COLUMBIA RIVER ESTUARY STUDY TASKFORCE (CREST)
PROJECT COMPLETION REPORT

(Submitted in compliance with Appendix C of
Washington Department of Ecology
Grant No. G-86015)

Following is a list of major activities for the period of July 1, 1985, through June 30, 1985.

Grant element 1:

1. Dredged Material Disposal at Area D, First Quarter Activities: CREST met with officials from the Army Corps of Engineers, Portland District, (Mr. Ken Patterson, Chief of Waterways Maintenance Section and Ms. Nancy Case, Chief of Dredging Operations) to review concerns over continued unrestricted use of Area D, at Columbia River Mile 7, for dredged material disposal (DMD). As background material for the meeting CREST distributed a draft report which it prepared on the subject (see Attachment E of the first quarterly report). Discussion focused on the concern that use of Area D for DMD may be contributing significantly to the high rate of shoaling in Baker Bay. The Corps officials asked for time to review the CREST report and suggested that a second meeting be scheduled for early November 1985.

2. Dredged Material Disposal at Area D, Second Quarter Activities: CREST staff attended meetings with Corps of Engineers staff and continued working with resource agencies concerning the Port of Chinook's request that restrictions controlling use of Area D for dredged material disposal be removed from Clatsop County's Comprehensive Plan. A second draft of a report documenting the scope of dredged material disposal on Baker Bay was produced (See attachment B of second quarterly report).

3. Dredged Material Disposal at Area D, Third Quarter Activities: During January 1986, CREST Staff completed their review of current disposal practices at Area D. Recommendations for regulating use of the site were developed in coordination with state and federal resource agencies and with the CREST Council. The recommendations were proposed as amendments to Clatsop County's Comprehensive Plan.

4. Dredged Material Disposal at Area D, Fourth Quarter Activities: A final report documenting the scope of dredged material disposal at Area D and the effects of disposal on Baker Bay was completed. In conformance with Section 9(d) of the grant, five copies of the report were sent to Washington Department of Ecology (See attachment B of Fourth Quarterly report).

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

Grant element 2:

1. Coastal Barrier Designations: CREST reviewed the U.S. Department of Interior's coastal barrier designations proposed for addition to the Coastal Barrier Resources System (CBRS) and prepared comments to the Department of Ecology and to the Oregon Department of Land Conservation and Development recommending that Columbia River-Sand Island/Clatsop Spit and Fort Canby be deleted from the CBRS.

2. Dredging, Columbia River Estuary: CREST staff met with staff of the Corps of Engineers Navigation Branch to discuss the Corps maintenance dredging program on the Columbia River Estuary. The meeting focused on dredged material disposal in the lower reaches of the estuary and on problems associated with continued maintenance of the Chinook Channel.

3. Dredged Material Disposal Meeting: Staff attended two interagency meetings in Portland to discuss new strategies for dredged material disposal associated with Corps of Engineers work. The main topic of the meetings was a preliminary proposal by the Corps to create an 1,100 acre dredged material island in the area between Taylor Sands and the Astoria-Megler Bridge.

Grant element 3:

1. Permit Application Assistance to the Port of Ilwaco: CREST staff assisted the Port of Ilwaco in filing for a Clatsop County Review Use permit to remove approximately 3,000 cubic yards of dike stone from Baker Bay West Channel with deposition of the material at the base of a pile dike at river mile 1.6. CREST staff also prepared findings of fact recommending to Clatsop County that the permit request be approved. (see attachment B of first quarterly report). (Note: This item was a bi-state activity.)

2. Permit Application Assistance to the Port of Chinook: CREST staff assisted the Port of Chinook in filing for a Clatsop County Review Use permit to dispose of dredged material at East Sand Island and at Area D and in preparing materials necessary to initiate an amendment to Clatsop County's Comprehensive Plan to lessen County restrictions on use of Area D. With respect to the Port's application for a review use permit CREST staff prepared findings recommending approval of the Disposal with conditions (see Attachment C of first quarterly report and attachment C of third quarterly report). (Note: This item was a bi-state activity.)

3. Tongue Point Dredging Proposal; Interworld, Inc.: Interworld, Inc. contracted with CREST staff to develop permit application materials for dredging the area between Piers 4 and 5 at Tongue Point, and to assist the firm by identifying an appropriate location for the disposal of dredged

GC97 .W2 C65 1985

materials. As part of this work CREST investigated the feasibility of disposing of dredged sediments in the flow lane of the Columbia River. To determine what sediment quality standards had to be met, CREST coordinated its investigation with the Washington Dept. of Ecology, the Oregon Dept.of Environmental Quality and the Environmental Protection Agency. (Note: This item was a bi-state activity.)

4. Plan Amendment Request by the Port of Chinook, Reviewed for Clatsop County: CREST staff completed plan amendment language for a request by the Port of Chinook to designate the following dredged material disposal sites in Clatsop County's Plan:

   1) a beach nourishment site on East Sand Island
   2) an upland disposal site on East Sand Island
   3) Area D

   The amendments have been approved by the Clatsop County Planning Commission and by the Board of County Commissioners (see Attachment B of third quarterly report). (Note: This item was a bi-state activity.)

5. Coordination with Pacific County: CREST staff met with Ken Kimura, Pacific County Planning Director, to discuss current CREST projects.

6. Coordination with Department of Ecology Staff: CREST staff met with Lisa Randlette of the Department of Ecology to discuss Pacific and Wahkiakum Counties' Shoreline Master Programs and Washington permit requirements and procedures.

7. Skamokawa Waterfront Redevelopment: The Cowlitz-Wahkiakum Governmental Council and Wahkiakum Port District #2 (a CREST member) asked CREST's assistance with preliminary planning for Waterfront improvements in Skamokawa, Washington. The planned improvements include development of a waterfront trail and foot bridge across Skamokawa Creek, expansion of Skamokawa Vista Park, rehabilitation of two historic buildings and other projects. CREST staff commented on a preliminary feasibility study for the project, and provided technical assistance.

Grant element 4:

1. CREST Council Meetings: The Crest Council held eleven meetings over the grant period. The agendas and minutes of the meetings have been provided as Attachment A of each of the quarterly reports.

2. Workshop on Wetland Preservation through Land Trusts: A workshop sponsored by CREST was held at the Columbia River Maritime Museum in Astoria on the 14th of April. The workshop explored the possibility of organizing a non-profit land trust to help preserve valuable wetland property.

ATTACHMENT - A

CREST COUNCIL MEETING
THURSDAY, APRIL 24, 1986
LAMPLIGHTER RESTAURANT
39TH & "L" Streets
SEAVIEW, WASHINGTON

This meeting was cancelled (not enough people for a quorum)

AGENDA

Page #		
		12:00 Call to Order/Introductions
	1.	Announcements
1 & 2	*2.	Consideration of March 27 Minutes
3	*3.	Consideration of March Financial Statement
4	4.	March Financial Status Report
5 & 6	5.	March Implementation Report

BACKGROUND

*2. The minutes of the March 27 meeting are enclosed for Council review and approval.

*3. The March Financial Statement is enclosed for Council review and approval.

4. The March financial status report is enclosed for the Council's information.

5. The March Implementation report is enclosed and will be reviewed by David Fox.

*action requested

CREST COUNCIL MEETING
THURSDAY, MAY 22, 1986
LAMPLIGHTER RESTAURANT
39TH & "L" Streets
SEAVIEW, WASHINGTON

AGENDA

Page #		
		12:00 Call to Order/Introductions
	1.	Announcements
	*2.	Consideration of March 27 Minutes
2 & 3	*3.	Consideration of March and April Financial Statements
4	4.	March and April Financial Status Reports
	5.	FY87 Budget Outlook
5 & 6	6.	March and April Implementation Report

BACKGROUND

*2. The minutes of the March 27 meeting were enclosed in the March mailing and will be reviewed for Council review and approval.

*3. The April Financial Statement is enclosed. The March and April statements will be reviewed for Council approval.

4. The April financial status report is enclosed for the Council's information.

5. A new budget for FY87 will be presented to the Council for approval at its June meeting. Paul will review FY87 income projections and expenditures for the Council's information.

6. The April Implementation report is enclosed and the March and April reports will be reviewed by David Fox.

*action requested

MINUTES

MAY 22, 1986
CREST COUNCIL MEETING
LAMPLIGHTER RESTAURANT
SEAVIEW, WASHINGTON

12:15 Lunch/Call to Order/Introductions

DELEGATES/ALTERNATES:	George Cooper, City of Warrenton Joan Dukes, Clatsop County Stan Hauer, City of Astoria Frank Heer, Port of Ilwaco Bob Petersen, Port of Ilwaco Curt Schneider, Clatsop County
CREST STAFF:	Mark Barnes, Planner Paul Benoit, Director David Fox, Planner Isabel Turner, Admin. Asst.

AGENDA ITEM #1: ANNOUNCEMENTS
Stan Hauer, Chairman, opened the meeting. There were no announcements.

AGENDA ITEM #2: MARCH 27 MINUTES
Frank Heer moved to approve the March minutes. Seconded by George Cooper. Unanimous.

AGENDA ITEM #3: MARCH AND APRIL FINANCIAL STATEMENTS
Frank Heer moved to approve the financial statements. Seconded by George Cooper. Unanimous.

AGENDA ITEM #4: MARCH AND APRIL FINANCIAL STATUS REPORTS
Paul reviewed the financial status report. There were no questions.

