts, effectively limited the utility of my samples, it was decided to include the pump unit in the initial deployment so as to give it the benefit of a test under field conditions.

The initial field test of the array commenced on January 4, 1980 (Figure 5.2) with the unit placed at a location along the western limit of the New London dumpsite in approximately 60 ft of water. The control unit was programmed to activate and scale all sensors every 15 minutes. The pump-filtration unit was adjusted to provide

Suspended Sediment Monitoring System

Block Diagram - Major subsystems

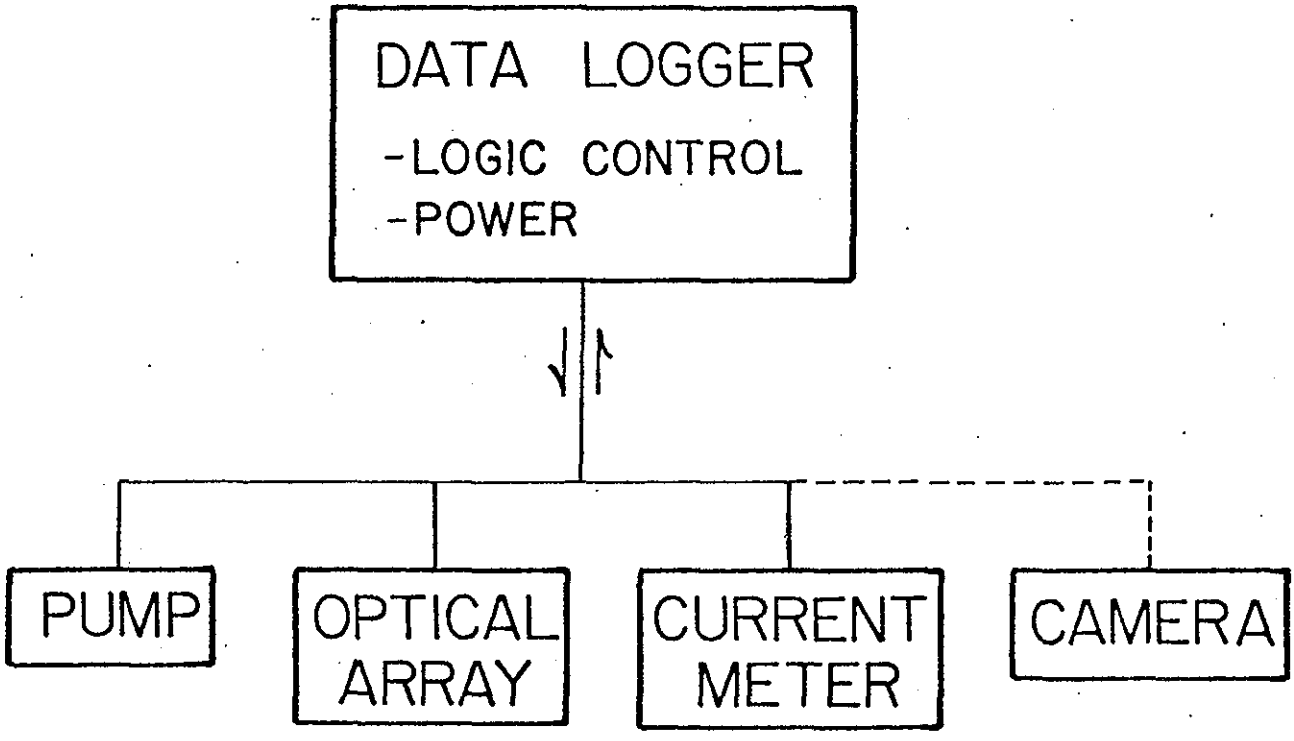
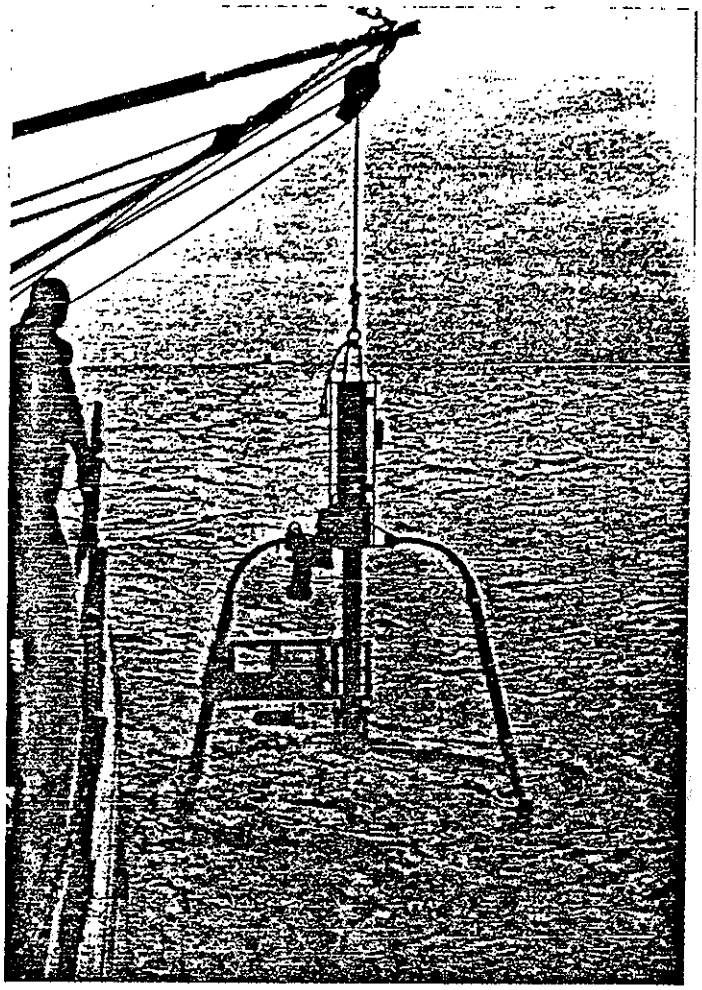


FIGURE 5.1



Sediment Array
Deployment No. 1
January, 1980

FIGURE 5.2

one sample of ambient suspended material concentrations each day. Approximately 700 mℓ of filtrate was passed through an individual filter providing an integrated sample of the suspended load over a 24-hour period. Twenty-five (25) Nuclepore (47 mm dia.; 0.4 μpore size) filters were inserted sufficient to provide an excess of three weeks of continuous sampling. In addition, selected filter units contained KV metro-discs to permit testing of their compatibility within the pump-filtration system and utility as a means to sample in-situ heavy metal concentrations.

The first deployment was terminated on January 17, 1980. The array was recovered and returned to Avery Point. Each of the component units was disassembled, inspected and, if appropriate, recalibrated. Films and magnetic tape records were processed and the resultant data reviewed. The examination indicated that all of the primary electronic components functioned properly. Minor mechanical problems affected one temperature probe, causing flooding and aberrant excess power consumption limited the battery life of the camera to nine days. Of the major subsystems, only the pump-filtration unit appeared to function unsatisfactorily. In particular there were questions concerning the accuracy of the timing controlling the drive and sampling rate of this unit since on recovery piston excursion indicated a 16 day, rather that a 13 day deployment. Primary concern, however, centered on the accuracy of the suspended material samples. Comparison of the filters sampled during deployment with those presumably unsampled indicated that both contained similar masses of sediment. It was unclear, therefore, whether the samples are the result of diffusion, biological growth or the planned filtration. Given the sediment weights contained on the filtered samples, it was apparent that the filtration was at best inefficient. These results were communicated to the manufacturer and the unit was returned for redesign on January 23, 1980.

Following completion of the evaluation of the results of the test deployment, the instrumentation array was reassembled and readied for its first long-term deployment. This commenced on January 31, 1980. Again the system was placed on the western boundary

of the New London dumpsite (41° 16.03'N, 72° 04.63'W) in approximately 55 ft. of water. The array deployed was identical to that used in the first deployment with the exception of the deletion of the pump-filtration unit which remained at the manufacturer's.

During the period of the second deployment primary emphasis was placed on the documentation of the array including operating instructions, schematic diagrams and calibration algorithms and on the development of the computer programs necessary to read the data tapes and analyze the results. The majority of these efforts were completed prior to March 1, 1980. A sample printout for the first deployment is shown in Table 5.1.

In addition to system and programming considerations, time was committed during the second deployment period to the redesign of the suspended sampling system. A simple spring-loaded suction unit similar in concept to a hypodermic syringe was constructed and tested. This unit functioned satisfactorily and it appears capable of providing accurate samples of both suspended material concentrations and concurrent heavy metal concentrations. Since it appears that the unit constructed by KV Associates will not be capable of doing either, despite redesign, funds for the construction of this new sampler have been solicited. There is little doubt that its addition will significantly extend the utility of the monitoring array.

The second deployment was terminated on March 3, 1980. Again the unit was recovered and returned to Avery Point. Following disassembly, inspection and analysis of the data tapes and films, all units were found to have functioned properly, providing approximately 32 days of data. Calibrations were checked and the array was reassembled and readied for deployment.

Deployment No. 3 commenced on March 17, 1980 with the unit placed in the same location occupied during Deployments 1 and 2. Primary emphasis during the deployment period was placed on the reduction and evaluation of data from the earlier deployments. Several programming problems were resolved and a regular reduction routine established.

Sample Data Printout
Suspended Sediment Monitor
January, 1980

CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	30.63	34382.40	3.421	1.296	7.586	7.110	1.434	2.009
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	30.88	34378.93	3.423	1.288	7.585	7.111	1.434	2.007
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	31.13	34376.33	3.418	1.339	7.588	7.113	1.434	1.667
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	31.38	34378.66	3.423	1.302	7.592	7.119	1.434	1.882
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	31.63	34389.66	3.410	1.339	7.606	7.128	1.435	1.606
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	31.88	34418.07	3.419	1.375	7.632	7.179	1.437	1.957
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	32.13	34432.07	3.400	1.301	7.640	7.190	1.438	1.999
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	32.38	34446.73	3.359	1.494	7.637	7.209	1.440	1.784
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	32.63	34453.46	3.408	1.301	7.641	7.221	1.442	1.713
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	32.88	34464.40	3.432	1.180	7.659	7.234	1.444	2.224
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	33.13	34467.33	3.427	1.204	7.654	7.234	1.445	2.122
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	33.38	34475.46	3.391	1.851	7.665	7.235	1.446	2.491
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	33.63	34475.66	3.409	1.254	7.670	7.235	1.446	2.911
CHAN.	TIME	FREQ CNT.	NEPH1	NEPH2	TEMP3	TEMP4	CHAN5	CUR METER
6	33.88	34471.46	3.396	1.427	7.669	7.231	1.447	2.615

TABLE 5.1

The third deployment was terminated on April 18, 1980 with the array being recovered and returned to Avery Point. Again, all systems functioned as designed providing approximately 32 days of data. Since this recovery, primary emphasis has shifted to data reduction. All data from the first three deployments have been listed and reviewed. Several storm and/or disposal events have been identified and used to define required additional data including waves and meteorological records. A paper describing the monitoring system is in preparation, and we expect to present some of the preliminary results at the New England Estuarine Research Society meeting scheduled for May 1980.

As outlined in the revised project schedule submitted to SAI in early May 1980, the monitoring array will be redeployed during June 1980 in order to sample low energy conditions at the New London dumpsite. It is hoped that this deployment will include addition of a suspended material sampler within the monitoring array. As previously indicated, there is little doubt that the addition of this unit will significantly extend the utility of the monitoring array and simplify the correlation of data obtained by the array with those obtained using the fixed mussel platforms.

6.0 SEDIMENT CHEMISTRY (Dr. E. Jones)

All chemical data except the most recent New Haven and Portland samples have been received and plotted showing trends in concentration as a function of distance from the center of the dump pile. Concentration changes as a function of time at particular stations have also been compiled. An example of these plots representing copper at the STNH-S spoil mound is presented in Figure 6.1. These data reflect the high values associated with Stamford material depressed to near background levels during June and August, followed by a return to higher levels when additional spoils were added to the site during clean-up operations in the fall of 1979. These data show excellent potential for use of sediment chemistry to evaluate the effectiveness of capping operations. Analysis of these data will be presented in future reports.

On April 28, 1980, a meeting was held at Barre Falls Dam to discuss potential future directions of the DAMOS chemistry program. Four topics were discussed including:

- Consideration of adding water column chemistry to DAMOS
- Consideration of adding ATP studies to the DAMOS chemistry program
- Clarification on how iron determinations are relevant to the existing bank of heavy metal data from the sediment work
- Consideration of adding ammonia (concentrations in the sediment) determinations to the DAMOS chemistry program

After some discussion dealing with the validity and necessity of performing water column sampling, heavy metal and PCB measurements, it was decided to gather existing pertinent information from the literature. E.N. Jones will provide water chemistry data from Phase I New London dump site work and contact Dr. Fitzgerald of UCONN at Avery Point as well as sources at WHOI. B. Condike will provide cost estimates for the performance of heavy metal and PCB analysis of water samples. The DAMOS chemists will consider the information gathered and present their views to the COE steering committee.