AGENDA ITEM #5: FY87 BUDGET OUTLOOK
Paul reviewed the budget outlook and projected income for FY87. The FY87 proposed budget will be reviewed at a budget committee meeting in June. It will then be presented to the CREST Council at the June 26 Council meeting.

AGENDA ITEM #6: MARCH AND APRIL IMPLEMENTATION REPORTS
David Fox and Mark Barnes reviewed the implementation reports. There were no questions.

Meeting adjourned at 1:15 p.m.

CREST COUNCIL MEETING
THURSDAY, JUNE 26, 1986
SHELBOURNE RESTAURANT
SEAVIEW, WASHINGTON

AGENDA

Page #		
		12:00 Call to Order/Introductions
	1.	Announcements - "Farewell Jean, we will miss you" - "Good luck Paul, in your new endeavors"
2	*2.	Consideration of May 22 Minutes
3 & 4	*3.	Consideration of May Financial Statement
5	4.	May Financial Status Report
6 - 10	*5.	FY87 Budget
11 & 12	6.	May Implementation Report

BACKGROUND

*2. The minutes of the May 22 meeting are enclosed for Council review and approval.

*3. The May Financial Statement is enclosed for Council review and approval.

4. The May financial status report is enclosed for the Council's information.

*5. A proposed FY87 budget is enclosed for your review and approval. Background materials supporting the proposed budget and detailing projected income are also enclosed.

6. The May Implementation report is enclosed and will be reviewed by David Fox and Mark Barnes.

*action requested

Attachment B

DREDGED MATERIAL DISPOSAL AT AREA D

David S. Fox

Paul Benoit

Columbia River Estuary Study Taskforce

June 1986

The preparation of this report was financially aided through a grant from the Washington State Department of Ecology with funds obtained from the National Oceanic and Atmospheric Administration, and appropriated for Section 306 of the Coastal Zone Management Act of 1972.

Table of Contents

	Page
LIST OF TABLES	v
LIST OF FIGURES	vii
EXECUTIVE SUMMARY	ix
STATEMENT OF PROBLEM	1
INTRODUCTION	1
RELEVANT SHORELINE MASTER PROGRAM, COMPREHENSIVE PLAN, AND AGENCY DREDGED MATERIAL DISPOSAL POLICY	5
SHOALING IN BAKER BAY	15
Causes of Shoaling	15
History of Shoaling in Baker Bay	16
DREDGED MATERIAL DISPOSAL AT AREA D	21
Disposal Practices	21
Scientific Research Pertaining to Area D	23
Potential Significance of Area D Disposal to Shoaling in Baker Bay	26
ALTERNATIVES TO USING AREA D	29
POLICY OPTIONS FOR DISPOSAL AT AREA D	31
REVISED DISPOSAL POLICY	35
REFERENCES	37
APPENDIX A. MAPS OF BAKER BAY AND THE COLUMBIA RIVER ENTRANCE FROM 1839-1982	
APPENDIX B. DISPOSAL VOLUMES AND COST ESTIMATES	
APPENDIX C. REVISED AREA D POLICY	

LIST OF TABLES

		Page
1.	Chronology of Important events affecting shoaling in Baker Bay.	17
2.	Shoaling in Baker Bay from 1868 to 1958.	19
3.	Changes in surface area of three depth regimes in Baker Bay, 1868 to 1958.	19
4.	Annual dredged material disposal volumes at Area D, 1966 through 1984.	22
5.	Amounts of Area D sediment in two grain size categories.	24
6.	Projected shoaling rate of Baker Bay based on the portion of sediment disposed of at Area D.	27
7.	Shoaling rates in the Columbia River Estuary from 1868 to 1958.	28
8.	Estimated cost of rehandling Area D sediments that have migrated back to maintained navigation channels.	30

LIST OF FIGURES

	Page
1. Location map of Area D	2
Figures A-1 through A-18 are maps of Baker Bay and the Columbia River entrance from 1839 to 1982.	
A-1. 1839	A-1
A-2. 1844	A-2
A-3. 1848	A-3
A-4. 1851	A-4
A-5. 1870	A-5
A-6. 1885	A-6
A-7. 1890	A-7
A-8. 1895	A-8
A-9. 1903	A-9
A-10. 1910	A-10
A-11. 1915	A-11
A-12. 1924	A-12
A-13. 1935	A-13
A-14. 1946	A-14
A-15. 1958	A-15
A-16. 1965	A-16
A-17. 1977	A-17
A-18. 1982	A-18

EXECUTIVE SUMMARY

Area D is an in-water dredged material disposal site located in the north channel of the Columbia River Estuary approximately 4,200 feet south of the Chinook pile dike. The site is used exclusively by the Army Corps of Engineers and their contractors. Disposal at Area D, is contributing to shoaling in Baker Bay and is contrary to local government and state and federal resource agency policy restricting use of the site. At issue is whether the contribution to shoaling is significant and whether continued disposal should be curtailed. This paper presents background information on Area D and related shoaling problems and recommends revised disposal policy for regulating use of the site.

An overview of the paper is presented below.

1) Policies stated in local shoreline master programs and comprehensive plans restrict dredged material disposal at Area D to periods when sea and weather conditions prohibit dredging vessels from using ocean disposal sites.

2) There have been inconsistencies in Corps of Engineers' and other agencies' policy statements concerning the use of Area D. The prevailing resource agency policy, however, has been similar to the local comprehensive plan policy discussed in (1), above.

3) Baker Bay has shoaled considerably in the past 100 years. The main cause of past shoaling has been jetty construction and the associated stabilization and enlargement of Sand Island in the bay.

4) In the period from 1868 to 1935, Baker Bay gained 104 - 119 million cubic yards of sediment. This amounted to a shoaling rate of 1.47 inches per year for a total of 98.5 inches over the 67 year period.

5) In the period from 1935 to 1958, Baker Bay lost 4.8 - 6.2 million cubic yards of sediment. This amounted to an erosion rate of 0.21 inches per year for a total of 4.8 inches over the 23 year period. This loss of sediment can be attributed primarily to the breaching of Sand Island.

6) The shoaling rate of the bay from 1958 to present has not yet been quantified. Shoaling has apparently continued on the bay's inner flats.

7) Research on the movement of sediment from Area D has produced evidence that a portion of the disposed of sediment moves into Baker Bay; however, none of the research results are conclusive.

8) The Corps is now placing an average of 645,000 cubic yards of material at Area D per year. 84% of the disposal apparently takes place when sea and weather conditions are generally too rough to allow safe transit of dredging vessels to ocean disposal sites. Therefore, it is reasonable to assume that 16% of the disposal does not comply with agency, shoreline master program, and comprehensive plan policy discussed in (1) and (2), above.

9) If all of the material disposed of at Area D entered and settled in Baker Bay, the resulting shoaling rate would be 0.64 inches per year. Evidence suggests that the material entering Baker Bay from Area D is comprised of fine sediments transported in the water column. If all of these fine sediments entered the bay and all coarse sediment moving in the bedload were excluded, the resulting shoaling rate would be 0.17 inches per year. The latter shoaling rate is much lower than past shoaling rates experienced by the estuary's bays.

10) The Corps of Engineers has stated that using ocean disposal sites in lieu of Area D would be prohibitively expensive. Estimates show, however, that there would be less than a 5% increase in channel maintenance cost if all disposal at Area D were in compliance with agency, shoreline master program and comprehensive plan policy.

11) Four policy options for Area D disposal are discussed in the report:

- -Retain the present restrictions on the use of Area D
- -Eliminate the present restrictions on the use of Area D
- -Allow the Corps to continue the disposal of sediment at Area D with restrictions based on total cubic yardage and types of dredging projects rather than on weather conditions.
- -Allow the Corps to continue the disposal of sediment at Area D with restrictions based both on total cubic yardage for identified dredging projects and on weather conditions.

12) The third policy option listed in number 11, above, was selected in coordination with local jurisdictions in Washington and Oregon, the Corps of Engineers, and state and federal resource agencies. A 5-year limit of 3,250,000 cubic yards was placed on Corps projects and an annual limit of 100,000 cubic yards was placed on non-Corps projects. The disposal limitations included in the policy will not allow disposal to increase significantly above its present level. The limitations are enforceable because disposal volume can be readily monitored. Since enforcing the current policy would increase channel maintenance costs and not likely have any beneficial effect on Baker Bay, limiting the disposal to current levels appeared to provide the best compromise.

STATEMENT OF PROBLEM

Prior to 1986 the Corps of Engineers has utilized Area D for the disposal of dredged materials from several maintenance dredging projects on an unrestricted basis. Such unrestricted disposal has contributed to shoaling in Baker Bay, has been contrary to the recommendations of state and federal resource agencies, and has been in direct conflict with local shoreline master program and comprehensive plan policies which prescribed only limited use of Area D.