The possibility of incorporating ATP work into DAMOS was considered with ATP regard to its relevance and applicability. It was

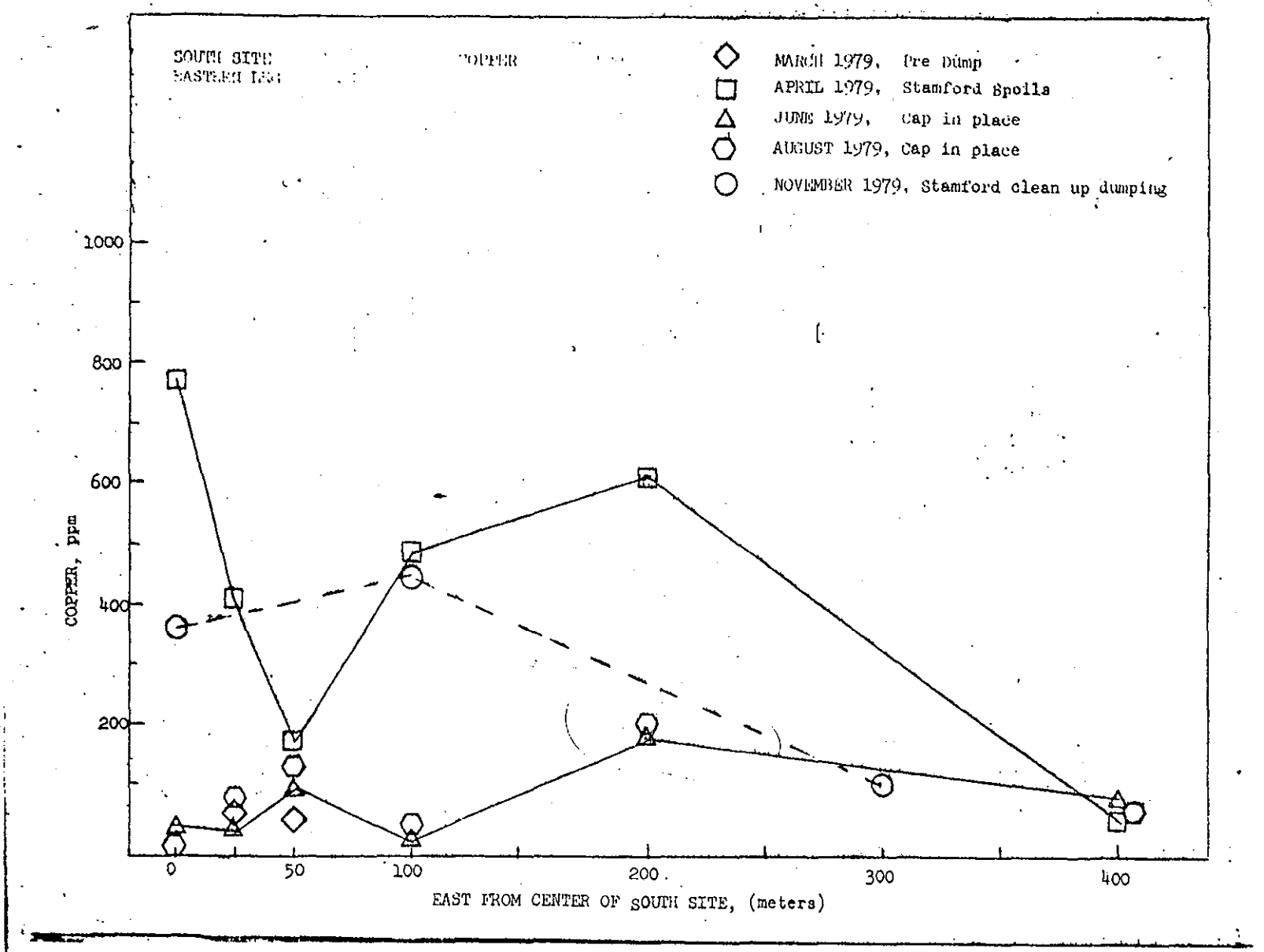

SOUTH SITE
EASTERN EDGE
COPPER
MARCH 1979, Pre Dump
APRIL 1979, Stamford Spoils
JUNE 1979, Cap in place
AUGUST 1979, Cap in place
NOVEMBER 1979, Stamford clean up dumping
COPPER, ppm
1000
800
600
400
200
0
50
100
200
300
400
EAST FROM CENTER OF SOUTH SITE, (meters)

FIGURE 6.1

thought that although relating ATP to biomass had certain potentials, biological speciation and community statistics were more desirable (Dr. Brooks has designed his program to answer the latter). However, a literature search was initiated, which would include some of the work of Dr. Yengst of Yale and Dr. Callibrize. Other insights might be available from Dr. Feng of UCONN.

Dr. Jones explained the use of iron in the DAMOS chemistry program. He has found that plots of Fe vs. other heavy metals can be useful in separating natural and spoil regions. F. Knowles showed a preference for COD vs. other metal plots. All agreed that since both Fe and COD will now be determined routinely, both types of plots would be generated. The iron determination was thought to be worth continuing.

Ammonia concentration in the sediment and water column associated with the dumping of spoils was discussed. B. Condike reported on a direct NH_3 determination using a specific ion/component electrode in slurries of sediment. Problems of such measurement were discussed related to the fact that the NH_3 released to the water column on dumping would have a very short residence time at the dump site and NH_3 remaining within the lump aggregate sediments would in all likelihood continue to stay in the sediment as long as the aggregates did not erode. Thus using ammonia as an indicator of spoil stability was questionable, since at the fringes of the spoil pile one does not expect lump aggregate spoil.

Further meetings are planned to discuss the results of the literature surveys and to develop specific approaches toward sampling and analysis of these parameters as required.

7.0 BENTHIC ECOLOGY (Dr. A. Brooks)

Although there has been no opportunity for benthic sampling during the months prior to March 1980, continued analysis of previous data has been underway.

Table 7.1 lists all DAMOS benthos sampling sites occupied with dates of sampling since the inception of the DAMOS program. The number of samples collected during each sampling date is shown in

SITE	WINTER SPRING 77-78	SPRING SUMMER 1978	WINTER 1978-79	SPRING 1979	SUMMER 1979	SPRING 1980
1.Rockland D.S.	12/12/77(3)	5/11/78(3)	11/16/78(3)	6/13/79(5)		
2.Rockland Canyon			11/16/78(3)			
3.Portland D.S.	12/15/77(3)	5/18/78(3)	11/19/78(3)	6/10/79(5)		
4.Portland Reference						4/8/80(10)
5.Isle of Shoals	12/17/77(3)	5/20/78(3)	12/8/78(3)	6/8/79(5)		
6.Boston Foul Grd.	12/18/77(3)	5/23/78(3)	12/6/78(3)	6/6/79(5)		
7.Boston Lightship	12/18/77(3)	5/23/78(3)	12/6/78(3)	6/6/79(5)		
8.Brenton Reef D.S.	4/25/78(3)	8/3/78(3)	12/11/78(3)	5/30/79(5)		
9.Brenton Reef Reference	4/19/78(3)	8/3/78(3)	12/11/78(3)	5/30/79(5)		
10.New London, D.S.(c-6)	4/17/78(3)	8/2/78(3)	1/28/79(5)	5/12/79(5)		3/25/80(10)
11.New London Ref. #1(F-8)	4/17/78(3)	8/2/78(3)	1/28/79(5)	5/23/79(5)		
12.New London Ref. #2(A10-3)						3/25/80(10)
13Cornfield Shoad D.S.	1/31/78(3)	7/31/78(3)	1/27/79(5)			
14.Cornfield Shoal Ref.	1/31/78(3)	7/31/78(3)	1/27/79(5)			
15.N.Haven D.S.	4/13/78(3)	7/29/78(3)	1/19/79(5)	5/21/79(5)		
16.N.Haven Ref(NW Control)	4/13/78(3)	7/29/78(3)	1/26/79(5)	5/21/79(5)		
17.N.Haven Ref. (Southern)						4/1/80(10)
18.STNH-N-Dump Pt.(S)				3/21/79(5)		
19.STHN-N-1-Dump Pt.						4/1/80(10)
20.STNH-N Inner Edge						4/2/80(10)
21.STNH-N Outer Edge						4/2/80(10)
22.STNH-S 1-Dump Pt.			1/26/79(5)			
23STHN-S-6-1000MEast			1/26/79(5)	5/21/79(5)	8/9/79(5)	
24.STNH-S-7-1000M West			1/26/79(5)	5/22/79(5)	8/9/79(5)	
25.N.Haven-Norwalk Dump Pt						4/1/80(10)
26.Cable & Anchor D.S.	4/11/78(3)	7/27/78(3)	1/23/79(5)			
27.WLIS D.S.	4/12/78(3)	7/27/78(3)	1/23/79(5)			
28. CAR & WLIS REF.	4/12/78(3)	7/28/78(3)	1/23/79(5)			
29.Green's Ledge			1/23/79(5)	5/18/79(5)		

TOTAL DREDGES = 123
TOTAL GRABS = 235

DAMOS BENTHOS
Sampling Sites and Dates of Sampling

TABLE 7.1

parenthesis. From December 1977 through 1978, samples were collected using an Anchor Dredge. From January 1979 to the present, samples for benthic analysis have been collected with a Smith-McIntyre grab sampler which collects a sample of bottom sediment with a 0.1 M^2 surface area. During the course of this program a total of 123 dredge and 235 grab samples have been obtained.

All benthic samples collected up through 1979 have been analyzed. The numbers of individuals counted and a listing of all species found have been tabulated. The total number of taxa identified from these samples is 655. The total number of individuals collected is 59,940.

Table 7.2 presents a computer printout of the master listing of all taxa identified up through 1979. Included in this listing are species which were found at the New London dredge disposal site during the New London Phase II studies which preceeded the DAMOS program. The Table has not been annotated but the following description should prove self explanatory. Columns 1-12 contain the NODC code number for the listed species, or in cases where a complete code number has not yet been assigned by NODC an arbitrary number has been designated by the author. Columns 13,14 and 15 contain an x, z and y respectively which are simply "flags" for use in future computer manipulation that designate their respective taxa as incertae sedis, a generic designation and juveniles of the species in question, respectively. Columns 16 through 49 contain the scientific name of the organism. In columns 50, 52, 53 and 56 will be found 1,2,3 and 4 respectively. These latter numbers are code numbers which represent the four sampling periods during the New London Phase II studies, namely March 1977, September 1977, march 1978 and September 1978 respectively. The presence of one or more of these numbers opposite a given species indicates that the species in question was collected during New London Phase II studies on the date(s) corresponding to the code number(s) indicated. Columns 60,62,64 and 66 contain the code numbers 5,6,7 and 8 respectively, corresponding to DAMOS sampling dates of the Winter-Spring 1977-78, Spring-Summer 1978, Winter 1978-79 and Spring-Summer 1979 collections and indicate that the species in

TABLE 7.2 MASTER SPECIES LIST

PIP TI:=RUN.DAT

		PROTOZOA 34-3496																	
344899		YFORAMINIFERA SP.				3	4		5						NL	N			S
344898		YFORAMINIFERA SP. A								6									S
344897		YFORAMINIFERA SP. B								6									S
344896		YFORAMINIFERA SP. C								6									S
		PORIFERA 36-3669																	
3666060199	X	CLIONA SP.	1	2	3										NL				
3666060104		CLIONA VASTIFICA								6									S
3668040199		CRANIELLA GRAVIDA	1												NL				
3663020199		HALICLONA PALMATA				3									NL				
3663020198	X	HALICLONA SP.				3	4			6					NL			RI	S
3665030102		HYMENIACIDON HELIOPHILA				3	4				7	8			NL				S
3664111002		IOPHON NIGRICANS				3			5						NL	N			
3607010199	X	LEUCOSOLENIA SP.							5										S
3666040103		POLYMASTIA ROBUSTA								6								RI	
3699		YPORIFERA SP.							5	6									S
3608010201		SCYPHA CILIATA		2	3										NL				
		CNIDARIA 37-3769																	
		HYDROZOA 3701-3729																	
370199	X	ACTINOTHOE SP.	1												NL				
370198		YANTENNULARIA SP.				3									NL				
3703010799	X	BOUGAINVILLIA SP.		2					5						NL				S
370197		CALYCELLA SYRINGA	1		3	4			5	6		8			NL	N			S
3704010199		CAMPANULARIA FLEXUOSA			3				5						NL			RI	S
3704010198	X	CAMPANULARIA SP.	1		3	4			5	6					NL	N			S
3704010197		CAMPANULARIA VERTICELLATA			3				5	6					NL			RI	S
37040198	X	CAMPANULARID SP.				4				6		8			NL			RI	S
3704010599		CLYTIA CORONATA				4				6					NL				S
3704010598	X	CLYTIA SP.				4				6	7				NL				S
3703030199		CORYMORPHA PENDULA							5		7	8						RI	S
3703030198	X	CORYMORPHA SP									7								S
3704040299	X	CUSPIDELLA SP.				4									NL				
37030109		DICORYNE FLEXUOSA										8				N			
3703010999	X	DICORYNE SP.		2											NL				
3704050899	X	DIPHASIA SP.		2											NL				
3703080199	X	EUDENDRIUM SP.		2	3	4			5	6	7	8			NL	N		RI	S
3703011199		GARVEIA GROENLANDICA								6	7	8							S
3704010899		GONOTHYRAEA GRACILIS								6									S
3704060199		HALECIUM DIMINUTIVUM				4				6		8			NL				S
3704060198	X	HALECIUM SP.		2	3	4			5	6	7	8			NL	N		RI	S
3703030401		HYBOCODON PROLIFER			3						7	8			NL				S
3703010804		HYDRACTINIA ECHINATA				4									NL				
3703010898	X	HYDRACTINIA SP.		2					5	6					NL	N			S
3704050901		HYDRALLMANIA FALCATA				4									NL				
370196		YHYDROZOAN SP									7							RI	S
3704020199	X	LAFOEA SP.				4									NL				
3704110101		LOVENELLA GRACILIS							5			8							S
3704010299	X	OBELIA SP.				4									NL				
37030101	X	PERIGONIMUS SP.										8							S
3701		PODOCORYNE CARNEA										8							S
370195	X	SELAGINOPSIS SP.				4									NL				
3704050299	X	SERTULARELLA SP									7								S
3704050399	X	SERTULARIA SP.		2					5						NL	N			
3703180198	X	STYLACTIS SP.								6									S
3704050599	X	THUIARIA SP.	1	2	3	4			5	6	7	8			NL	N		RI	S
3703030299	X	TUBULARIA SP.				4					7	8			NL				S
370303		YTUBULARIID SP.	1	2	3				5	6					NL				S
		ANTHOZOA 3740-3769																	
375999	X	ACTINIARIAN SP.							5									RI	S
37599999	X	ACTINIARIAN SP. A	1	2											NL				
374099		YANTHOZOAN SP.		2					5			8			NL	N			