INTRODUCTION

Area D is an in-water dredged material disposal site located in the north channel of the Columbia River approximately 4,200 feet south of the Chinook pile dike (Figure 1). The site is utilized for dredged material disposal exclusively by the Corps of Engineers and their contractors. Over the past several years, local officials and state and federal agencies have expressed concerns regarding shoaling in Baker Bay and the possibility that dredged material disposed of in Area D may be contributing significantly to this shoaling problem. As a general rule, resource agencies have required that in-estuary disposal only be allowed when it is not feasible to use alternative disposal sites and methods which result in fewer environmental impacts. As a result of these concerns and requirements, the Columbia River Estuary Regional Management Plan (CREST Plan) and local comprehensive plans included policies restricting the use of Area D to periods when sea and weather conditions render the Columbia River Bar impassable to dredging vessels. This restriction was intended to reduce dredged material disposal at Area D to an absolute minimum. The Corps of Engineers' practice over the past several years, however, has been to place dredged material at Area D for several channel maintenance projects in the lower estuary regardless of sea and weather conditions.

The disparity between policies stated in local shoreline master program and comprehensive plans and actual Corps of Engineers practices presented a conflict. In order to resolve this conflict, CREST, in coordination with its Washington and Oregon member jurisdictions and the Corps of Engineers, investigated issues pertaining to the use of Area D and provided recommendations for revised regional and local plan policies for regulating disposal at the site. The first four sections of this paper present background information pertaining to the use of Area D, including:

- Relevant Shoreline Master Program and Comprehensive Plan and Agency Dredged Material Disposal Policy,
- Shoaling in Baker Bay,
- Dredged Material Disposal at Area D, and
- Alternatives to Using Area D.

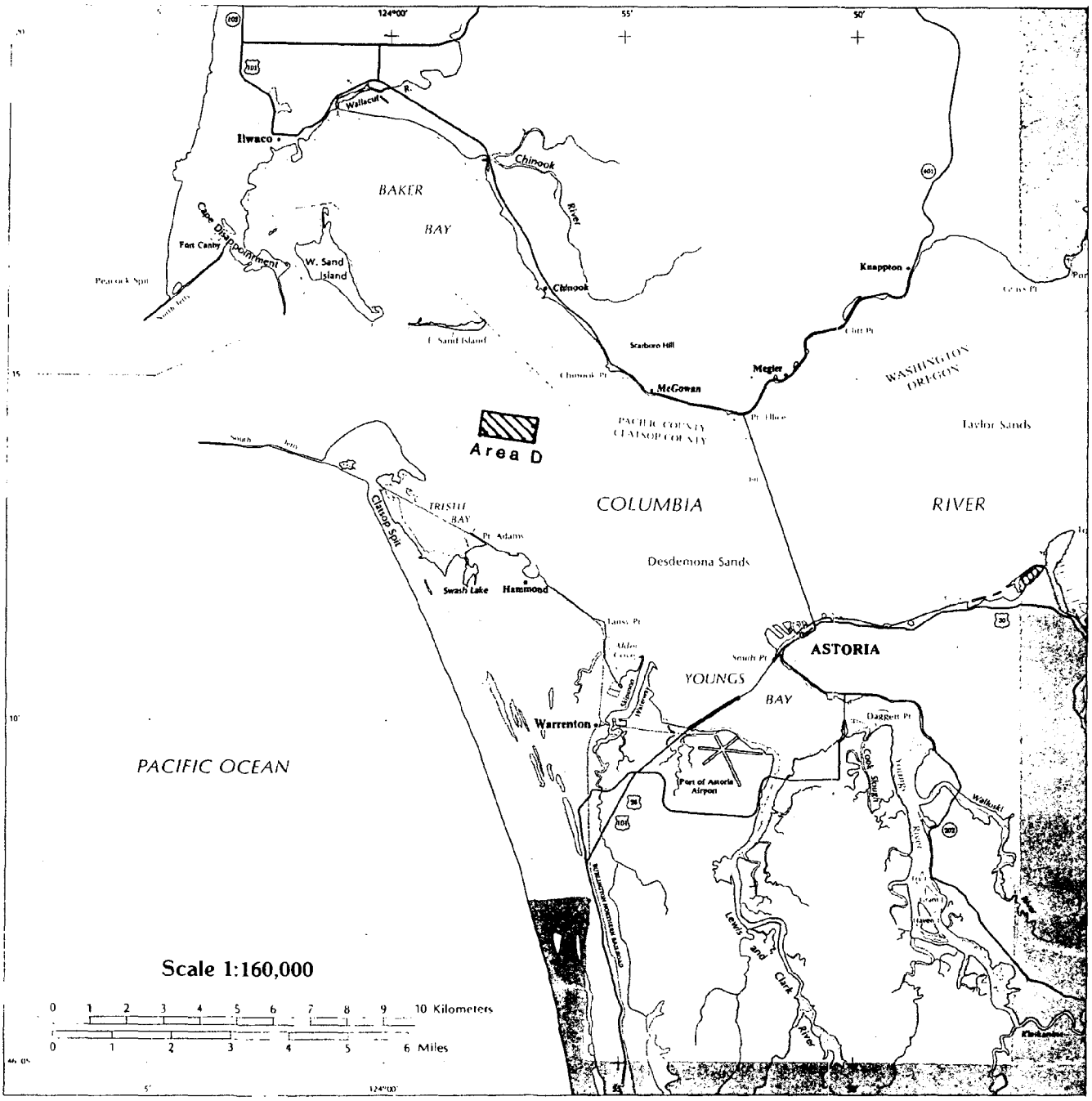

Figure 1. Location map of Area D

The final two sections of the paper present new policy options for regulating Area D disposal. The revised disposal policy will be incorporated into the Columbia River Estuary Regional Management Plan and local Shoreline Master Programs and Comprehensive Plans.

RELEVANT SHORELINE MASTER PROGRAM, COMPREHENSIVE PLAN, AND AGENCY DREDGED MATERIAL DISPOSAL POLICY

The use of Area D as a dredged material disposal site is addressed in several sections of the CREST Columbia River Estuary Regional Management Plan and local shoreline master programs comprehensive plans. These plans cite the possible relationship between dredged material disposal at Area D and shoaling in Baker Bay and set policies to limit the use of Area D and other in-water disposal sites in the estuary.

The CREST Plan includes the following statements regarding Area D and estuarine in-water disposal:

(1) Section 24.12, Dredging and Dredged Material Disposal Policy:

"Except for flow-lane disposal and beach nourishment, in-water disposal inside the estuary may be substituted for ocean disposal only when sea or weather conditions pose a hazard to the dredging vessel."

(2) Section 41, Lower River and Islands Plan, 4. Dredged Material Disposal at Area D and Tansy Point:

"The Area D and Tansy Point in-water dredged material disposal sites should be used only when weather and sea conditions render the use of disposal sites outside the Columbia River mouth hazardous."

(3) Section 41.02, Estuary Channels, Issues and Findings:

"The fate of the dredged material deposited in estuary disposal sites is a major concern. Much of the material may stay in the estuary, reentering channels or building up shoals in bays and flats marginal to the channels. Material placed in Area D, for example, may end up in Baker Bay, increasing the already severe shoaling and access channel maintenance problems there."

(4) Section 45, Baker Bay Plan, 3. Baker Bay as a Hydraulic System:

"Dredged material disposal in Area D should be minimized. Other in-water areas, that do not have adverse effects on Baker Bay, should be found."

(5) Section 55.12, Lower Columbia River Estuary:

"Recent discussions with the Corps, CREST and resource agencies have resulted in temporary termination of the Tansy Point disposal site and restricted use of Area D. The Astoria Turning Basin was constructed by clamshell

and barge, with disposal at sea. Area D was used when the bar was impassable because of weather and wave conditions."

The dredged material disposal section of the CREST Plan describes Area D as follows (Section 59):

(6) "D - Estuary (CoE "D")
Location 46 14'27"N, 123 57'00"W @ RM
Size 5000' x 2000'
Depth 38'
Relative Biological Density Moderate
Sediment Transport fines toward Baker Bay
Access Good
Traffic Density Low
Related Projects Used in place of ocean disposal for many projects when bar conditions are rough."

The CREST Plan provided the framework of the Columbia River Estuary portions of local shoreline master programs and comprehensive plans in Washington and Oregon. These plans incorporated many of the CREST Plan policies either directly or with some alterations. The Clatsop County Comprehensive Plan makes the following statements regarding Area D and estuarine in-water disposal:

(7) Section P31.3, Estuary Channels Subarea Portion of the Land and Water Use Plan, Issues and Findings and Subarea Policy:

"The fate of the dredged material deposited in estuary disposal sites is a major concern. Much of the material may stay in the estuary, reentering channels or building up shoals in bays and flats marginal to the channels. Material placed in Area D, for example, may end up in Baker Bay, increasing the already severe shoaling and access channel maintenance problems there.

"SUBAREA POLICY

The continued use of the Tansy Point site and Area D should occur (as per interagency agreement) only when weather and sea conditions render the use of disposal areas outside the mouth hazardous. New in-water sites in the estuary may be designated in the future and that use of Area D and Tansy Point may be discontinued with the next few years."

(8) Section P20.5 (Policy 3,B,3), Dredged Material Disposal Site Selection Policy:

"In-water disposal sites shall be in areas identified as low in benthic productivity and use of these sites shall

not have adverse hydraulic effects. Long-term use of disposal sites within the estuary shall be allowed only when no feasible alternative shoreland or ocean disposal sites can be identified and the biological and physical impacts are demonstrated to be minimal."

(9) Section P20:6 (Policy 1) Dredging and Dredged Material Disposal Policy:

"Except for flow-lane disposal and beach nourishment in-water disposal within the estuary may be substituted for ocean disposal only when sea or weather conditions prohibit dredging vessels from using ocean disposal sites."