3743010199		YLERIANTHARIAN SP.	1	2	3	4	5	6	7	8		NL	N	RI	S		
3759010101		EDWARDSIA ELEGANS	1	2	3	4	5	6	7	8		NL	N	RI	S		
3759010199	X	EDWARDSIA SP.							7	8			N				
3759040199		HALCAMPA DUODECIMCIRRATA						6					N	RI	S		
37590299	X	HALCAMPOIDES SP.		2		4	5	6				NL			S		
37590399		HALOCLAVA PRODUCTA							7	8					S		
375903	X	HALOCLAVA SP.								8					S		
3760060101		METRIDIUM SENILE			3	4		6	7			NL		RI	S		
3760020101		STOMPHIA COCCINEA								8			N				
		PLATYHELMINTHES 39-3976															
3906050599	X	NOTOPLANA SP.							7						S		
3999		YPLATYHELMINTH SP.					5	6	7				N	RI	S		
		RHYNCHOCOELA 43-4308															
4306050199	X	AMPHIPORUS SP.	1	2	3	4	5	6	7	8		NL	N	RI	S		
4303020299	X	CEREBRATULUS SP.	1	2	3	4	5	6	7	8		NL	N	RI	S		
4303020499	X	LINEUS SP.					5	6					N	RI			
4303020599	X	MICRURA SP.	1	2	3	4	5	6	7	8		NL	N	RI	S		
4399		YRHYNCHOCOEL SP.		2	3	4	5	6	7	8		NL	N	RI	S		
4302010104		TUBULANUS PELLUCIDUS							7				N		S		
4302010199	X	TUBULANUS SP.		2			5	6	7	8		NL	N	RI	S		
		NEMATODA 47-4759															
4799		YNEMATODE SP.		2	3	4	5	6	7			NL	N	RI	S		
4799		YNEMATODE SP. (PARASITIC)								8			N				
		MOLLUSCA 5085-5708															
		POLYPLACOPHORA 5303															
53030206		TONICELLA RUBER								8			N				
		APLACOPHORA 54-5402															
5402010101		CHAETODERMA NITIDULUM					5	6	7	8			N				
5402010199	X	CHAETODERMA SP.					5						N				
		SCAPHOPODA 56															
5600010105		DENTALIUM ENTALE								8			N				
5600010106		DENTALIUM OCCIDENTALE						6					N				
		GASTROPODA 51-5143															
5110040103		ACTEOCINA CANALICULATA						6		8					S		
5105140101		ADMETE COUTHOYI						6					N				
5103200199		ALVANIA PELAGICA					5	6	7	8			N				
5105030399		ANACHIS LAFRESNAYI	1	2	3	4	5	6	7			NL	N		S		
5105030398	X	ANACHIS SP.	1		3							NL					
5105040145		BUCCINUM UNDATUM						6		8					S		
5103760399		BULBUS SMITHII						6					N				
5199	X	CAPELLINIA SP.	1									NL					
5141030299		CATRIONA AURANTIA							7						S		
5105050328		COLUS PYGMAEUS					5			8			N				
5105050329		COLUS STIMPSONI					5						N				
51410401	X	CORYPHELLA SP.								8					S		
5103640205		CREPIDULA CONVEXA	1	2	3	4		6				NL	N				
5103640204		CREPIDULA FORNICATA			3	4	5	6	7	8		NL			S		
5103640207		CREPIDULA PLANA		2	3	4	5	6	7	8		NL	N		S		
5103640299	X	CREPIDULA SP.			3	4						NL					
5103640401		CRUCIBULUM STRIATUM	1			4						NL					
5110040203		CYLICHNA ALBA						6					N				
5110040299		CYLICHNA ORYZA						6		8					S		
5105010601		EUPLEURA CAUDATA				4						NL					
514201		FACELINA BOSTONIENSIS								8					S		
5198		LUNATIA HEROS	1		3	4	5	6					N		S		
5197		LUNATIA PALLIDA					5						N				
51	X	LUNATIA SP.								8			N				
5196		LUNATIA TRISERIATA	1	2	3	4	5	6		8					S		
5105030207		MITRELLA LUNATA	1	2	3	4	5	6	7	8		NL			S		
5105030299	X	MITRELLA SP.					5							RI			
5105080103		NASSSARIUS TRIVITTATUS	1	2	3	4	5	6	7	8		NL	N	RI	S		
5103760299		NATICA FUSILLA							7				N				
5110050199		PHILINE QUADRATA					5						N				
5103760407		POLINICES DUPLICATUS					5		7	8					S		
5103760408		POLINICES IMMACULATUS		2								NL					

5106020699		PROPEBELA CONCINNULA							5			8			N				
5110130101		RETUSA OBTUSA							5		7	8			N				
5110040302		SCAPHANDER PUNCTOSTRIATUS	1						5	6				NL	N				
5108010299		TURBONILLA NIVEA				4								NL					
5108010298	X	TURBONILLA SP.	1			4						8		NL				S	
5105010301		UROSALPINX CINEREA			3				5					NL	N				
5195		YGASTROPOD EGGS			3									NL					
5194		YGASTROPOD SP.			4									NL					
		BIVALVIA 55-5520																	
5506010201		ANADARA TRANSVERSA				4			5	.				NL				S	
5509090201		ANOMIA ACULEATA	1											NL					
5509090202		ANOMIA SIMPLEX		2						6				NL	N				
5509090203		ANOMIA SQUAMULA								6								S	
5515390101		ARCTICA ISLANDICA							5	6	7				N	RI			
5515190101		ASTARTE BOREALIS								6	7	8			N	RI			
5515190115		ASTARTE QUADRANS										8				RI			
5515190199	X	ASTARTE SP.									7				N				
5515190111		ASTARTE SUBAEQUILATERA		2					5	6	7	8		NL	N			S	
5515190113		ASTARTE UNDATA	1	2	3	4			5	6	7	8		NL	N	RI		S	
5515190113		ASTARTE UNDATA (A)										8			N	RI			
5515220601		CERASTODERMA PINNULATUM	1	2	3	4			5	6	7	8		NL	N	RI		S	
5599	X	CHIONE SP.		2	3									NL					
5517020201		CORBULA CONTRACTA	1											NL					
5517020299	X	CORBULA SP.								6					N				
5507010201		CRENELLA DECUSSATA								6		8			N				
5507010203		CRENELLA GLANDULA							5						N				
5598		CUMINGIA TELLINOIDES								6					N				
5520100299		CUSPIDARIA OBESA							5						N				
5515170106		CYCLOCARDIA BOREALIS	1	2	3	4			5	6	7	8		NL	N	RI		S	
5507010502		DACRYDIUM VITREUM			3	4				6	7			NL				S	
5515090301		ENSIS DIRECTUS	1	2	3	4				6	7			NL		RI		S	
5517060201		HIATELLA ARCTICA										8						S	
5515010202		LUCINOMA FILLOSA										8				RI			
5520050201		LYONSIA ARENOSA										8			N				
5520050206		LYONSIA HYALINA								6		8						S	
5515310116		MACOMA BALTHICA									7				N				
5515310101		MACOMA CALCAREA							5			8			N				
5515310199	X	MACOMA SP.							5		7				N			S	
5515310120		MACOMA TENTA	1						5	6	7	8		NL				S	
5515471101		MERCENARIA MERCENARIA				4								NL					
5507010601		MODIOLUS MODIOLUS		2		4			5	6				NL				S	
5515250301		MULINIA LATERALIS		2					5	6	7	8		NL	N			S	
5507010402		MUSCULUS DISCORS	1						5					NL				S	
5507010401		MUSCULUS NIGER	1	2					5					NL	N			S	
5507010499	X	MUSCULUS SP.				4								NL					
5517010201		MYA ARENARIA									7					RI		S	
5517010201	Z	MYA ARENARIA										8			N				
5507010101		MYTILUS EDULIS	1	2	3	4			5	6	7	8		NL	N	RI		S	
5502020206		NUCULA DELPHINODONTA	1									8		NL	N	RI			
5502020204		NUCULA PROXIMA	1	2	3	4			5	6	7	8		NL	N	RI		S	
5502020201		NUCULA TENUIS							5	6	7	8			N	RI			
5502040211		NUCULANA TENUISULCATA							5	6	7	8			N				
5520020107		PANDORA GOULDIANA		2										NL					
5520020199	X	PANDORA SP.									7							S	
5597	X	PECTINIID SP.							5						N				
5596		YPELECYPOD SP.							5							RI		S	
5595		YPELECYPOD SP. A									7	8			N				
5520070102		PERIPLOMA FRAGILE									7					RI			
5520070104		PERIPLOMA PAPYRATIUM	1						5	6	7	8		NL	N	RI		S	
5515471201		PITAR MORRHUANA	1	2	3	4			5	6	7	8		NL	N	RI		S	
5504010101		SOLEMYA VELUM	1	2	3	4			5	6				NL				S	
5515290202		SOLEN VIRIDIS								6		8						S	
55152999	X	SOLENID SP.				4								NL					
5515250199		SPISULA SIMILIS	1											NL					
5515250102		SPISULA SOLIDISSIMA	1	2					5	6				NL		RI			

55153102	X	TELLINA SP.									8								S
5515310299		TELLINA VERSICOLOR	1	2	3	4		5	6	7			NL	N	RI	S			
55153199		YTELLINID SP								7	8			N	RI	S			
5520080209		THRACIA CONRADI	1					5		7			NL	N	RI				
5520080299	X	THRACIA SP.						5						N					
5515020399		THYASIRA INSIGNIS						5	6	7	8			N		S			
5515020398	X	THYASIRA SP.						5		7				N		S			
5502040511		YOLDIA LIMATULA		2	3			5	6	7	8		NL			S			
5502040599		YOLDIA LUCIDA			3			5	6	7	8		NL	N		S			
5502040513		YOLDIA SAPOTILLA				4		5	6	7	8		NL	N	RI	S			
5502040507		YOLDIA THRACIAEFORMIS						5	6	7				N					
		ANNELIDA 50-5016																	
		POLYCHAETA 5001																	
5001250304		AGLAOPHAMUS CIRCINATA			3	4		5	6	7	8		NL		RI	S			
5001670208		AMPHARETE ACUTIFRONS								7	8			N	RI	S			
5001670201		AMPHARETE ARCTICA	1	2	3	4		5	6	7	8		NL	N	RI	S			
50016799	X	AMPHARETID SP.							6		8			N	RI				
5001670303		AMPHICTEIS GUNNERI						5	6	7				N					
50016801		AMPHITRITE AFFINIS									8			N					
5001680101		AMPHITRITE CIRRATA						5	6	7	8			N					
5001680104		AMPHITRITE JOHNSTONI							6							S			
500199		YAMPHITRITINAE SP.								7				N					
5001220104		ANCISTROSYLLIS GROENLANDICA						5		7	8			N		S			
5001220199	X	ANCISTROSYLLIS SP.							6							S			
500101		ANTINOELLA SARSI									8			N					
5001010104		APHRODITA HASTATA						5	6					N					
5001420101		APISTOBRANCHUS TULLBERGI									8			N					
50013399		YARABELLID SP.								7						S			
5001020301		ARCTEOBIA ANTICOSTIENSIS									8			N					
5001410211		ARICIDEA CERRUTI								7						S			
5001410210		ARICIDEA NEOSUECICA						5		7						S			
50014102		ARICIDEA QUADRILOBATA									8			N					
5001670802		*ASABELLIDES OCULATA*				4				7	8		NL		RI	S			
5001630199		ASYCHIS ELONGATA	1		3	4		5	6	7	8		NL	N	RI	S			
5001230104		AUTOLYTUS PROLIFERA		2	3	4			6		8		NL			S			
5001230199	X	AUTOLYTUS SP.						5		7						S			
5001540199		BRADA GRANOSA	1	2				5					NL	N					
5001540102		BRADA VILLOSA		2				5			8		NL	N	RI	S			
5001600101		CAPITELLA CAPITATA	1	2	3	4			6	7	8		NL	N		S			
5001500299		CAULLERIELLA FILLARIENSIS		2	3			5		7	8		NL		RI	S			
5001240601		CERATOCEPHALE LOVENI									8			N					
5001500401		CHAETOZONE SETOSA		2				5	6	7	8		NL	N					
5001700102		CHONE INFUNDIBULIFORMIS						5	6	7	8			N	RI				
50015099	X	CIRRATULID SP.	1	2	3	4		5	6	7	8		NL	N	RI	S			
5001500699		CIRRIFORMIA GRANDIS	1	2	3	4		5					NL	N	RI	S			
5001500698	X	CIRRIFORMIA SP.							6							S			
5001410601		CIRRIPHORUS LYRIFORMIS									8				RI				
5001410699	X	CIRROPHORUS SP.								7						S			
5001630202		CLYMENELLA TORQUATA	1	2	3	4		5	6	7	8		NL	N	RI	S			
5001630203		CLYMENELLA ZONALIS	1	2	3	4		5	6	7	8		NL	N		S			
50016302		CLYMENURA TENUIS									8				RI	S			
5001520101		*COSSURA LONGOCIRRATA*									8			N					
5001290201		DIOPATRA CUPREA		2	3	4					8		NL	N					
5001540402		DIPLOCIRRUS HIRSUTUS						5		7	8			N		S			
5001500501		DODECACERIA CONCHARUM			3				6				NL			S			
500150050199	Z	DODECACERIA CONCHARUM			3								NL						
5001330103		DRILONEREIS LONGA	1	2	3	4			6	7	8		NL	N	RI	S			
5001330105		DRILONEREIS MAGNA	1	2		4		5	6		8		NL	N	RI				
5001330199	X	DRILONEREIS SP.			3	4				7			NL	N		S			
5001022101		ENIPO GRACILIS						5	6	7	8			N					
5001130204		ETEONE FLAVA		2				5					NL		RI				
5001130207		ETEONE HETEROPODA								7	8					S			
5001130208		ETEONE LACTEA		2					6		8		NL		RI				
5001130205		ETEONE LONGA		2		4		5		7	8		NL		RI	S			
5001130209		ETEONE TRILINEATA								7				N					

5001631102		EUCLYMENE COLLARIS	1	2	3	4		5	6	7	8		NL	N			S
5001631199	X	EUCLYMENE SP.						5	6	7				N	RI		
500197	X	EUCLYMENINAE SP.				4		5	6	7	8		NL	N	RI		S
5001130301		EULALIA VIRIDIS	1						6	7			NL				S
5001131101		EUMIDA SANGUINEA	1		3	4							NL				
5001131199	X	EUMIDA SP.		2									NL				
5001230701		EXOGONE DISPAR									8				RI		
500196	X	FABRICIINAE SP.							6						RI		
5001540202		FLABELLIGERA AFFINIS									8				RI		S
5001020601		GATTYANA AMONDSONI		2					6				NL	N			
5001020603		GATTYANA CIRROSA						5						N			
5001270104		GLYCERA AMERICANA	1	2	3	4		5	6	7	8		NL		RI		S
5001270101		GLYCERA CAPITATA	1	2	3						8		NL		RI		
5001270105		GLYCERA DIBRANCHIATA	1						6				NL		RI		
5001270106		GLYCERA ROBUSTA				4							NL				
5001280202		GONIADA MACULATA						5	6	7	8			N	RI		
5001210103		GYPTIS VITTATA									8			N			
5001020803		HARMOTHOE EXTENUATA	1	2	3	4			6	7	8		NL	N	RI		S
5001020806		HARMOTHOE IMBRICATA		2	3	4		5	6	7	8		NL	N	RI		S
5001022001		HARTMANIA MOOREI		2				5	6	7	8		NL	N			S
50012199	X	HESIONID SP.						5									S
5001600201		HETEROMASTUS FILIFORMIS						5	6	7	8			N			
5001730999		HYDROIDES UNCINATA		2	3	4							NL				
5001430201		LAONICE CIRRATA		2				5	6	7	8		NL	N	RI		
5001701401		LAONOME KROYERI						5						N	RI		
5001021103		LEPIDONOTUS SQUAMATUS	1	2	3	4				7	8		NL				S
5001021104		LEPIDONOTUS SUBLEVIS								7							S
5001682001		LOIMIA MEDUSA						5		7	8						S
5001631599		LUMBRICLYMENE CYLINDRICAUDATA						5	6	7	8			N	RI		
5001631598	X	LUMBRICLYMENE SP.		2									NL				
5001310102		LUMBRINERIS FRAGILIS	1	2	3	4		5	6	7	8		NL	N	RI		S
5001310115		LUMBRINERIS IMPATIENS									8			N	RI		S
5001310113		LUMBRINERIS TENUIS	1	2	3	4		5	6	7	8		NL	N	RI		S
5001630301		MALDANE SARSI		2				5	6	7	8		NL	N	RI		S
50016399	X	MALDANID SP.			3	4		5	6	7	8		NL	N	RI		S
5001300202		MARPHYSA BELLII	1	2	3	4				7	8		NL				S
5001600401		MEDIOMASTUS AMBISETA	1		3	4			6	7	8		NL				S
5001670501		MELINNA CRISTATA						5	6	7	8			N			S
5001210202		MICROPHTHALMUS ABBERANS						5									S
5001640201		MYRIOCHELE HEERI						5	6	7	8			N			S
5001250114		NEPHTYS BUCERA	1	2					6		8		NL		RI		S
5001250103		NEPHTYS CAECA				4			6				NL		RI		S
5001250102		NEPHTYS CILIATA						5	6	7	8			N			
5001250115		NEPHTYS INCISA	1	2	3	4		5	6	7	8		NL	N	RI		S
5001250110		NEPHTYS PARADOXA						5	6	7	8			N			
5001250117		NEPHTYS PICTA	1	2	3	4		5	6				NL	N	RI		S
5001250199	X	NEPHTYS SP.				4		5					NL		RI		
5001250118		NEPHTYS SQUAMOSA									8				RI		
5001240499		NEREIS ACCUMINATA	1	2	3	4				7			NL		RI		S
5001240411		NEREIS DIVERSICOLOR		2									NL				
5001240409		NEREIS GRAYI		2		4			6	7	8		NL	N	RI		S
5001240410		NEREIS SUCCINEA			3	4		5		7	8		NL	N	RI		S
5001240406		NEREIS ZONATA			3	4		5		7			NL		RI		S
5001680602		NICOLEA VENUSTULA		2	3								NL				
5001630501		NICOMACHE LUMBRICALIS						5	6	7	8			N			
5001310204		NINOE NIGRIPES	1	2	3	4		5	6	7	8		NL	N	RI		S
5001330301		NOTOCIRRUS SPINIFERUS	1	2	3	4		5	6	7	8		NL	N	RI		S
5001600306		NOTOMASTUS LATERICEUS	1	2					6				NL	N			
5001600305		NOTOMASTUS LURIDUS	1	2	3	4				7			NL				S
5001231304		ODONTOSYLLIS FULGURANS				4							NL				
5001290101		ONUPHIS CONCHYLEGA									8			N			
5001580303		OPHELIA BICORNIS	1							7			NL				S
500195		OPHELINA ACCUMINATA		2				5	6	7	8			N	RI		S
5001280401		OPHIOGLYCERA GIGANTEA	1			4		5	6	7	8		NL	N	RI		S
5001640102		OWENIA FUSIFORMIS	1	2	3	4		5	6	7	8		NL	N	RI		S
[illegible]	X	[illegible]						5							RI		

5001130801		PARANAITIS SPECIOSA							5			8					RI	S
5001410301		PARAONIS GRACILIS							5	6	7	8			N	RI	S
50014199	X	PARAONID SP.				3								NL				
5001660302		PECTINARIA GOULDII		2		4			5	6	7	8		NL	N			S
5001660303		PECTINARIA GRANULATA								6	7				N			
5001630701		PETALOPROCTUS TENUIS							5			8			N			
5001540304		PHERUSA AFFINIS	1	2	3	4			5	6	7	8		NL	N	RI		S
5001540302		PHERUSA PLUMOSA								6	7				N			
5001540399	X	PHERUSA SP.							5						N			
5001060101		PHOLOE MINUTA	1	2	3	4			5	6	7	8		NL	N	RI		S
5001130108		PHYLLODOCE ARENAE	1						5	6	7			NL		RI		S
5001130198		PHYLLODOCE MACULATA			3	4				6	7	8		NL	N			S
5001130197		PHYLLODOCE MUCOSA								6						RI		
5001130196	X	PHYLLODOCE SP.				4								NL				
5001680701		PISTA CRISTATA	1	2	3	4			5	6	7	8		NL	N			
500194		YPOLYCHAETE SP.			3	4								NL				
5001680804		POLYCIRRUS EXIMIUS	1			4					7			NL				S
5001680802		POLYCIRRUS MEDUSA			3						7			NL				S
5001680898	X	POLYCIRRUS SP.		2	3	4				6	7			NL	N	RI		S
50016808	X	POLYCIRRUS SP.										8			N	RI		S
5001430414		POLYDORA CONCHARUM										8			N			S
5001430411		POLYDORA LIGNI	1	2		4					7	8		NL	N			S
5001430402		POLYDORA SOCIALIS										8			N			S
5001430499	X	POLYDORA SP. A		2	3	4			5	6				NL				S
5001430498	X	POLYDORA SP. B	1	2	3					6				NL	N			
5001430497	X	POLYDORA SP. C			3	4			5					NL				S
5001570401		POLYPHYSIA CRASSA							5						N			
5001700601		POTAMILLA NEGLECTA			3	4				6	7			NL	N			
5001700699		POTAMILLA RENIFORMIS	1	2	3	4			5	6	7			NL	N			S
5001630901		PRAXILLELLA GRACILIS							5	6	7	8			N			S
5001630902		PRAXILLELLA PRAETERMISSA							5			8			N			
5001631899		PRAXILLURA ORNATA									7				N			
5001430501		PRIONOSPIO MALMGRENI		2	3	4				6	7	8		NL	N	RI		S
5001430599	X	PRIONOSPIO SP.								6					N			
500193		PROCERAEA CORNUTUS	1	2		4			5	6				NL	N			S
500192		PROCERAEA FASCIATUS	1											NL				
50020201	X	PROTODRILUS SP.										8				RI		
5001631003		RHODINE LOVENI							5	6	7	8			N			
5001700801		SABELLA CRASSICORNIS		2	3					6		8		NL	N			
5001700899		SABELLA SP.							5						N			
5001650202		SABELLARIA VULGARIS	1	2	3	4			5	6	7			NL	N			S
50017099	X	SABELLID SP.			3	4			5			8		NL		RI		
5001570101		SCALIBREGMA INFLATUM	1	2	3	4			5	6	7	8		NL	N	RI		S
5001432099	X	SCOLELEPIS SP.	1								7			NL	N			
5001432001		SCOLELEPIS SQUAMATUS	1								7			NL				S
5001430699	X	SCOLECOLEPIDES SP.		2										NL				
5001430602		SCOLECOLEPIDES VIRIDIS			3					6				NL	N			
5001400305		SCOLOPLOS ACUTUS	1	2	3	4			5	6	7	8		NL	N	RI		S
5001400301		SCOLOPLOS ARMIGER								6	7				N			S
5001400303		SCOLOPLOS FRAGILIS	1	2	3				5					NL				S
5001400304		SCOLOPLOS ROBUSTUS	1			4				6				NL	N			
5001400399	X	SCOLOPLOS SP.							5									S
5001220201		SIGAMBRA TENTACULATA				4					7	8		NL				S
5001430701		SPIO FILICORNIS		2		4			5	6	7	8		NL	N	RI		S
5001430701		SPIO FILICORNIS (A)										8			N	RI		
5001430704		SPIO SETOSA								6						RI		
5001490302		SPIOCHAETOPTERUS OCULATUS	1									8		NL	N			
5001490399		SPIOCHAETOPTERUS VARIOPEDATUS			3									NL				
50014399	X	SPIONID SP.				4					7			NL				S
5001431001		SPIOPHANES BOMBYX	1	2					5	6		8		NL		RI		S
5001431099	X	SPIOPHANES SP. A							5						N			
5001431005		SPIOPHANES WIGLEYI										8			N			
5001590101		STERNASPIS SCUTATA							5	6	7	8			N	RI		
5001060302		STHENELAIS BOA		2	3	4			5	6		8		NL				S
5001060303		STHENELAIS LIMICOLA	1	2	3					6	7	8		NL		RI		

5001431801		STREBLOSPIO BENEDICTI							7	8				S
50012399	X	SYLLID SP.			3	4					NL			
5001231503		SYLLIDES LONGOCIRRATA			3						NL			
5001230306		SYLLIS CORNUTA				4	5		7	8	NL	N		S
5001230302		SYLLIS GRACILIS		2	3			6		8	NL	N		S
5001682202		TEREBELLA LAPIDARIA	1	2						8	NL	N		S
50016899	X	TEREBELLID SP.			3	4	5	6	7		NL	N		S
5001690101		TEREBELLIDES STROEMI					5	6	7	8		N	RI	
5001500305		THARYX ACUTUS					5		7	8		N	RI	S
5001500306		THARYX ANNULOSUS								8			RI	
5001500399	X	THARYX SP.		2	3	4	5	6	7	8	NL	N	RI	S
5001681003		THELEPPUS CINCINNATUS					5	6	7	8		N	RI	
5001690201		TRICHOBRANCHUS GLACIALIS					5	6	7	8		N		
500145		TROCHOCHAETA MULTISETOSA								8		N		
50014599		TROCHOCHAETA WATSONI					5		7	8		N		
		ARCHIANNELIDA 5002												
500299	X	ARCHIANNELID SP.	1						7		NL			S
		OLIGOCHAETA 5004-5010												
500499	X	OLIGOCHAETE SP.			3						NL			
50090299	X	TUBIFICID SP.				4				8	NL	N		S
		HIRUDINEA 5012												
5012	X	PLATYBDELLA SP.								8		N		
		SIPUNCULA 72												
72000201		GOLFINGIA MINUTA								8		N		
7200020199	X	GOLFINGIA SP.		2							NL			
7200020401		PHASCOLION STROMBI		2	3		5	6	7	8	NL	N		S
7200010501		PHASCOLOPSIS GOULDII				4					NL			
72000199		YSIPUNCULID SP.				4				8	NL	N		
		ECHIURA 73-7303												
7301020201		ECHIURUS ECHIURUS				4	5			8	NL	N		S
		CHAETOGNATHA 83												
8300000399	X	SAGITTA SP.	1						7		NL	N		
		ARTHROPODA 58-7102												
		CRUSTACEA 61-6191												
6199		YCRUSTACEAN EGGS			3						NL			
		CLADOCERA 6109												
6109050199	X	EVADNE SP.						6						S
		OSTRACODA 6110												
6111030101		CYLINDROLEBERIS MARIAE								8		N		
6110999999		PSEUDOCYTHERETTA EDWARDSII					5							S
611098		YOSTRACOD SP.						6						S
		COPEPODA 6117-6127												
611799		YCOPEPOD SP.		2							NL			
611899		YCALANOID SP.		2							NL			
6118010299	X	CALANUS SP.		2		4	5	6	7		NL		RI	S
6118170199	X	CENTROPAGES SP.						6					RI	
612099		YCYCLOPOID SP.		2			5				NL			S
611999		YHARPACTICOID SP.			3	4	5				NL			S
6119100199	X	HARPACTICUS SP.			3						NL			
		CIRRIPEDIA 6130-6142												
6134020112		BALANUS AMPHITRITE				4					NL			
6134020102		BALANUS BALANUS					5			8		N		
6134020104		BALANUS CRENATUS					5					N		
6134020114		BALANUS IMPROVISUS		2							NL			
6134020199	XZ	BALANUS SP.		2							NL			
6134010102		CHTHAMALUS FRAGILIS								8				S
		MYSIDACEA 6151-6153												
6153012301		ERYTHROPS ERYTHROPHTHALMA								8		N		
6153010802		HETEROMYSIS FORMOSA		2		4			7	8	NL			S
6153012102		MYSIDOPSIS BIGELOWI							7					S
6153011508		NEOMYSIS AMERICANA				4			7	8	NL		RI	S
		CUMACEA 6154												
6154050121		DIASTYLIS POLITA			3					8	NL	N	RI	
6154050126		DIASTYLIS QUADRISPINOSA					5	6	7	8		N	RI	S
6154050127		DIASTYLIS SCULPTA	1		3		5	6	7	8	NL		RI	S