Standard S4.233 of the Clatsop County Land and Water Development and Use Ordinance sets the following standard for in-estuary disposal:

(10) "F. Except for flow-lane disposal and beach nourishment, disposal of dredged materials inside the estuary shall be substituted for ocean disposal only when sea or weather conditions are a hazard to safe navigation for the dredging vessel."

The Columbia River Estuary element of Wahkiakum County's Shoreline Master Program makes the following statements regarding the use of Area D:

(11) Dredged Material Disposal Standards:

"11. Except for flow-lane disposal and beach nourishment, deposition inside the estuary should be substituted for ocean disposal only when sea or weather conditions are a hazard to safe navigation for the dredging vessel."

The CREST Plan was reviewed while still in draft stages by local, state, and federal agencies. The Corps of Engineers commented on the following policy in a draft of the CREST Plan concerning estuarine in-water dredged material disposal:

(12) CREST Plan Draft Dredged Material Disposal Plan Policy (paragraph III,D,3,j,4):

"Deposition inside the estuary should be substituted for ocean disposal only when sea or weather conditions are a hazard to safe navigation for the dredging vessel."

(13) Corps of Engineers Comment on the Policy (November 15, 1978, letter from the Corps to CREST):

"9. Page 49, paragraph III.D.3.j.(4). The sentence should be changed to state "Except for approved flowlane disposal sites for upstream maintenance, deposition in the

estuary should be substituted for ocean disposal only when sea or weather conditions are a hazard..."

The comment suggests that the Corps of Engineers did not object to conditioning the use of estuarine in-water disposal sites to periods when the sea and weather conditions precluded the use of ocean disposal sites. The draft policy controlling use of Area D was modified as per the Corps' comment and was incorporated into the final CREST Plan and, subsequently, into local shoreline master programs and comprehensive plans (see Excerpts #(1), (9), and (11), above).

There have been conflicting statements among agencies regarding policies restricting the use of Area D. We were unable to locate any written policies from the Corps of Engineers regarding Area D. The following statements, which do not necessarily represent Corps policy, were made in a 1960 Corps current-measurement program report:

(14) Corps of Engineers, 1960, p. 11, paragraph j:

"Several factors not having to do with movement of bed material enter into the location of disposal area D. A disposal area inside the estuary, with sufficient depth for dumping and at an economical travel distance, is necessary when outside conditions are too rough to permit dumping. Also, in the routine of dredging when the dredge is loaded, use of a inside area for dumping expedites and is less hazardous for changing shifts. In light of all these factors it was decided to continue use of disposal area D on a minimum-use basis."

The following statements were made in an exchange of letters between the U.S. Fish and Wildlife Service (USFWS) and the Corps of Engineers in 1975:

(15) June 1975 letter from USFWS to the Corps:

"Area "D". The resource agencies had understood that this area was used only on an ebb tide when bar conditions were such that the dredges could not safely use the ocean dumping sites. We were understandably concerned when we were informed at the annual dredge spoil meeting this past February that material from the Astoria area bars has been routinely dumped in Area "D". Although the exact fate of this material is not known, it is highly probable that at least a portion of it ends up in Baker Bay, which is silting in. We believe there is an urgent requirement for a study to determine the fate of material deposited at this site. If it does, in fact, add to the siltation problem in Baker Bay, then another in-water spoil site in the estuary should be located. We therefore request that Area "D" be used on an emergency basis only until a study is completed."

(16) August 11, 1975, letter from the Corps to USFWS:

> "The use of Area "D" in conjunction with 40-foot channel maintenance is not based on emergency conditions. In addition to use during periods of adverse weather and sea conditions Area "D" is used when work at the Columbia River entrance bar is interrupted to change personnel or to transport supplies to the dredge. However, use of Area "D" is minimized during periods of favorable weather. The confusion in the use of this area may have resulted from Astoria Turning Basin construction plans which call for use of Area "D" only if conditions at sea are unfavorable. This restriction is necessary for the Astoria Turning Basin construction because of the potential for polluted material or material of a lesser quality than normally encountered in 40-foot channel maintenance."

A 1977 letter from the Corps of Engineers to CREST made the following statements concerning the use of Area D:

(17) September 20, 1977, letter from the Corps to CREST:

> "Area D has been reserved for use during periods when sea conditions preclude transits to Area E, A or B offshore. It is also utilized if a dredge is loaded enroute to Astoria for moorage or to make crew pickup. Thirdly, the area is utilized intermittently when hopper dredging is accomplished on the Desdemona, Flavel or Upper Sands reaches of the navigation channel."

The USFWS made the following statement in their review of a recent Corps public notice involving disposal at Area D:

(18) March 15, 1984, letter from USFWS to the Corps:

> "We are concerned (and surprised) that the material from Flavel Bar is to be disposed of in the estuary in Area "D". It was our impression, gained over the years, that Area "D" was used when it was not possible to cross the bar for disposal in ocean sites. In any case, it has always been understood that material is to be placed in Area "D" only on the ebb tide."

Comments from the State of Oregon on Corps of Engineers projects involving dredging in a navigation channel are transmitted from several state agencies to the Division of State Lands (DSL) and are then conveyed to the Corps in the form of a Governor's letter. The following excerpts give an example of a state agency response and a recommendation of the Governor for a dredging project involving the use of Area D:

(19) December 14, 1984, letter from Department of Land Conservation and Development (DLCD) to DSL:

"However, dredge disposal at in-water disposal area D needs to be limited to occasions when weather and sea conditions render the use of disposal areas outside the Columbia River mouth hazardous (Clatsop County Estuary Plan, p.31.3). This condition has been established through the County's acknowledged plan in the planning process and in numerous state and federal interagency meetings. The Department will not object to the project provided this condition is added to the permit."

(20) January 9, 1985, letter from Governor Victor Atiyeh to the Corps:

"I approve the project as outlined in the Public Notice subject to the following conditions:

"1. ...
"2. ... "Area D" may be utilized only during ebb tide when inclement weather precludes disposal at other sites."

On May 22, 1985, the Corps of Engineers issued a public notice which specified the use of Area D for Chinook Channel maintenance dredging. This notice did not limit the use of the site to periods of inclement weather. Following the issuance of the notice, several letters were exchanged among agencies which further outlined policies on the use of Area D. DLCD made the following comment regarding Area D:

(21) July 15, 1985, letter from DLCD to DSL:

"Finally, the Clatsop County plan limits disposal of material at in-bay Site D to inclement weather. The permit will need to be conditioned to limit dredge material disposal at Site D to inclement weather conditions when disposal offshore is not feasible..."

The State of Oregon Governor's letter did not incorporate this DLCD comment for the Chinook Channel maintenance project. Instead, the following condition was placed on the use of Area D:

(22) August 21, 1985, letter from Governor Victor Atiyeh to the Corps:

"I approve the project as outlined in the Public Notice subject to the following conditions:

"1. ...

"2. ...

"3. "Area D" shall be utilized only during ebb tide."

USFWS commented on the Chinook Channel maintenance dredging project in a response both to the Corps and Clatsop County public notice for the project. USFWS made no comment concerning restrictions on the use of Area D in their response to the Corps public notice. However, they made the following statement in their response to the Clatsop County public notice:

(23) <u>September 25, 1985, letter from the USFWS to Clatsop County Department of Planning and Development</u>:

"We also object to the indiscriminate use of Area "D" as proposed. According to the Ogden Beeman Study (1985), 50 percent of the material deposited in Area D returns to the navigation channel between river miles 7 and 25. A smaller but unknown percentage of the material enters Baker Bay, contributing to shoaling of that bay. Area D should be used only on the ebb tide when it is not possible for the dredging vessel or barge to cross the bar."

CREST solicited additional comments on the use of Area D in October of 1985 and received the following response from the Environmental Protection Agency (EPA):

(24) <u>November 20, 1985, letter from EPA to CREST</u>:

"EPA has the following policy on three items proposed as County comprehensive plan amendments:

"(1) We have consistently held that the use of Area "D" is to be restricted to those periods when sea and weather conditions are hazardous for safe passage over the bar. At all other times we expect dredged material to be dumped at the designated Ocean Disposal Sites off the mouth of the Columbia River or at approved upland disposal sites. All dredged material disposal at area "D" must take place on an ebb tide.

"(2) ...

"(3) ...

"There is an apparent misunderstanding of resource agency policies concerning the use of area "D". We recommend the County request this issue be placed on the agenda of the upcoming annual dredging meeting held by the Corps of Engineers. This would provide an opportunity for all interested agencies to articulate their policies and resolve the misunderstanding."

On October 10, 1985, Clatsop County issued a permit to the Port of Chinook for dredged material disposal at Area D. The permit contained the following conditions restricting the use of the site:

(25) Staff report attached to October 10, 1985, Clatsop County development permit:

"A. Dredged material shall be disposed of at Area D only during periods when sea or weather conditions pose a hazard to safe transport of the dredged materials over the Columbia River Bar. Dredged material shall be disposed of at approved offshore disposal sites when the dredged material can be safely transported over the Columbia River bar.

"B. When dredged material disposal at Area D is allowed under provisions of condition A, above, said disposal shall occur only during ebb tides.

"C. The applicant shall present Clatsop County with written confirmation from the U.S. Army Corps of Engineers that the dredging contract contains provisions requiring the dredging operation to comply with Conditions A and B, above."