6154040201		EUDORELLA EMARGINATA						5		7	8			N	RI			
6154040211		EUDORELLA PUSILLA									8			N	RI			
6154040204		EUDORELLA TRUNCATULA								6	8				RI			
6154040299	X	EUDORELLA SP.								6					RI			
6154090301		LEPTOCUMA MINOR								6	8			N	RI			
6154050404		LEPTOSTYLIS LONGIMANA									8			N				
6154050801		OXYUROSTYLIS SMITHI				3							NL					
6154060101		PETALOSARSIA DECLIVIS									8			N				
		ISOPODA 6158-6167																
6162010301		CALATHURA BRANCHIATA						5	6	7	8			N				
6162020504		CHIRIDOTEA ARENICOLA									8				RI			
6162020505		CHIRIDOTEA NIGRESCENS									8				RI			
6162020599	X	CHIRIDOTEA SP.								7	8				RI	S		
6162020503		CHIRIDOTEA TUFTSI									8				RI			
6161010105		CIROLANA POLITA	1					5	6	7	8		NL	N	RI			
6162020701		EDOTEA MONTOSA					4			7	8		NL		RI			
6162020602		ERICHSONIELLA FILIFORMIS				3							NL					
6159010199		GNATHIA CERINA						5						N				
6162020309		IDOTEA PHOSPHOREA						5								S		
6160010301		PTILANTHURA TENUIS				3	4			7	8		NL		RI	S		
		AMPHIPODA 6168-6172																
6169220602		ACANTHOHAUSTORIUS MILLSI								7	8				RI	S		
61693701	X	ACANTHOSTEPHIA SP.									8			N				
61693702	X	ACEROIDES SP.									8			N				
6171010899	X	AEGININA SP.			2			5	6				NL		RI	S		
6171010801		AEGININA LONGICORNIS				3	4	5	6	7	8		NL	N	RI	S		
6169020108		AMPELISCA ABDITA			2	3	4	5	6	7	8		NL	N	RI	S		
6169020111		AMPELISCA AGASSIZI	1			3		5	6	7	8		NL		RI	S		
6169020101		AMPELISCA MACROCEPHALA			2			5	6		8		NL	N	RI			
6169020109		AMPELISCA VADORUM	1	2	3	4		5	6	7	8		NL		RI	S		
6169020110		AMPELISCA VERRILLI	1	2	3	4					8		NL			S		
6169340303		ANONYX LILJEBORGI				3							NL					
6169340314		ANONYX SARSI								7	8			N	RI			
6169070101		ARGISSA HAMATIPES									8			N	RI			
6169370402		ARRHIS PHYLLONYX									8			N				
6169020203		BYBLIS SERRATA	1	2	3	4		5	6	7	8		NL	N	RI			
6169120201		CALLIOPIUS LAEVIUSCULUS	1						6				NL	N				
6171010703		CAPRELLA LINEARIS	1								8		NL			S		
61710199		YCAPRELLID SP								7						S		
6169211601		CASCO BIGELOWI						5	6	7	8			N	RI			
6169150102		CERAPUS TUBULARIS				3							NL					
6169150201		COROPHIUM ACHERUSICUM									8					S		
6169150202		COROPHIUM BONELLI									8					S		
6169150203		COROPHIUM CRASSICORNE						5			8				RI	S		
6169150211		COROPHIUM INSIDIOSUM								7	8					S		
6169150299	X	COROPHIUM SP.	1										NL					
6169170401		DEXAMINE THEA									8					S		
616999		DYOPEDOS MONACANTHUS				3					8		NL			S		
616998		DYOPEDOS PORRECTUS								7	8			N	RI	S		
616997	X	DYOPEDOS SP.	1										NL					
6169150302		ERICHTHONIUS BRASILIENSIS		2									NL					
6169150306		ERICHTHONIUS RUBRICORNIS						5	6	7	8			N	RI	S		
6169210710		GAMMARUS ANNULATUS				3	4		6	7			NL			S		
6169210713		GAMMARUS LAWRENCIANUS								7						S		
6169210799	X	GAMMARUS SP.	1	2	3								NL					
6169020305		HAPLOOPS SETOSA	1										NL					
6169020301		HAPLOOPS TUBICOLA						5	6	7	8			N				
6169420116		HARPINIA PROPINQUA						5	6	7	8			N	RI	S		
6169420115		HARPINIA TRUNCATA								7					RI			
6169341405		HIPPOMEDON PROPINQUUS						5	6	7	8			N	RI			
6169341408		HIPPOMEDON SERRATUS	1					5	6	7	8		NL	N	RI			
6169270202		ISCHYROCERUS ANGUIPES	1			3					8		NL			S		
6169270302		JASSA FALCATA								7	8					S		
6169060303		LEMBOS SMITHI				3							NL					
6169060399		LEMBOS WEBSTERI	1	2							8		NL			S		

6169330301		LISTRIELLA BARNARDI		2							NL			
6169210801		MAERA DANAE	1	2	3	4	5	6	7	8	NL			S
6169211003		MELITA DENTATA					5		7	8		N	RI	
61694815	X	METOPA SP.								8		N		
616997		MONOCULOIDES EDWARDSII	1								NL			
6169370817		MONOCULODES INTERMEDIUS								8		N		
6169370810		MONOCULODES PACKARDI								8		N		
6169370821		MONOCULODES TESSELATUS								8		N		
61693708	X	MONOCULODES SP.								8		N		
6169060401		MICRODEUTOPUS GRYLLOTALPA	1								NL			
6169371699	X	OEDICEROS SP.					5						RI	
6169342904		ORCHOMENE PINGUIS								8			RI	
6169345202		ORCHOMENELLA GROENLANDICA							7				RI	
6169345201		ORCHOMENELLA MINUTA					5			8		N	RI	
6169221101		PARAHAUSTORIUS ATTENUATUS							7					S
6169221102		PARAHAUSTORIUS HOLMESI						6	7					S
6169221103		PARAHAUSTORIUS LONGIMERUS	1								NL			
6169480702		PARAMETOPELLA CYPRIS					5							S
6169420928		PARAPHOXUS SPINOSUS						6					RI	
6170011006		PARATHEMISTO GAUDICHAUDI								8		N		
6169371202		PAROEDICEROS LYNCAEUS								8		N		
6169260207		PHOTIS DENTATA					5	6		8			RI	S
6169260208		PHOTIS MACROCOXA							7	8		N	RI	
6169260202		PHOTIS REINHARDI	1	2						8	NL		RI	
6169420702		PHOXOCEPHALUS HOLBOLLI	1	2	3	4	5	6	7	8	NL		RI	S
6169430503		PLEUSYMTES GLABER								8				S
6169201203		PONTOGENEIA INERMIS							7					S
6169221201		PROTOHAUSTORIUS DEICHMANNAE							7					S
6169221202		PROTOHAUSTORIUS WIGLEYI						6	7	8			RI	S
6169150801		PSEUDUNCIOLA OBLIQUA								8			RI	
6169060899		RUDILEMBOIDES NAGLEYI	1								NL			
6169150699	X	SIPHONOECETES SP							7					S
6169430609		STENOPLEUSTES GRACILIS			3		5		7	8	NL			S
619430610		STENOPLEUSTES INERMIS								8		N		
6169481002		STENOTHOE MINUTA					5							S
6169500501		TIRON SPINIFERUM								8		N		
6169421001		TRICHOPHOXUS EPISTOMUS			3		5	6	7	8	NL		RI	S
6169150702		UNCIOLA INERMIS	1					6		8	NL	N	RI	
6169150703		UNCIOLA IRRORATA	1	2	3	4	5	6	7	8	NL	N	RI	S
6169150704		UNCIOLA SERRATA				4					NL			
6169371599	X	WESTWOODILLA SP.						6				N		
		DECAPODA 6175-6189												
6183020399		AXIUS SERRATUS		2		4		6		8	NL		RI	S
6183040205		CALLIANASSA ATLANTICA			3				7	8	NL			S
6188030107		CANCER BOREALIS						6	7	8			RI	
6188030108		CANCER IRRORATUS	1	2	3	4	5	6	7	8	NL		RI	S
6179220103		CRANGON SEPTEMSPINOSA	1	2	3	4		6		8	NL		RI	S
6179180301		DICHELOPANDALUS LEPTOCERAS							7					S
6179160408		EUALUS PUSIOLUS		2		4			7	8	NL	N		S
6189020501		EURYPANOPEUS DEPRESSUS				4	5	6			NL	N		S
6187011101		EUPROGNATHA RASTELLIFERA			3						NL			
6187011201		HETEROCRYPTA GRANULATA				4					NL			
6187010202		HYAS COARCTATUS				4					NL			
6187010901		LIBINIA DUBIA	1	2	3	4		6			NL			S
6187010902		LIBINIA EMARGINATA	1	2	3	4	5			8	NL			S
61870199	X	MAJID SP.				4				8	NL			S
6189010502		OVALIPES OCELLATUS				4				8	NL			S
6183060226		PAGURUS ACADIANUS		2		4					NL			
6183060233		PAGURUS ARCUATUS								8		N		
6183060230		PAGURUS LONGICARPUS	1		3	4	5	6	7	8	NL	N		S
6183060232		PAGURUS POLLICARIS	1	2	3	4	5		7		NL			S
6183060299	X	PAGARUS SP.			3	4				8	NL			S
6189020801		PANOPEUS HERBSTII					5		7	8				S
6187011301		PELIA MUTICA	1	2							NL			
6189060405		PINNIXA CHAETOPTERANA	1	2	3	4	5		7	8	NL			S
[illegible]		PINNIXA SAYANA							7	8				S

6189060201		PINNOTHERES MACULATUS							7					S
6189060202		PINNOTHERES OSTREUM		2					7		NL			S
61890699	X	PINNOTHERID SP.				4					NL			
6183040102		UPOGEBIA AFFINIS				4	5		7	8	NL			S
618499	X	BRACHYURAN SP.				4					NL			
6184	X	BRACHYURAN SP. (ZOEA)								8			RI	
		ARACHNIDA 59-5933												
5930010499	X	HALACARUS SP.			3	4	5	6			NL			S
		PYCNOGONIDA 60-6001												
6001060204		ANOPLODACTYLUS LENTUS	1								NL			
		BRACHIOPODA 80-8006												
8005070103		TEREBRATULINA SEPTENTRIONALIS					5	6	7			N		
		ENTOPROCTA 79-7903												
7902010202		BARENTSIA LAXA			3						NL			
7902010299	X	BARENTSIA SP.			3	4		6			NL			S
		ECTOPROCTA 78-7817												
7815010199	X	AETEA SP.		2	3	4	5		7		NL			S
7806010101		AEVERRILLIA ARMATA		2	3	4	5	6	7		NL			S
7806010199		AEVERRILLIA SETIGERA			3	4		6	7	8	NL			S
7806010198	X	AEVERRILLIA SP.				4					NL			
7815080202		AMPHIBLESTRUM FLEMINGII	1	2	3	4	5				NL			S
7815260299		BICELLARIELLA CILIATA	1	2	3	4	5	6	7	8	NL			S
7815260298	X	BICELLARIELLA SP.						6						S
7805010201		BOWERBANKIA GRACILIS		2		4					NL			
7805010202		BOWERBANKIA IMBRICATA				4		6	7		NL			S
7805010299	X	BOWERBANKIA SP.		2		4	5	6			NL	N		S
7815250199		BUGULA SIMPLEX						6						S
7815250101		BUGULA TURRITA		2		4		6	7	8	NL			S
7815250198	X	BUGULA SP.		2	3			6			NL			S
7815080101		CALLOPORA AURITA		2	3	4	5	6	7		NL	N		S
7815080102		CALLOPORA CRATICULA			3	4	5	6	7		NL			S
78150899	X	CALLOPORID SP.				4					NL			
7815070299	X	CAULORAMPHUS SP.					5							S
7815070201		CAULORAMPHUS CYMBAEFORMIS		2		4					NL			
781599		CLEIDOCHASMA CONTRACTUM			3				7		NL			S
7815300102		CRIBRILINA PUNCTATA	1	2	3	4		6	7		NL			S
7809010101		CRISEA EBURNEA	1		3	4					NL			
7809010199	X	CRISEA SP.				4					NL			
7816170101		CRYPTOSULA PALLASIANA	1	2	3	4			7	8	NL			S
7816170199	X	CRYPTOSULA SP.		2							NL			
7816060101		CYLINDROPORELLA TUBULOSA			3	4					NL			
7815250201		DENDROBEANIA MURRAYANA							7				RI	
7815050103		ELECTRA PILOSA		2	3	4					NL			
7815050198	X	ELECTRA SP.	1		3	4			7		NL			S
7815020101		EUCRATEA LORICATA			3						NL			
7816090101		HIPPOPORELLA HIPPOPUS			3						NL			
7819090199	X	HIPPOPORELLA SP.		2	3	4					NL			
78160999	X	HIPPOPORINA SP.		2	3	4	5	6	7	8	NL		RI	S
7816020101		HIPPOTHOA HYALINA	1	2		4	5	6	7	8	NL	N		S
7816020199	X	HIPPOTHOA SP.			3						NL			
7815040199	X	MEMBRANIPORA SP.			3					8	NL			S
7815040103		MEMBRANIPORA TENUIS		2	3	4	5	6	7	8	NL	N		S
7815040104		MEMBRANIPORA TUBERCULATA							7					S
7806110101		MICROPORELLA CILIATA		2	3	4		6		8	NL			S
7816110199	X	MICROPORELLA SP.		2	3						NL			
7816130399	X	PARASMITTINA SP.				4		6	7		NL			S
7816080401		SCHIZOMAVELLA AURICULATA		2		4					NL			
7816080499	X	SCHIZOMAVELLA SP.			3						NL			
7816080199		SCHIZOPORELLA BIAPERTA				4					NL			
7816080101		SCHIZOPORELLA UNICORNIS	1	2	3	4	5			8	NL			S
7816080198	X	SCHIZOPORELLA SP.		2							NL			
7815020399		SCRUPARIA CHELATA			3	4		6			NL			S
78150299	X	SCRUPARIID SP.					5							S
7815280101		SCRUPOCELLARIA SCABRA		2							NL			
781699	X	SMITTINID SP.			3	4					NL			
[illegible]		[illegible]												

7815080599	X	TEBELLA SP.				3			6				NL					3	
7806040199	X	TRITICELLA SP.			2	3	4		5	6		8	NL					S	
7810020198	X	TUBULIPORA SP.				3							NL						
7899		YBRYOZOAN SP. A			2		4						NL						
		PHORONIDA	77																
7700010203		PHORONIS ARCHITECTA		1	2	3	4		5		7	8	NL	N		RI		S	
		ECHINODERMATA	81-8179																
		STELLEROIDEA	8101-8103																
810199	X	OPHIOPHRAGMA SP.		1	2								NL						
		ASTEROIDEA	8104-8118																
8117030202		ASTERIAS FORBESII		1			4		5	6	7	8	NL					S	
8117030204		ASTERIAS VULGARIS										8						S	
8107020101		CTENODISCUS CRISPATUS							5	6	7	8		N					
8114040111		HENRICIA SANGUINOLENTA					3						NL						
8117031499		PEDICELLASTER TYPICUS		1	2					6	7		NL	N					
		OPHIUROIDEA	8120-8129																
8129030202		AMPHIPHOLIS SQUAMATA		1	2	3	4		5	6	7	8	NL	N				S	
8128010105		OPHIOCANTHA BIDENTATA							5			8		N					
8129020101		OPHIOPHOLIS ACULEATA							5		7	8		N		RI			
8127010611		OPHIURA ROBUSTA							5	6		8		N					
8127010610		OPHIURA SARSI			2				5	6		8	NL	N					
8127010699	XZ	OPHIURA SP.								6				N					
8120	X	OPHIUROID SP.										8		N					
		ECHINOIDEA	8136-8165																
8147010101		ARABACIA PUNCTULATA		1									NL						
8155020101		ECHINARACHNIUS PARMA							5	6		8		N		RI		S	
813699		YECHINOID SP.			2								NL						
8149030201		STRONGYLOCENTRATUS DROEBACHIENSIS								6				N					
		HOLOTHUROIDEA	8170-8179																
817099	X	APODIDA SP.							5							RI		S	
8179020102		CAUDINA ARENATA		1	2	3	4				7		NL					S	
81790201	X	CAUDINA SP.										8						S	
8172060104		CUCUMARIA FRONDOSA								6				N					
8172040201		HAVELOCKIA SCABRA									7	8		N					
8170		YHOLOTHUROID SP.										8						S	
8179010102		MOLPADIA OOLITICA							5	6	7	8		N					
8172060399	X	PENTAMERA SP.								6	7	8		N					
		HEMICHORDATA	82-8205																
8201010302		SACCOGLOSSUS KOWALEVSKII									7	8						S	
8201010299		STEREOBALANUS CANADENSIS								6				N					
		UROCHORDATA	84-8413																
8499999999		BOSTRICHOBRANCHUS FILULARIS							5	6	7			N					
8498	X	BOSTRICHOBRANCHUS SP.							5							RI			
8406010799		BOTRYLLUS SP.			2								NL						
8404030301		PEROPHORA VIRIDIS										8				RI			
		GNATHOSTOMATA I	87-8794																
8791031501		ENCHELYOPUS CIMBRIUS					4						NL						
8793011601		MACROZOARCES AMERICANUS										8		N					
		GNATHOSTOMATA II	88-8861																
8845010102		AMMODYTES AMERICANUS								6								S	
8839010201		TAUTOGOLABRUS ADSPERUS									7							S	

>

question were collected on the date(s) corresponding to the code number(s) indicated. Columns 71-72, 74, 76-77 and 79 contain the letters NL, N, RI and S corresponding to the station(s) from which the species in question was collected, namely New London, Northern Stations (i.e. all stations north of Cape Cod), Rhode Island Sound and Southern Stations (i.e. all stations located in Long Island Sound.

Detailed reports of the analyses of the Winter-Spring 1977-1978 and the Spring-Summer, 1978 collections have already been submitted to the New England Division, Army Corps of Engineers. Collation, statistical analysis and application of various numerical classification techniques on the data resulting from the Winter 1978-79 and Spring-Summer 1979 sample collections are currently nearing completion and will be reported in ensuing monthly reports.

Beginning in 1980, a new sampling methodology was adopted which follows that recommended in a study reported by Walker, Saila and Anderson (1979). This technique searches for patterns among the physical variates (in this case, median grain size, concentration in the sediments of: chromium, copper, nickel, lead, zinc, oil and grease, and percent of volatile solids and organic matter) and then searches for related patterns among the biological variates. One of the advantages inherent in this approach is that the data from each grab can be worked up in two steps; data on the chemical and physical variates which are not as expensive to obtain are determined first. Results of these analyses are then used to allocate the more expensive effort of obtaining species abundances and composition in a manner which should result in the examination of fewer benthic samples thereby lowering analytical costs. Judicious stratification of microhabitat variability on the basis of the physical characteristics of each grab sample should also allow much more precise estimates of species abundance. It is anticipated that this technique will allow detection of a 50% change in population abundance at the 90% confidence level.

Adoption of the foregoing methodology has resulted in a sampling plan which has considerably modified previous DAMOS benthic

sampling procedures. Sampling stations have been reduced to five dredge disposal sites, namely, Portland, ME, New London, CT, Stamford-New Haven North pile, Stamford-New Haven South pile and the Norwalk-New Haven site. Additional work of the same type has been proposed for the Fall River-Brenton Reef areas but has not yet been finalized. The basic sampling plan is to obtain 40 Smith-McIntyre grab samples of bottom sediment at each site. Wherever scheduling and funding allow, ten grabs will be obtained at the approximate dump point center prior to disposal. After cessation of dumping, ten grabs each would be collected from the center of the pile, the inner edge of the "skirt" of the pile, the outer edge (i.e. just outside the"skirt" of the pile) and at a reference station which would reasonably be considered beyond the influence of deleterious effects of spoil material on the indigenous fauna. At the New Haven sites, which are in close promimity to one another, a single reference station has been selected as representative of the resident community adjacent to the three disposal sites. Sampling at these five sites will be conducted twice per year.

As mentioned previously, a digest of the results of the analysis of the benthos in samples collected during the Winter 1978-79 and Spring-Summer 1979 DAMOS curises, is nearing completion. For the present, however, it seems judicious to withhold any interpretation of the data until the analysis is finalized. Because of this the remainder of this report will be limited to selected tabulations of the above mentioned data. Tables 7.3 through 7.9 present a digest of data from the DAMOS winter 1978-79 collections and Tables 7.10 through 7.17 present a corresponding digest of the DAMOS Spring-Summer 1979 collections.

8.0 DIVER OBSERVATIONS (Dr. Lance Stewart)

Visual observations of dredge material at the New London, Central Long Island Sound and Portland Disposal Sites were made during the recent survey operations. Summaries of the dives and observations noted are presented in this report. Additional interpretation and discussion will be presented in future reports after film has been developed.

DATA SUMMARY - GULF OF MAINE - WINTER 1978-79 COLLECTION

Total No. Phyla : 10
Total No. Species : 114
Total No. Individuals : 2028+

Predominant Species List

Species	Phylum	Feeding Type	Occurrence/ 18 Samples	Total No. Individuals	% Total	Cumul. %
Nucula proxima	M	DF	7	752	37.1	37.1
Sternaspis scutata	A	DF	13	180	8.9	46.0
Ampharete arctica	A	SDF	16	94	4.6	50.6
Ninoe nigripes	A	P	15	87	4.3	54.9
Yoldia sapotilla	M	DF	12	86	4.2	59.1
Nephtys incisa	A	DF	15	71	3.5	62.6
Lumbrineris fragilis	A	P	14	67	3.3	65.9
Praxillella gracilis	A	DF	9	64	3.2	69.1

A: Annelida
M: Mollusca
DF: Deposit Feeder
SDF: Surface Deposit Feeder
P: Predator

TABLE 7.3

DATA SUMMARY (TOTAL DISTRIBUTION) : GULF OF MAINE
WINTER 1978-79 COLLECTION

	Rockland Canyon			Rockland Dump			Portland Dump		
	1	2	3	1	2	3	1	2	3
No. Species/Sample	22	9	18	13	16	15	11	32	35
No. Individuals/Sample	542	69	170+	41	71	114	18	59	89
No. Phyla/Station		5			6			9	
No. Species/Station		30			27			57	
No. Individuals/Station		781+			226			166	

	Isle of Shoals Dump			Boston Lightship			Boston Foul Ground		
	1	2	3	1	2	3	1	2	3
No. Species/Sample	24	27	34	26	23	25	22	17	20
No. Individuals/Sample	106	108	144	79	88+	120	90+	58	62
No. Phyla/Station		7			8			6	
No. Species/Station		47			43			35	
No. Individuals/Station		358			287+			210+	

TABLE 7.4

DATA SUMMARY - RHODE ISLAND BIGHT
DECEMBER 1978 COLLECTION

No. Phyla : 6
No. Species : 63
No. Individuals: 6831+

BRENTON REEF REFERENCE

Predominant Species List

Species	Phylum	Feeding Type	Occurrence/ 3 Samples	No. of Individuals	% of Total	Cumul. %
Ampelisca agassizi	Ar	SF	3	5798	84.9	84.9
Ninoe nigripes	A	P	3	240	3.5	88.4
Amphārete arctica	A	SDF	3	188	2.8	91.2
Unciola irrorata	Ar	DF	3	154	2.3	93.5

No. Phyla : 5
No. Species : 24
No. Individuals: 111

BRENTON REEF DUMPSITE

Predominant Species List

Species	Phylum	Feeding Type	Occurrence/ 3 Samples	No. of Individuals	% of Total	Cumul. %
Unciola irrorata	Ar	DF	3	50	45.0	45.0
Scalibregma inflatum	A	DF	3	13	11.7	56.7

None of the 22 remaining species present at this site contributed significantly to the total number of individuals.

A: Annelida
Ar: Arthropoda
DF: Deposit Feeder
SF: Suspension Feeder
SDF: Surface Deposit Feeder

TABLE 7.5

DATA SUMMARY (TOTAL DISTRIBUTION) : RHODE ISLAND BIGHT
DECEMBER 1978 COLLECTION

	Brenton Reef Reference			Brenton Reef Dumpsite		
	1	2	3	1	2	3
#Species/Sample	39	38	33	11	15	11
#Individuals/Sample	2699	1316+	2816+	32	36	43
#Phyla/Station		6			5	
#Species/Station		63			24	
#Individuals/Station		6831+			111	

TABLE 7.6

DATA SUMMARY - LONG ISLAND SOUND - WINTER 1978-79 COLLECTION

Total No. Phyla : 14
Total No. Species : 183
Total No. Individuals : 4296+

Predominant Species List

Species	Phylum	Feeding Type	Occurrence/ 65 Samples	Total No. Individuals	% Total	Cumul. %
Caulleriella fillariensis	A	SF	7	696	16.2	16.2
Mytilus edulis	M	SF	5	594	13.8	30.0
Nephtys incisa	A	DF	53	557	13.0	43.0
Polydora ligni	A	SDF	15	260	6.1	49.0
Euclymene collaris	A	DF	18	154	3.6	52.6
Ampharete arctica	A	SDF	22	117	2.7	55.4
Melinna cristata	A	SDF	21	117	2.7	58.1
Ampelisca vadorum	Ar	SF	9	112	2.6	60.7
Phoxocephalus holbolli	Ar	SF	5	101	2.4	63.0
Phoronis archi_tecta	P	SF	28	89	2.1	65.1
Cerianthus (borealis)	C	SF	29	88	2.0	67.2

A: Annelida
C: Cnidaria
M: Mollusca
P: Phoronida

DF: Deposit Feeder
SDF: Surface Deposit Feeder
SF: Suspension Feeder

TABLE 7.7

DATA SUMMARY (TOTAL DISTRIBUTION) : LONG ISLAND SOUND
WINTER 1978-79 COLLECTION

	Cornfield Shoals Reference					Cornfield Shoals Dumpsite					New London Reference (F-8)					New London Dumpsite (C-6)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Species/Sample	5	6	6	6	8	5	2	4	5	3	41	28	37	36	36	25	8	21	12	20
Individuals/Sample	12+	6+	11	16+	12+	6	3	6	6	6	361+	231+	519+	235+	598+	88+	31	76+	65	130+
Phyla/Station			6					3					9					8		
Species/Station			18					16					76					48		
Individuals/Station			57+					27					1944+					390+		

	CAR-WLIS Reference					CAR Dumpsite					Greens Ledge Dumpsite				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Species/Sample	15	12	5	6	7	12	15	10	13	11	2	3	10	5	3
Individuals/Sample	59+	23+	12+	28	15	28	49+	30	44	26	15	9	20+	19	10
Phyla/Station			5					8					6		
Species/Station			25					33					15		
Individuals/Station			137+					177+					73+		

Continued ....