The Corps of Engineers did not include provisions in their dredging contract to restrict the use of Area D to periods of inclement weather. The Corps did, however, provide the following response to Condition A in the County permit:

(26) September 27, 1985, letter from the Corps to the Port of Chinook:

"We strongly believe that it is inappropriate to expect or request a contractor to cross the Columbia River Bar and go to an ocean disposal site after October 15, 1985. We normally bring our Corps of Engineers seagoing hopper dredges off the bar on or before October 15, due to the inclement weather and hazardous conditions. We anticipate award of a contract to dredge 125,000 cubic yards in Chinook channel on October 4, 1985. A tug and barge will be used for disposal of material from this project. Work is anticipated to start on approximately October 15 and continue to the end of the environmental window on November 30, 1985.

"It is much more hazardous for a small tug and barge than for our seagoing hopper dredge to cross the bar. In the interest of safety to both life and property, we will not require our contractor to cross the bar. This is consistent with the current wording of the Clatsop County comprehensive plan regarding inclement weather."

The majority of resource agencies and local shoreline master programs and comprehensive plans have applied restrictions to use of Area D in order to reduce the amount of disposal at the site. Some agencies have been inconsistent in their policy toward Area D; however, restricting the use of the site to

periods of inclement weather is the prevailing policy at local, state, and federal levels.

SHOALING IN BAKER BAY

Causes of Shoaling

Baker Bay has shoaled considerably in the past 100 years. Because the shoaling process is attributable to a combination of many influences, the causes of shoaling in Baker Bay cannot be precisely determined. Natural and human influences that may have affected the movement of sediment into and out of the bay are listed below.

1. Natural shoaling in estuaries: Estuaries such as the Columbia were formed 10,000 to 15,000 years ago when sea level rose rapidly and flooded coastal river valleys. Since this time, the natural process has been a slow infilling of the estuary with sediments.

2. Natural changes in circulation, sediment load, etc.: Natural changes in circulation patterns, river discharge levels, and sediment load in the Columbia River have caused both deposition and removal of sediments from Baker Bay in the past. The net effect on the bay is unknown.

3. Volcanic eruptions: Volcanic eruptions contribute a great deal of sediments to the estuary. Sediment from the Mt. St. Helens eruption may have contributed significantly to shoaling in Baker Bay.

4. Upriver Human Activities: Timber and agricultural practices in the Columbia River drainage basin have tended to increase the total amount of sediment entering the river. Damming and water diversion activities have had the opposite effect by reducing the large sediment loads carried by the river. The total sediment transport capacity of the river has been reduced by three quarters since before 1950 (Ogden Beeman and Associates 1985a, p. 13). In addition, dredging and subsequent upland disposal upriver from the estuary has reduced the total amount of sediment available to the estuary (Ogden Beeman and Associates 1985a, p. 13). The net effects of these activities on Baker Bay has been an increase in sediment load and the potential for shoaling prior to the 1940's and 50's and a decrease in sediment load after the 1950's. The present and future trend seems to be a reduction in shoaling stemming from these factors (Ogden Beeman and Associates 1985b, pp. 132-136).

5. Jetty Construction: Construction of the entrance jetties has led to the stabilization and enlargement of Sand Island in Baker Bay. The jetties have also lead to a decrease in ocean wave influence in Baker Bay. The net effect of jetty construction has been to increase shoaling in Baker Bay.

6. Flow Diversion Structures in the Estuary: The construction of pile dikes and creation dredge spoil islands have diverted the main river flow from the north side of the lower estuary to

the south side. These activities have probably contributed to shoaling in Baker Bay by reducing the potential for flushing the bay during freshets.

7. Pilings and Fish Traps: In the late 1800's and early 1900's many pilings were placed in Baker Bay to anchor fish traps and to support structures. A large number of these pilings still exist. The net effect on Baker Bay has been to reduce currents and increase shoaling in the bay.

8. Diking: About 5,000 acres of the Chinook and Wallacut River tidelands were diked in the 1930's (Thomas, 1983, pp. 15 and 25). Removal of these areas from tidal influence has reduced the volume of tidal exchange of the rivers, thus reducing the rivers' total flushing effects on the bay. The net effect of diking the tidelands has been to increase shoaling in Baker Bay.

9. Dredged Material Disposal: Since about 1945, the Corps of Engineers has been dumping dredged material at Area D. A portion of this material enters Baker Bay. The net effect is an increase in shoaling in the bay.

10. Dredging: Channel dredging in Baker Bay has reduced the total amount of sediment in the bay.

History of Shoaling in Baker Bay

The history of Baker Bay shoaling is recorded in a series of navigation charts of the estuary mouth produced from 1839 to 1982 (Appendix A). Table 1 lists the major human events that have contributed to shoaling and sediment removal in the bay.

Prior to jetty construction in 1885, only natural influences had caused changes in Baker Bay. The mouth of the Columbia River, including Baker Bay, was an extremely dynamic environment. Channels and sand bars continually changed in size, shape, and position. Between 1839 and 1848, Sand Island was located mid-river approximately 4.3 miles south of Cape Disappointment (Appendix A, Figures A-1 thru A-3). By 1870, the island had naturally shifted 1.55 miles to the north to a position 2.75 miles south of Cape Disappointment (Appendix A, Figures A-4 and A-5).

The natural northerly movement of Sand Island continued until 1885 when south jetty construction began. While the jetty was being built, Sand Island moved into Baker Bay and enlarged (Appendix A, Figure A-6). By 1910, the island stabilized in approximately its present location (Appendix A, Figures A-7 thru A-10) due to changes in current flow patterns resulting from the new jetty. The movement and stabilization of Sand Island in Baker Bay has been the largest recorded shoaling event in the bay.

Table 1. Chronology of important events affecting shoaling in Baker Bay

1885	South jetty construction began
1895	South jetty construction completed (4.25 miles long)
1913	North jetty construction began Eleven foot barge access channel dredged from the east end to the north tip of Sand Island
1914	South jetty extension completed
1917	North jetty extension completed
1932	Chinook pile dike constructed
1935	Channel from the east side of Sand Island to Ilwaco completed (east channel)
1939	Jetty A completed Four Sand Island pile dikes completed
1940	Chinook Channel (10 ft), mooring basin and breakwaters completed Sand Island breached
1945	Ilwaco (West) Channel completed (8 ft) Use of Area D for the disposal of dredged materials begins
1950	Ilwaco (West) Channel deepened to 10 ft
1951	Maintenance of East Channel discontinued
1953	Fourth pile dike on West Sand Island completed
1984	Ilwaco (West) Channel deepened to 16 ft

Shoaling continued to occur in the bay through the 1930's (Appendix A, Figures A-11 thru A-13). Factors contributing to this shoaling included the shelter from strong currents and waves brought on by Sand Island's presence in the bay, the effects of numerous pilings in the bay, and, possibly, the effects of diking the Chinook and Wallacut River tidelands and the increased sediment load in the Columbia River due to upriver activities. From 1868 through 1935 Baker Bay gained about 104 to 119 million cubic yards of sediment (Table 2) (Sherwood, et al. 1984, p. 307). This represents a shoaling rate of 1.47 inches per year (Table 2) (Sherwood, et al. 1984, p. 311). Table 3 shows the large shift in deep water area to shoal area.

In the period between 1935 and 1958, Baker Bay lost sediment on the average (Appendix A, Figures A-14 and A-15). This sediment loss is attributable primarily to the breach in Sand Island that occurred in 1940. A great deal of sediment was lost from the gap between the islands during the occurrence of the breach. In addition, the newly opened gap resulted in scouring and deepening of the shallow flats immediately north of the islands. Two channel dredging projects in the period between 1935 and 1958 also resulted in the removal of sediments from Baker Bay: Chinook Channel in 1940 and West (Ilwaco) Channel in 1945. The overall loss of sediment from Baker Bay from 1935 to 1958 amounted to about 4.8 to 6.2 million cubic yards (Table 2) (Sherwood, et al. 1984, p. 307). This represents an "erosion" rate of 0.21 inches per year (Table 2) (Sherwood, et al. 1984, p. 307). Table 3 shows a small shift of shoal area to deep water area. Although the overall average change in Baker Bay from 1935 to 1958 involved a loss of material, the inner bay tidal flats continued to shoal in at a slow rate during this period (CREDDP 1984, p.5).

Numerical data on shoaling rates from 1958 to the present were not available as of the date of this report. The Corps of Engineers has contracted for the development of these data. Bathymetric differencing maps indicate that since 1958, scouring of sediments from the gap between East and West Sand Island has decreased and that the inner bay flats have been slowly shoaling (CREDDP 1984, p.5). The magnitude of the bay's bathymetric changes has been lower in recent times than in previous periods (Appendix A, Figures A-16 thru A-18).

Table 2. Shoaling in Baker Bay from 1868 to 1958 (modified and recalculated from Sherwood, et al. 1984, pp. 276-318)

Measurement	1868-1935	1935-1958	1868-1958
Sediment volume changes (millions of cubic yards)	gain of 104-119*	loss of 4.8-6.2	gain of 99-113
Shoaling rate** (inches per year)	1.47	-0.21	1.03

*Two figures are given because the researcher calculated the amounts using two different methods (see Sherwood, et al. 1984, pp. 308-310).

**The shoaling rates were calculated using the bay's total area below +3' MLLW. Areas above +3' MLLW were not considered in the calculations because the original data included a significant amount of upland area in this elevation category. Upland area is not subject to shoaling; therefore, more accurate shoaling estimates are obtained by excluding these areas from the calculations.

Table 3. Changes in surface area of three depth regimes in Baker Bay, 1868 to 1958 (modified from Sherwood, et al. 1984, pp. 276-318)

Depth Regime (datum MLLW)	Area (acres)			Area Change (acres)		
	1868	1935	1958	1868-1935	1935-1958	1868-1958
above +3'	0	1035	971	+1035	- 64	+ 971
+3' to -3'	1728	5742	5418	+4014	-324	+3690
-3' to -18'	5571	1701	2061	-3870	+360	-3555
below -18'	1188	0	36	-1188	+ 36	-1152

DREDGED MATERIAL DISPOSAL AT AREA D

Disposal Practices

Area D is used for maintenance dredging of Desdemona, Flavel, Upper Sands and Tongue Point Crossing shoals and for portions of West (Ilwaco), Chinook, and Skipanon Channel maintenance. The disposal site is also used intermittently during Columbia River Bar maintenance dredging. Table 4 shows the annual disposal amounts at Area D from 1966 through 1984.

The use of Area D has changed considerably since the 1970's. The total average annual disposal amount has decreased from 1,320,000 cubic yards in the 1971 through 1977 period to 742,000 cubic yards in the 1978 through 1984 periods. Much of this decrease is attributable to a policy shift regarding disposal of sediments from the mouth of the Columbia River (MCR) project. In the early and mid 1970's, sediments dredged from inner portions of the bar were routinely disposed of in Area D. In addition, sediment loads from the MCR project were dumped in Area D when the dredging vessel came back into the river for shift changes and resupplying. These practices were discontinued in the late 1970's, resulting in a substantial decrease in the use of Area D for MCR disposal. MCR sediments are now disposed of in Area D only when the hopper dredge, after loading up on the bar, is forced back into the river due to rough weather conditions.

The majority of disposal at Area D is now undertaken as relief work for MCR dredging. Relief work is performed when the Corps hopper dredge discontinues work on the bar due to rough weather conditions and moves into the estuary to dredged other projects. According to Corps of Engineers information, 61% of the dredging in Baker Bay, Chinook and Skipanon Channels and 85% of the dredging on lower Columbia River Bars is relief work. On the average, 84% of the disposal in Area D is undertaken as relief work (Nancy Case, personal communication, 11/25/85; Appendix B). If one can assume that bar conditions during all periods of relief work are too rough for safe navigation to ocean disposal sites, then 84% of the disposal at Area D is in conformance with agency, shoreline master program, and comprehensive plan policy. This assumption, however, is not entirely valid because there are periods when weather conditions are too rough to dredge on the bar but not too rough to cross the bar. During these periods, disposal in Area D would still be contrary to agency shoreline master program and comprehensive plan policy. The number of times that those instances occur cannot be quantified.

Present disposal at Area D averages 645,000 cubic yards per year. Of this amount, 104,850 cubic yards or 16% are not disposed of during relief work and potentially do not comply with the inclement weather policy. Some of this 104,850 cubic yards disposal may, however, occur during rough weather

Table 4. Annual dredged material disposal volumes at Area D, 1966 through 1984 (from Corps of Engineers records)

	Disposal Amounts by Project (x 1,000 cubic yards)			
YEAR	MOUTH OF THE COLUMBIA RIVER	CHINOOK SKIPANON BAKER BAY	OTHER*	TOTAL
1966	156	0	1,410	1,566
1967	235	0	652	887
1968	126	0	308	434
1969	29	0	12	41
1970	3	0	490	493
1971	242	0	608	850
1972	288	0	1,254	1,542
1973	410	0	666	1,076
1974	507	1	1,006	1,514
1975	896	16	908	1,820
1976	759	0	890	1,649
1977	710	0	76	786
1978	146	0	703	849
1979	158	28	351	537
1980	236	59	313	608
1981	61	117	1,071	1,249
1982	34	22	143	199
1983	43	137	115	295
1984	66	154	1,236	1,456
Total	5,105	534	12,212	17,851

*Flavel, Desdemona, Upper Sands, and Tongue Point Crossing shoals

conditions (for example see page 12, excerpt 26, and preceding discussion). In these instances disposal at Area D would conform to the policy. The number of times that these instances occur cannot be quantified.

Scientific Research Pertaining to Area D

Several research projects have provided information on sediment transport at Area D. The Columbia River Estuary Data Development Program (CREDDP) produced estuary-wide information on currents, sediment transport, and shoaling that is useful for examining Area D. Prior to CREDDP, the Corps of Engineers funded two research projects on the movement of sediment from Area D: Walter, et al. (1979) and Roy, et al. (1982).

Sediments deposited at Area D move from the vicinity of the site to other localities after disposal (Walter, et al. 1979, p. 30). The material disposed of at Area D can be transported from the site either suspended in the water (suspended sediment transport) or along the bottom (bedload sediment transport). The type of sediment transport is dependent mainly on sediment grain size and current speed. In the vicinity of Area D, sediments with grain sizes smaller than 2.5 phi (0.18 mm) are generally transported in suspension while sediments with grain sizes larger than 2.5 phi are generally transported as bedload. Table 5 shows the amounts of Area D sediment falling in each of the two grain size categories. Once sediment enters Baker Bay, either in suspension or bedload, most of it will settle and remain because of the slower currents in the bay.

As indicated by the comparison of phi sizes most of the sediment transported from Area D moves in the bedload. Bedload sediment transport patterns in the vicinity of Area D are extremely complex. Net transport is upstream in the north channel just south of Area D and downstream in the area immediately north of Area D. Area D itself shows seasonal variation in transport patterns; however, the primary transport is in the upstream direction (Sherwood, et al. 1984, p. 142: Fox, et al. 1984, plates 8 and 9; Roy, et al. 1982, Appendix p. 26).

More specific evidence concerning the movement of sediment from Area D appears in the two studies funded by the Corps of Engineers. Walter, et al. (1979) examined currents, suspended and bedload sediment transport, sediment size, and sediment mineralogy at Area D and other parts of the estuary and adjacent ocean. The researchers' findings pertaining to Area D include the following:

1) (p.43) "The north channel around Site D is dominated by medium grained sands (1.75 - 2.0 phi) with local distributions of coarser sand (0.50 - 1.50 phi)."

Table 5. Amounts of Area D sediment in two grain size categories (Nancy Case, Personal Communication, 11/25/85)

Project/ Bar	Average annual cubic yards	Average cubic yards larger than 2.5 phi*	Average cubic yards smaller than 2.5 phi*
Flavel	500,000	390,000	110,000
Other lower Columbia River Bars	30,000	25,500	4,500
MCR	50,000	45,000	5,000
Skipanon, Chinook, Baker Bay	65,000	16,250	48,750
Totals	645,000	476,750	168,250

*Sediments larger than 2.5 phi are more likely to be transported from Area D as bedload. Sediments smaller than 2.5 phi are more likely to be transported from Area D in suspension.

2) (p.43) "Bottom currents around Site D are generally strong enough to remove sediment finer than the ambient sediment present in the north channel."

3) (p.43) "Currents around Site D have a significant cross-channel component that probably produces a net movement toward Baker Bay."

4) (p.43) "Dredged materials disposed at this site are not stable and are transported away from the site, probably, in part, into Baker Bay."

Roy, et al. (1982) examined sediment transport at Area D by recording changes in a mound of sediment deposited at the site and by following the movements of florescent-dyed sediment placed at the site. This study focused on bedload transport of Area D sediment in the north channel and made no measurements in Baker Bay. The researchers' findings pertaining to Area D are as follows:

1) (pp. 25-26) The mound of sediment placed at Area D changed little in the six weeks following disposal. Although the western part of the mound moved slowly downstream, evidence suggested that the net movement of the entire mound was upstream.

2) (pp. 26-27) The florescent-dyed sediment placed at Area D moved both upstream and downstream along the axis of the north channel. The sediment moved farther and more rapidly upstream than downstream. The researcher stated that "These data suggest that bottom currents in the north channel must be reversing and generally stronger and/or of longer relative duration and more variable in an upstream direction " (quote: Roy, et al. 1982, p.27).

3) (p.28) The material at Area D that moves upstream is possibly transported to Desdemona Sands.

Further discussions with the researchers studying sediment transport in the estuary have provided additional information on the potential movement of Area D sediment into Baker Bay. Most of the sediment transported in the bedload into Baker Bay originates from the north shore of the estuary and moves into the Chinook Channel entrance of the bay (Chris Sherwood, personal communication, 9/10/85). There is no evidence of significant bedload transport directly from Area D to Baker Bay (Chris Sherwood personal communication, 9/10/85; Ed Roy, personal communication 9/17/85). Apparently, the main potential for sediment transport from Area D to Baker Bay is through suspended sediment transport, which involves that portion of the disposed of sediment with grain sizes smaller than 2.5 phi (Table 5).

The research discussed above has produced evidence that a portion of the material deposited at Area D is transported into Baker Bay; however, none of the research results are conclusive. It is safe to assume that the material moves to a number of different localities, including northward into Baker Bay, upstream, possibly to Desdemona Sands, and downstream, possibly to the main navigation channel. The relative percentages of material moving from Area D to these three localities is not known. It appears, however, that of the three, Baker Bay likely receives the least amount.