DATA SUMMARY (TOTAL DISTRIBUTION) : LONG ISLAND SOUND
WINTER 1978-79 COLLECTION, Continued

	New Haven Reference					New Haven Dumpsite					Stamford-New Haven North				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
#Species/Sample	5	6	7	7	4	19	21	28	28	24	10	8	9	8	5
#Individuals/Sample	15	25	20	24	21	104	148+	120+	193+	108+	44	17	41	30	16
#Phyla/Station			5					10					6		
#Species/Station			17					52					20		
#Individuals/Station			105					673+					148		

	Stamford-New Haven - 1					Stamford-New Haven - 6					Stamford-New Haven - 7				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
#Species/Sample	17	11	7	6	9	10	7	7	11	10	12	13	14	10	9
#Individuals/Sample	47+	41+	44	39+	53	36	18	24	51	42+	42+	36	41	23	28+
#Phyla/Station			7					6					9		
#Species/Station			26					24					32		
#Individuals/Station			224+					171+					170+		

TABLE 7.9

DATA SUMMARY : GULF OF MAINE

SUMMER 1979 COLLECTION

Total No. Phyla : 9
Total No. Species : 184
Total No. Individuals : 5945+

Predominant Species List

		Phylum	Feeding Type	Occurrence/ 25 Samples	Total No. Individuals	% Total	Cumul. %
1.	Spio filicornis (A)	A	SDF	17	2758	46.4	46.4
2.	Ampharete arctica	A	SDF	23	506	8.5	54.9
3.	Sternaspis scutata	A	DF	23	407	6.8	61.7
4.	Haploops tubicola	Ar	SF	14	217	3.6	65.3
5.	Maldane sarsi	A	DF	13	211	3.5	68.8
6.	Nucula proxima	M	DF	5	139	2.3	71.1
7.	Thyasira insignis	M	SF	18	88	1.5	72.6
8.	Myriochele heeri	A	DF	19	73	1.2	73.8
9.	Astarte undata (A)	M	SF	9	66	1.1	74.9
10.	Ninoë nigripes	A	P,DF	22	66	1.1	76.0
11.	Scoloplos acutus	A	DF	12	65	1.1	77.1
12.	Nephtys incisa	A	DF	21	64	1.1	78.1

A : Annelida
Ar : Arthropoda
M : Mollusca
R : Rhynchocoela

DF : Deposit Feeder
SDF : Surface Deposit Feeder
SF : Suspension Feeder
P : Predator

TABLE 7.10

DATA SUMMARY (TOTAL DISTRIBUTION) : GULF OF MAINE
SUMMER 1979 COLLECTION

	Rockland Dumpsite					Portland Dumpsite					Isle of Shoals				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
No. Species/Sample	15	23	28	16	15	49	49	56	56	49	35	42	26	37	29
No. Individuals/Sample	72	106	194+	114	54	156	235	180+	211	141	360	313+	239	569	247
No. Phyla/Station			7					7					7		
No. Species/Station			46					107					78		
No. Individuals/Station			540+					923+					1728+		

	Boston Lightship					Boston Foul Ground				
	1	2	3	4	5	1	2	3	4	5
No. Species/Sample	38	31	35	36	30	22	22	28	29	26
No. Individuals/Sample	425	472	602	~~375~~ 357	263	80	105	110	138	202
No. Phyla/Station			7					6		
No. Species/Station			72					59		
No. Individuals/Station			2119					635		

TABLE 7.11

DATA SUMMARY : RHODE ISLAND BIGHT .
SUMMER 1979 COLLECTION

No. Phyla : 6
No. Species : 87
No. Individuals : 6788

BRENTON REEF REFERENCE

Species	Phylum	Feeding Type	Occurrence/ 5 Samples	No. of Individuals	% Total	Cumul. %
Ampelisca agassizi	Ar	SF	5	5424	79.9	79.9
Unciola irrorata	Ar	DF	5	190	2.8	82.7
Leptocheirus pinguis	Ar	DF	5	184	2.7	85.4
Ninoe nigripes	A	P	5	123	1.8	87.2
Eudorella pusilla	Ar	SF	5	122	1.8	89.0
Periploma papyratium	M	SF	5	102	1.5	90.5

No. Phyla : 6
No. Species : 47
No. Individuals : 319+

BRENTON REEF DUMPSITE

Cirolana polita	Ar	DF	3	100	31.3	31.3
Scalibregma inflatum	A	DF	4	48	15.0	46.4
Pseudunciola obliqua	Ar	DF	2	28	8.8	55.2
Lumbrineris fragilis	A	P	4	21	6.6	61.8

No other species present at this site contributed significantly to the total number of individuals.

A : Annelida
Ar: Arthropoda
M : Mollusca
DF: Deposit Feeder
SF: Suspension Feeder

TABLE 7.12

DATA SUMMARY (TOTAL DISTRIBUTION): RHODE ISLAND BIGHT
SUMMER 1979 COLLECTION

	Brenton Reef Reference					Brenton Reef Dumpsite				
	1	2	3	4	5	1	2	3	4	5
# Species/Sample	40	45	46	45	53	14	~~17~~18	15	16	12
# Individuals/Sample	856	1270	1540	1593	1529	41+	71+	132	34+	41
# Phyla/Station			6					6		
# Species/Station			87					47		
# Individuals/Station			6788					319+		

TABLE 7.13

DATA SUMMARY : LONG ISLAND SOUND
SUMMER 1979 COLLECTION

* Total No. Phyla : 11
Total No. Species : 148
Total No. Individuals : 3416+

Predominant Species List

	Species	Phylum	Feeding Type	Occurrence/ 30 Samples	Total No. Individuals	% Total	Cumul. Total
1.	Mytilus edulis	M	DF	8	789	23.1	23.1
2.	Nucula proxima	M	DF	18	458	13.4	36.5
3.	Leptocheirus pinguis	Ar	DF	10	238	7.0	43.5
4.	Nephtys incisa	A	DF	27	237	7.0	50.5
5.	Ampelisca vadorum	Ar	SF	11	175	5.1	55.6
6.	Ampharete arctica	A	SDF	16	156	4.6	60.2
7.	Unciola irrorata	Ar	DF	11	92	2.7	62.9
8.	Yoldia limatula	M	DF	6	83	2.4	65.3
9.	Phoronis architecta	P	SF	14	77	2.2	67.5
10.	Corymorpha pendula	C	SF	12	66	1.9	69.4

A : Annelida
Ar : Arthropoda
C : Cnidaria
M : Mollusca
P : Phoronida
DF : Deposit Feeder
SDF: Surface Deposit Feeder
SF : Suspension Feeder

TABLE 7.14

DATA SUMMARY (TOTAL DISTRIBUTION) : LONG ISLAND SOUND
SUMMER 1979 COLLECTION

	New London Reference (F-8)					New London Dumpsite (C-6)					New Haven Reference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
No. Species/Sample	33	41	31	36	38	19	21	17	31	29	6	4	11	16	17
No. Individuals/Sample	145+	341+	317+	242+	269+	93+	109+	134+	206+	132+	29+	27	260+	118+	114+
No. Phyla/Station			8					8					6		
No. Species/Station			69					61					30		
No. Individuals/Station			1314+					674+					548+		

	New Haven Dumpsite					Western Long Island Sound #3					Green's Ledge				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
No. Species/Sample	14	26	30	35	30	6	3	4	5	5	11	4	8	10	5
No. Individuals/Sample	42+	74+	86+	184+	114+	63+	36	63	41	28	36+	10	32	20+	51
No. Phyla/Station			9					4					7		
No. Species/Station			65					7					19		
No. Individuals/Station			500+					231+					149+		

TABLE 7.15

DATA SUMMARY : STAMFORD-NEW HAVEN

Tot. No. Phyla : 10
Tot. No. Species : 69
Tot. No. Individuals : 1688+

Species	Phylum	Feeding Type	Occurrence/ 25 Samples	Total No. Individuals	% Total	Cumul. %
Mulinia lateralis	M	DF	14	652	38.6	-
Nephtys incisa	A	DF	25	314	18.6	57.2
Yoldia limatula	M	DF	12	188	11.1	68.3
Melinna cristata	A	SDF	19	124	7.3	75.6

A : Annelida
M : Mollusca
DF : Deposit Feeder
SDF : Surface Deposit Feeder

TABLE 7.16

DATA SUMMARY (TOTAL DISTRIBUTION) : STAMFORD-NEW HAVEN
SUMMER 1979 COLLECTION

	STNH S-6 1000 M East May 1979					STNH S-7 1000 M West May 1979				
	1	2	3	4	5	1	2	3	4	5
No. Species/Sample	9	7	9	17	10	12	15	10	10	10
No. Individuals/Sample	36	32+	35+	65+	36+	43	39	37+	30	25+
No. Phyla/Station			7					7		
No. Species/Station			24					31		
No. Individuals/Station			204+					174+		

	STNH S-6 1000 M East August 1979					1000 M West August 1979				
	1	2	3	4	5	1	2	3	4	5
No. Species/Sample	14	9	11	19	10	21	13	14	13	12
No. Individuals/Sample	165	37	58	107†	124	225+	132	145	138+	145+
No. Phyla Station			8					8		
No. Species/Station			30					33		
No. Individuals/Station			491†					785+		

	STHH Dump Point August 1979				
	1	2	3	4	5
No. Species/Sample	7	5	7	3	3
No. Individuals/Sample	9	7	9	5	4
No. Phyla/Station			5		
No. Species/Station			15		
No. Individuals/Station			34		

TABLE 7.17

8.1 New London Disposal Site Survey

25 March 80 - Survey of northeast site corner for new discharge of spoil at recently repositioned dump buoy; circumnavigation of northeast and southeast spoil border attempted with DPV; free course transect to east from new dump buoy to note topographic features and record new spoil pile dynamcis.

Stewart, DeGoursey, Auster aboard R/V East Passage.

Dive #1
Stewart in at temporary dumpsite buoy. Used DPV to survey perimeter of spoil pile. A transect was run approximately 250 m to the NE. The transect did not circumscribe a circle as expected but continued to the NE toward New London Harbor.

Dive #2.
DeGoursey in at SE corner of new pile. Ran DPV in NE direction along perimeter but did not cover much distance because course was into current.

New spoil was easily discerned. Material was soft and cohesive, already flattening out (apron - no clumps).

Dive #3 Stewart/Auster
In at temporary dumpsite buoy. Transect to east. Clay clumps on surface of spoil (20-70 cm dia/longest length). Clumps 70-100 cm apart at base of buoy. Actual direct measurement of clay mounds undertaken with meter stick along transect path. 20 meters to east, size and frequency of clumps diminished. (Clumps 200 cm apart, 20-60 cm dia. eroded and fragmenting).
70 meters to east, large boulder-size clumps (70-90 cm height 70-120 cm length). Many adjacent clumps.

Fracture lines observed through spoil (4-5 m long). sediment surface "pulsing" with surface swell. Other fracture boundaries moving vertically against each other (3-4 cm). No horizontal movement was discerned. Importance of this mechanism to spoil compaction is noteworthy; on future surveys this process will be recorded in cinema.
When meter stick or arm was inserted into spoil, adjacent spoil to 100 cm exhibited wave pattern. Spoil material exhibited cohesive, plastic qualities statically but behave as a semi-fluid under conditions (post-storm) with apparent long frequency (50-90 m) and estimate (1 m) amplitude.
No organisms were observed on spoil. Epibenthic 20 yds east of buoy. 35 mm photo taken during transect observations.

Dive #4 DeGoursey/Auster
In at SE perimeter station area. No surface buoy up. Located station with sonic receiver (6 pps). Secured new station marker buoys with pipe anchor. All lines, stakes, etc. in place.

New London (25 March 80)

Species (observed incidently)

Naticid snails 3
Cancer borealis 1
Cancer irroratus 3
Pagurus pollicaris

26 March 80 -- DeGoursey/Auster aboard R/V East Passage

Dive #1
In at SE perimeter station. Visibility 8-10 Ft. Current ½ kt. E, Temp 5°C- 70 ft. depth. No evidence of recent dumping in this area. All available substrate colonized by epifauna.

Amphipod tubes 1000+
Boulder at SE 6 Coryphella sp. -- 1
Tubularia sp. -- 1
Pagurus longicarpus -- very dense at SE 4 40/m^2
Pagurus pollicaris - 20 -- many still burrowed, others active on sediment surface
Cancer irroratus -- 4 -- active
Lunatia 3- burrowing into sediment
Asterias Forbesi -- 1

Calibrated stake at SE 5 30 cm exposed below "0" mark. Scouring or disturbed? (no other evidence of scouring)..
Photo at stations at SE 10 and SE 1
DeGoursey epibenthic SE/0 to N
Auster epibenthic SE 1 to S

Dive #2 Auster/DeGoursey
In at temporary dump buoy. Current ½ kt. East. Visibility 8-10 ft.
60 ft. depth
DeGoursey to E. Auster to W.
Large clay clumps 70-120 cm length, 1.5 m apart. Mytilus edulis embedded in sediment and clumps. Most individuals alive. One clump of Mytilus with 7 Metridium senileattached.
All with stalks extended. (transplanted from harbor.) No other macrobenthic fauna observed. Leaf debris and drifting macroalgae. No spoil "pulsing" observed on previous days dive. Swell diminished. Less fracting in clumps than on previous days dive. Evidence of recent disposal operations. Greater frequency of clumps closer (7.5 m diameter) to dump buoy. Further

than 75 m showed more signs of flattening and smoothing of clumps (older spoil?) Noted some degree of sorting of larger grained, coarse sediment at base of clay clumps.

8.2 New Haven Disposal Site Survey

2 April 80 - Determine baseline conditions at designated Norwalk disposal site (fig. 1 relative position). 35 mm photography, S8 mm cinema, density counts, natural sediment features obtained reconnaissance over the presently active S site to survey degree of sediment surface irregularity (mound topography measure) and biological repopulation (35mn photography). Third objective to transect the N site to relocate transect line, read elevation stakes, epibenthic samples, sediment and biological conditions since final capping in June 79.

Stewart, DeGoursey, Auster aboard R/V East Passage.

Dive #1 - Stewart/DeGoursey. Pre-disposal survey. In at Norwalk Site Buoy. Swam SE transect 75 m from buoy. Flat, featureless topography, soft .25m penetration accomplished easily by diver. Bottom typical unconsolidated floc in flow with E tidal current. Corymorpha was dominant epifaunal organism. Pseudopleuronectes americanus and Cancer irroratus also active and very abundant.
C. irroratus females berried.
Also observed Sygnathus fusscus (1)
Crangon septemspinosa
Pagurus pollicaris
Asterias forbesi
Axius (?) burrows (10+)
De Goursey - photos underwater, Canon F-1.

Dive #2 South site
Stewart/Auster in 200 m west of buoy
Stewart swam to NE and surfaced 20 m N of buoy (15034.7/26543.2)
Auster swam to SE and surfaced 50 m SW of buoy
Traversed area of recent disposal operation
Topographic relief on order of 2 meters. Large clumps up to 1 meter height showing beginning of erosion and fracturing processes. Bottom cohesive clay/silt type. Cancer irroratus burrowing in spoil and excavating clay clumps. Peaks and valleys along bottom probably represent individual dumps.

Libinia - burrowed
Crangon septemspinosa - obiquitous over and in bottom.
Pagurus logicarpus active on spoil pile

Nassarius trivittatus on pile (transplanted??)
Burrows 5-6 cm dia. from Axius serratus (?)
Larger burrows 8-10 cm (Cancer or Homarus?)
Coymorpha delineate perifphery.

Epibenthic 50 m SW of buoy.

New Haven Disposal Site Survey

Dive #3. North Site. DeGoursey/Auster
Temporary buoy deployed at coordinates of missing north site buoy. Descended and traversed 20 m to south to attempt to locate transect line. Line was not located. Went to north 100 m. Shell debris over hard packed sand with thin silt veneer. Cancer irroratus abundant (25). Some still burrowed. Many berried females. Thigmotactic response to larger shell debris in area. 2-5/m^2 density.

Pagurus pollicaris excavating spoil.
Pagurus longicarpus traversing spoil surface.
Juvenile P. americanus 2/m^2.
Metridium senile on shell.
Several Libinia emerginata burrowed in sediment.
No Axius type burros.
No Corymorpha until periphery - low density.
No clay clumps. Barnacle set on shell debris.
Surface featureless except for several mound-like peaks c/m relief.
Epibenthic on spoil 100 m N of buoy - Auster.

Dive #4
Stewart in transect filming (S 8 mm) over N site W-E, located transect line and subsurface buoy on North Site. The transect line deployed 21 June 79 had been lost since November 79. Station relocation and stake reading will provide a nine month term evaluation of surface conditions. (DeGoursey dove to put pinger (1pps) on transect line). Stewart attached floats to subsurface buoy for site relocation and more accurate description of transect line stations and elevation stakes.

3 April 80 - Dive #1. Stewart, DeGoursey, Auster. Norwalk Site.
Marker .5 m side (.25 m^2) quadrant and counted Corymorpha density during transect to North.
Stewart 36/¼ m^2
DeGoursey 23
Auster 17, 18, 22, 25, 28
Cancer irroratus sparse over site - no berried
Nassarius trivittatus on surface - sparse.
Pagurus longicarpus on surface - sparse

Dive #2. North Site. Auster/DeGoursey. Vis. 6 ft.
Total coverage of buoy mooring chain with epibenthic organisms (Mytilus, Balanus, Metridium, Asterias, Tubularia, macroalgae).

Cancer irroratus dense (4-6/m^2) in some areas of pile north of buoy.
Libinia emerginate - large individuals, 10-12 cm carapace width.
Pagurus longicarpus and Pagurus pollicaris abundant. 50+ transect lines and stakes fouled with barnacles.
Photos with Nikonos and 28 mm lens.
Pleurobranchia in water column.

New Haven Disposal Site Survey

Dive #3. Auster/Stewart.
South Site - at disposal buoy. Just dumped barge.
Visibility 0-2 ft. Spoil very soft, partially cohesive.
Crassostrea shell debris
Mercenaria (1)
Cancer irroratus on clay clump.
Clay clumps already eroding and fracturing.
Relief off bottom on order of 2-3 meters. Anchor chain heavily fouled by common epiphytes cited on previous dive. 35 mm photos taken in SE traverse.

General notes
Heavy load of floculant material (absorbed organics) in water column. Typical for the season.
Pleurobranchia and Cyanea cited in water column.
No withdrawal response observed in any Corymorpha.
Cancer irroratus that are observed with black and partially eroded carapace will be collected and retained for laboratory analysis of necrosis or pathogens. Often decopod crustacia in this region of L.I.S. undergo staining of the carapace during overwintering, and the cause must be distinuished as natural or spoil sediment induced.

8.3 PORTLAND, ME - DISPOSAL SITE SURVEY

9-11 April 1980- Equipment and personnel on scene to : sample Bulwark Shoals reference station and stock Modiolus platform with individual bagged samples; characteristic fauna collection from shallow site for identification and community structure extrapolation to disposal site vicinity. Lobster traps (4) refurbished, baited, and set on site in attempts to obtain H. americanus samples for EPA Assist with bathymetric, benthic samples and sea parameter data routine. Review remote TV videotape sequences at selected stations adjacent to dump site, also obtain 35 mm b & w photos from deployed TV/35 mm tripod array.

Stewart, DeGoursey, Auster, SAI personnel aboard R/V Edgerton.

10 April 80 — Weathered out. Trial of ENDECO remote TV/still camera system at USCG dock. Inquiries on individuals fishing disposal grounds made at piers and local chandleries.

11 April 80 — Stewart, Degoursey, Auster.
Dove at Bulwark Shoals to collect Modiolus to stock metals platform and for baseline analysis. Visibility 30 ft. Depth 40 ft. Bottom predominently bedrock with heavy cover of mussels (70%)
Observed brittlestars Ophiopholis
Stalked Ascidians Boltenia
Dog whelk Buccinum undatun
Spider crab Hyas
green urchins Strongylecentrotus
No Homarus observed. Two vacant burrows.
Collected 5 bags of mussels.
1 Siphonophore in water column.
on platform deployed.

Video Survey -
Several major problems were encountered while using the Endeco camera system.
Eleven of the predetermined 18 stations were occupied:

Station 2 Photos 1-4 Top
Stone cobble, spoiges,
*Floodlight impacted and broken - replaced with Ikelite superlight.

Station 5 Photos 5-16 Top
Boltenia (stalked Ascidian), brachiopods.
Gravel/cobble with heavy silt overlay.

Station 8 Photos 17-18 Top
Cerianthids, heavy silt.

Station 7 Photos 30-36 Slope
Heavy silt, worm tubes.

Portland, ME - Disposal Site Survey

Station 4 Photos 39-49 Slope
Heavy silt, some cobble
Brachiopods, anenome or sponge as at Stn. 2.
Worm tubes (?)

Station 1 Photos 51-62 Slope
Brachiopods, some sponges, Ascidians (Boltenia)
Some cobble with heavy silt overlay.

Station 9 Photos 65-82
Areas of cobble, mostly silt
Asteriod
Sponges as in Stn. 2

Station 6 Photos 84-89
Silt, no cobble
No apparent macrofauna.

Station 11 Photos 91-94
Station 13 96-99 No Video-no light on camera
Station 3 100-103 Still photos only

Stills with Nikon. 24 mm lens f/5.6 on Plus-X ASA 125 film. Electronic flash (2) - Vivitar 283 with diffuser - one manual one auto - RCA Video Camera, Panasonic VTR, Digital Depth Recorder.

9.0 MUSSEL WATCH (Dr. Sung Feng)

Delays have also had significant effects on the initiation of the mussel watch program and although continuity has been maintained at New London, there has been a significant hiatus in sampling at other sites. Consequently, additional baseline samples have been obtained and the program has been restructured to provide more frequent sampling from fewer stations.

During the period since initiation of the 1980 DAMOS program, the following work has been accomplished:

- Purchased materials needed to construct PVC mussel platforms
- Six PVC mussel platforms wer fabricated. One used for the Portland site and four for the Central Long Island site.
- Sampled New London dumpsite stations (D1) and two reference sites: Latimer's Light and South of Fishers Island. D3 was not located. Monthly sampling of this site has been carried on since last December (1979).
- Processed baseline samples of Modiolus modiolus from Portland and monthly samples of Mytilus edulis from New London.

- Collected 3,000 Mytilus edulis from Latimer's Light for deployment at the four Central Long Island Sound Stations. 500 mussels were measured. All mussels were then bagged. Rigged the platforms for deployment.

- Spent two days (April 23 and 24 in Central Long Island Sound to deploy the four platforms. The locations of these platforms in terms of Loran-C coordinates and Latitude and Longitude are present in Table 9.1.

Norwalk	15037.3	41°09.21'
	43999.6	72°52.17'
STNH North	15042.2	41°09.23'
	33000.7	71°08.68'
STNH Sourth	15033.4	41°08.74'
	43994.5	72°71.42'
Reference	15035.1	41°09.88'
	44005.1	72°52.08'

TABLE 9.1

- Processed baseline samples of mytilus edulis for the Central Long Island Sound site.

- Commenced the 6th round of Internation Council for the Exploration of the Sea sponsored interlaboratory calibration exercise on lead and cadmium for quality assurance.

- Located and sampled D3 at the New London Site.

10.0 FISHERIES COMMUNICATION (Mr. S. Pratt)

At the present time no funding has been made available for this section of the program. However, arrangements have been made for sampling of lobsters in the vicinity of the Portland and Central Long Island Sound Disposal Sites. Definition of the program plan for this portion of the program will be completed during June 1980.

11.0 SPECIAL PROJECTS (Dr. R. W. Morton)

Several special projects have been accomplished during the period covered by this progress report involving both field operations and presentation of data. Maintenance of disposal buoys has been

a continuous problem, particularly at the New London disposal site where the buoy has been replaced twice and damaged by ship traffic once. In addition to replacement of the New London Buoy, periodic maintenance of the radar reflector and light source at the STNH-S buoy has occurred.

During final dredging and capping operations at the STHN-S site a prototype Loran-C navigation system was used to control the disposal of material at specified points. Using this system which consisted of a Northstar 6000 Loran-C and 6700 interface, an Apple II microcomputer and a video monitor, thirty-five disposal operations were conducted with a precision of approximately 50 meters at three designated disposal points. By application of this technique additional capping material was spread over the southern margin of the disposal mound, and Stamford material that was exposed as a result of an errant dump was covered with New Haven sediment. A full report of this operation has been presented as DAMOS Contribution #12 entitled Precision Disposal of Dredge Material Utilizing Enhanced Loran-C Navigation Control

Three papers were presented by DAMOS investigators at the 2nd Annual International Ocean Dumping Symposium held at Woods Hole Oceanographic Institute during April 1980. These were titled:

- Use of Precision Bathymetric Surveying Techniques to Manage and Monitor the Disposal of Dredge Spoils in Central Long Island Sound, by Dr. Robert W. Morton, DAMOS Contribution #8.
- Chronological Records on In-Situ Physical and Biological Conditions Obtained by Diver Survey at New London and New Haven, CT Dredge Disposal Sites, By Dr. Lance Stewart DAMOS Contribution #9
- Changes in Levels of PCB's in Mytilus edulis.
- Associated with Dredge Spoil Disposal by Dr. S. Feng, J.K. Watson, R. Arimato, R. Grillo, J. Lanier and T. Ouellette, DAMOS Contribution #10.

Dr. Morton was also requested to testify for the Committee on Merchant Marine and Fisheries of the House of Representatives on May 21, 1980 regarding the results of capping procedures at the Central Long Island Sound Disposal Site. The statement presented at

that hearing entitled "'Capping' Procedures as an Alternative Technique to Isolate Contaminated Dredge Material in the Marine Environment" has been submitted as DAMOS Contribution #11.