Potential Significance of Area D Disposal to Shoaling in Baker Bay

Comparisons of the past shoaling rates in Baker Bay to other parts of the estuary and to disposal amounts at Area D help demonstrate the potential significance of Area D to shoaling in Baker Bay. One inch of shoaling in Baker Bay requires about 1,011,000 cubic yards of sediment (based on the bay's surface area excluding tidal marshes--36,400,000 square yards). The Corps can be expected to place an average of 645,000 cubic yards of sediment per year at Area D (Nancy Case, personal communication, 11/25/85). Table 6 shows projected shoaling rates in Baker Bay based on assumptions involving various percentages of Area D sediment entering the bay.

Comparisons with actual measured shoaling rates demonstrate the relative significance of the projected shoaling rates listed in Table 6. Table 7 shows shoaling rates of the estuary's bays calculated from 1868 to 1958. Baker Bay has shoaled in at a rate of 1.03 inches per year during this time period. This shoaling rate could not be produced even if all of the Area D sediment was deposited in Baker Bay. If 86% of the Area D material moved into Baker Bay, the resulting shoaling rate would, however, be greater than that experienced by the other bays of the estuary from 1868 to 1958 (Table 7). Assuming that only fine-grained sediments capable of being transported in suspension are transported from Area D to Baker Bay, the shoaling rates attributable to dredged material disposal are much lower (Table 6).

Table 6. Projected shoaling rate of Baker Bay based on the portion of sediment disposed of at Area D (projections do not include other sediment sources)

% of Total Area D Sediment Assumed to Enter Baker Bay	Projected Shoaling Rate Assuming all Area D Sediments have the Potential to Enter the Bay (inches per year)	% of Area D Sediment Finer than 2.5 phi Assumed to Enter Baker Bay	Projected Shoaling Rate Assuming only Sediments Finer than 2.5 phi have the Potential to Enter the Bay (inches per year)
100% (645,000 cu. yd.)	0.64	100% (168,250 cu. yd.)	0.17
75% (483,750 cu. yd.)	0.48	75% (126,188 cu. yd.)	0.12
50% (322,500 cu. yd.)	0.32	50% (84,125 cu. yd.)	0.08
25% (161,250 cu. yd.)	0.16	25% (42,063 cu. yd.)	0.04
15% (96,750 cu. yd.)	0.10	15% (25,238 cu. yd.)	0.02
10% (64,500 cu. yd.)	0.06	10% (16,825 cu. yd.)	0.02
5% (32,250 cu. yd.)	0.03	5% (8,413 cu. yd.)	0.01
0% (0 cu. yd.)	0	0% (0 cu. yd.)	0

Table 7. Shoaling rates in the Columbia River Estuary from 1868 to 1958 (recalculated from Sherwood, et al. 1984, p.311*)

Geographic Region	Shoaling Rate (inches per year)
Baker Bay	1.03
Youngs Bay	0.55
Inner Grays Bay	0.29
Cathlamet Bay	0.36

*These values represent the shoaling rate of the bays' total areas below +3' MLLW. Areas above +3' MLLW were not considered in the calculations because the original data included a significant amount of upland area in this elevation category. Upland area is not subject to shoaling; therefore, more accurate shoaling estimates are obtained by excluding these areas from the calculations.

ALTERNATIVES TO USING AREA D

Estuarine in-water disposal is considered to have greater environmental impacts than ocean or upland disposal. In order to justify the use of Area D, alternative disposal means that result in fewer environmental impacts must be examined. Area D should not be used if feasible alternative disposal sites exist.

Potential alternatives to disposal at Area D include disposal at upland, beach nourishment, and ocean sites. At present, there are upland disposal sites designated for channel maintenance on East and West Sand Islands and on the Skipanon peninsula. These sites do not have capacity to meet the disposal needs for all of material fated for Area D. Local comprehensive plans currently do not designate any beach nourishment sites in the lower estuary. The Corps, however, uses beach nourishment sites on East and West Sand Islands. These sites also do not have the capacity to receive all of the material currently disposed of in Area D. Ocean disposal sites off the mouth of the Columbia River seem to provide an alternative to Area D during calm weather conditions when the dredging vessel can safely navigate over the bar.

The ocean disposal sites have several advantages because they have capacity to handle the Area D material and do not pose significant engineering problems or unresolved environmental constraints. Use of ocean disposal sites is, however, more costly than using Area D primarily because the ocean sites are more distant from the dredging areas. In addition to the extra costs incurred due to longer travel distances, there is a secondary effect on costs because the time lost by the Corps hopper dredge while steaming to ocean sites has to be offset by more expensive private contractor dredging. The present annual cost of hopper dredging on the shoals and channels which involve disposal at Area D is approximately 6.7 million dollars (Nancy Case, personal communication, 10/29/85; Appendix B). The cost increase for disposing of all of the Area D sediments at ocean sites would amount to about 1.88 million dollars (Nancy Case, personal communication 10/29/85; Appendix B). The 1.88 million dollar estimate assumes that all disposal at Area D would be replaced with ocean disposal; however, policy requires that disposal at ocean sites in lieu of Area D occur only during calm weather conditions. Based on current disposal practices, the Corps of Engineers would have to expend approximately 306 thousand dollars in addition to their 6.7 million dollar total dredging cost in order to comply with the policy (Appendix B). This amounts to less than a 5% cost increase.

Evidence suggests that some of the material disposed of at Area D migrates back to maintained navigation channels. A reduction in the amount of disposal at Area D may significantly reduce the costs associated with rehandling the material during channel maintenance. Table 8 shows some estimated costs of

rehandling Area D material once it migrates back to maintained channels. Various quantities of sediment are given in Table 8 because the amount of dredged material that migrates back into navigation channels to be re-dredged is unknown. If, for example, 50% of the Area D sediments have to be re-dredged, then adherence to agency policy for Area D would reduce dredging in the estuary by about 52,000 cubic yards (Table 8). As a result, the $306,000 additional cost for adhering to Area D policy would be offset by approximately $70,000.

Table 8. Estimated costs of rehandling Area D sediments that have migrated back to maintained navigation channels. The 100% figure (104,850 cubic yards) represents the amount of Area D disposal that does not comply with restrictions on the use of the site.

Percent of Total Sediment that may re-enter maintained channels	Estimated Cost of Rehandling*
100% (104,850 cu. yd.)	$141,550
75% (78,638 cu. yd.)	106,160
50% (52,425 cu. yd.)	70,770
25% (26,213 cu. yd.)	35,390
0% (0 cu. yd.)	0

* The cost of rehandling is estimated at $1.35 per cubic yard.

POLICY OPTIONS FOR DISPOSAL AT AREA D

Four options for treating the policy for regulating disposal at Area D are outlined below.

Option 1: Retain the current policy of limiting the use of Area D to only those periods when sea and weather conditions are too rough for safe passage over the bar.

Option 1 would require the Corps to dispose of about 16% of the material currently placed at Area D in ocean sites. The estimated cost increase to the Corps would amount to approximately $306,000. Whether adherence to this policy would result in any significant reduction in the shoaling rate of Baker Bay cannot reasonably be determined. The inclement weather policy also presents problems because it is difficult to enforce. Since the ultimate decision concerning the safety of crossing the bar lies with the ship captain, the appropriateness of bar conditions for passage cannot be dictated by another agency or individual.

Option 2: Eliminate the inclement weather restriction on the use of Area D.

Option 2 would allow the Corps to continue their present practices of disposal at Area D. Removing the restriction would exempt the Corps from having to utilize feasible alternatives when such alternatives are available, would not result in any reduction in shoaling rates, and would likely result in increased usage of the site by the Corps.

Option 3: Revise the policy to specify maximum amounts of material that could be disposed of in Area D and the specific dredging projects that would be allowed to use Area D.

Under Option 3, the cubic yardage limit would be derived primarily from current disposal practices at the site. Provided that the Corps does not significantly alter their practices, this option would not result in the increase in maintenance dredging costs. Also, total disposal at the site would not increase. The policy would be enforceable because disposal records can be easily monitored. In order to be equitable, the policy should be written to include non-Corps dredging projects as well as Corps of Engineers channel maintenance projects. All projects listed for use of Area D would still have to comply with restrictions on sediment type, work timing, and any other conditions typically placed on dredging and disposal operations.

Option 4: Revise the policy to specify maximum amounts of material that can be disposed of in Area D and the specific dredging projects that would be allowed to use Area D. In addition, modify the inclement weather condition by setting a time period during which the bar would be considered generally

unsafe for vessel transit. A suggested period would be October 15 to May 15. During this period Area D could be used for disposal of sediments without consideration of ocean sites as feasible alternatives; over the remaining period use of Area D would be restricted to specific times when the bar is, in fact, not passable.

The effects of implementing Option 4 would be similar to those listed under Option 3. Retaining a modified version of the inclement weather restrictions would, however, present a continued enforcement problem. This problem could be resolved through closer coordination with the Corps.

The following summary outlines factors discussed in this report which pertain to policies controlling the use of Area D. These factors provide a premise for making a decision regarding future Area D policy.

1) The current policy restricting the use of Area D to inclement weather periods when the dredging vessel cannot safely use ocean disposal sites was based primarily on two points: (1) disposal at Area D contributes significantly to shoaling problems in Baker Bay and (2) estuarine in-water disposal is undesirable and should only be performed when no feasible alternative disposal sites are available. The current policy assumes that ocean sites offer feasible alternatives during calm weather conditions.

2) The proposed options only affect that portion of the disposal in Area D which currently does not comply with the inclement weather policy. This amounts to approximately 16% of the total disposal or 104,850 cubic yards per year. This cubic yardage estimate is based on the following assumptions:

a) the estimate that 16% of the total disposal at Area D is not undertaken as relief work is correct and
b) the total disposal figure for Area D of 645,000 cubic yards per year will not change significantly in the future.

3) The proposed policy options will probably not significantly affect the shoaling rate of Baker Bay. This statement is based on the following assumptions:

a) only 16% of the total disposal is impacted by the policy,
b) of this percentage, only the sediments capable of being carried in suspension have the potential for entering Baker Bay (total 27,000 cubic yards per year), and
c) of this final cubic yardage, only a fraction actually does enter the bay

4) The use of offshore disposal sites during periods when the use of Area D does not comply with the inclement weather policy will result in a 4 to 5% increase in the dredging costs of the relevant projects. A determination of the feasibility of using offshore sites is dependent upon a determination of the significance of this 4 to 5% cost increase. The cost increase estimate is based on the following assumptions:

a) The Corps would have to expend an additional $306,000 in order to comply with the inclement weather policy.
b) Only a small portion of this $306,000 is offset by the fact that less will be expended in rehandling Area D material when it migrates back to maintained navigation channels.

REVISED DISPOSAL POLICY

A final decision was made concerning the four policy options in coordination with the Washington and Oregon CREST Council members, the Army Corps of Engineers, and state and federal resource management agencies. Policy option 3 (see above) was selected with a 5-year 3,250,000 cubic yard limitation placed on Corps of Engineers projects and a 100,000 cubic yard per year limitation placed on non-Corps projects. Appendix C shows the language changes proposed for Clatsop County's Comprehensive Plan to accommodate the new Area D policy. Similar language will be incorporated into the CREST Regional Management Plan, shoreline master programs and other local comprehensive plans.

Option 3 appeared to best accommodate the factors which pertain to policies controlling the use of Area D (see above). The disposal limitations included in the policy will not allow disposal to increase significantly above its present level. The limitations are enforceable because disposal volume can be readily monitored. Since enforcing the current policy would increase channel maintenance costs and would not likely have any beneficial effect on Baker Bay, limiting the disposal to current levels appeared to provide the best compromise.

REFERENCES

Clatsop County. 1984. Comprehensive Plan, Goal 16 and 17 Element - Columbia River Estuary. Astoria, OR: Clatsop County.

Clatsop County. 1984. Clatsop County Land and Water Development and Use Ordinance. Astoria, OR: Clatsop County.

CREST. 1979. Columbia River Estuary Regional Management Plan. Astoria, OR: CREST.

Fox, D.S.; Bell, S.; Nehlsen, W.; Damron, J. 1984. The Columbia River Estuary: Atlas of Physical and Biological Characteristics. Astoria, OR: CREDDP.

Ogden Beeman and Associates, Inc. 1985a. Summary Report: Columbia River, Lower Estuary and MCR Shoaling Investigation. Portland, OR: U.S. Army Corps of Engineers.

Ogden Beeman and Associates, Inc. 1985b. Studies to Control Shoaling of the Navigation Channel, Lower Columbia River. Portland, OR: U.S. Army Corps of Engineers.

Oregon Historical Society. 1980. Columbia's Gateway, A History of the Columbia River Estuary to 1920. Vancouver, WA: PNRBC.

Roberson, J.A.; Copp. H.D.; Naik, B. 1980. Mathematical Modeling of Circulation in Baker Bay, Washington/Oregon. Pullman, WA: Washington State University.

Roy, E.H.; Creager, J.S. ; Gelfenbaum, G.R.; Sherwood C.R.; Stewart, R.J. 1982. An Investigation to Determine Sedimentary Environments Near the Entrance to the Columbia River Estuary. Seattle, WA: University of Washington.

Sherwood, C.R.; Creager, J.S.; Roy, E.H.; Gelfenbaum, G.; Dempsey, T. 1984. Sedimentary Processes and Environments in the Columbia River Estuary. Astoria, OR: CREDDP.

Thomas, D.W. 1983. Changes in Columbia River Estuary Habitat Types Over the Past Century. Astoria, OR: CREDDP.

U.S. Army Corps of Engineers. 1960. Interim Report on 1959 Current Measurement Program, Columbia River at Mouth, Oregon and Washington, Volume I. Portland, OR: U.S. Army Corps of Engineers.

Wahkiakum County. 1980. Shoreline Management Master Program for Wahkiakum County. Cathlamet, Washington: Wahkiakum County.

Walter, S.R.; Roy, E.H.; Creager, J.S.; Borgeld, J.C. 1979. An Investigation to Determine the Bedload and Suspended Load Transport Over the Outer Tidal Delta and Monitor the Sedimentary Environment at Sites A, E, and D Near the Mouth of the Columbia River. Seattle, WA: University of Washington.

APPENDIX A

MAPS OF BAKER BAY AND THE COLUMBIA RIVER ENTRANCE FROM 1839 THROUGH 1982

Map Sources: Figures A-1 thru A-11 are from maps compiled by the Oregon Historical Society, 1980; Figures A-12, A-13, A-14, A-16, A-17 are from maps compiled in a 1 July 1977 letter from the Corps of Engineers to the Port of Chinook; Figure A-15 is a NOAA Navigation Chart; Figure A-18 is a portion of the CREDDP base map of the estuary.

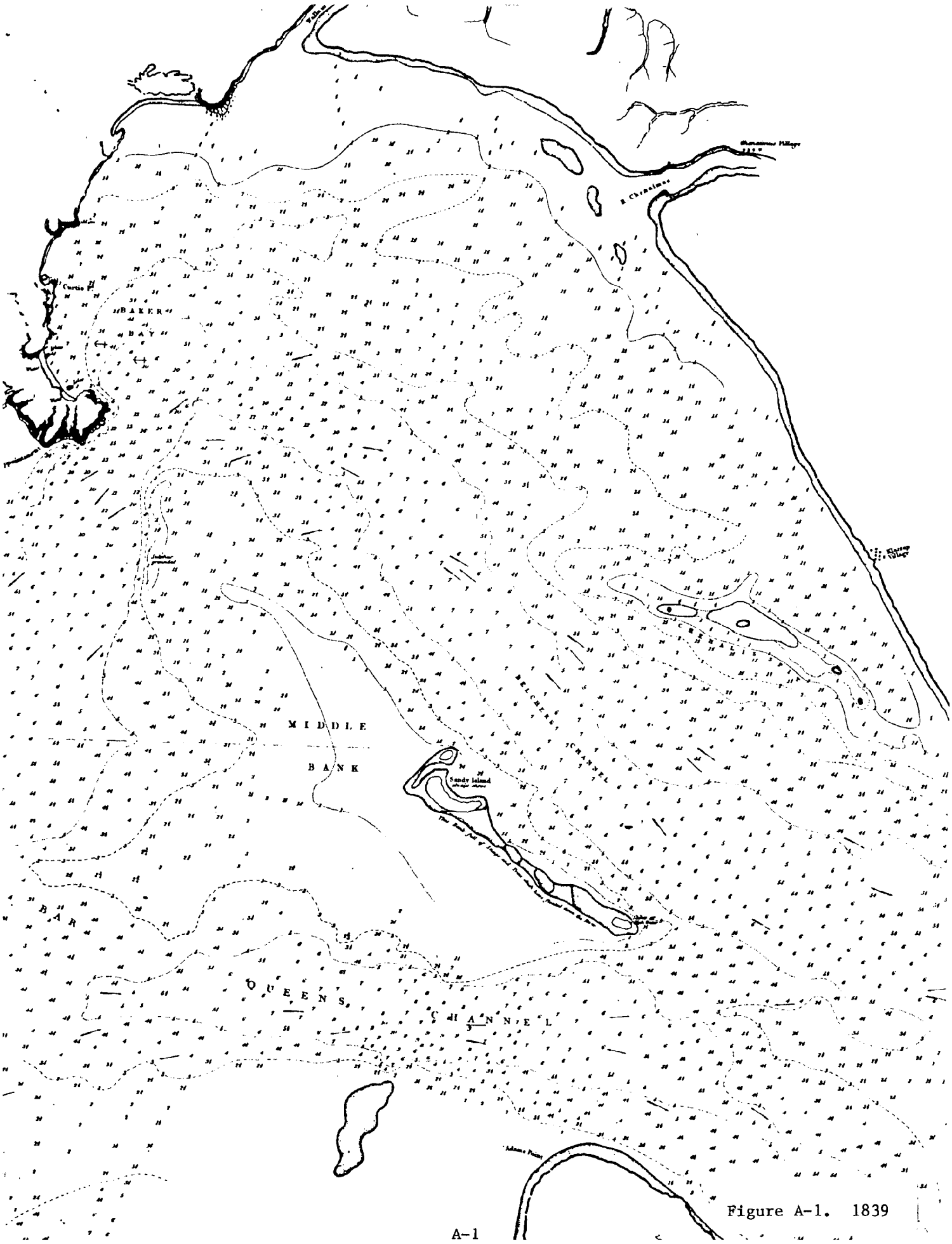

Figure A-1. 1839

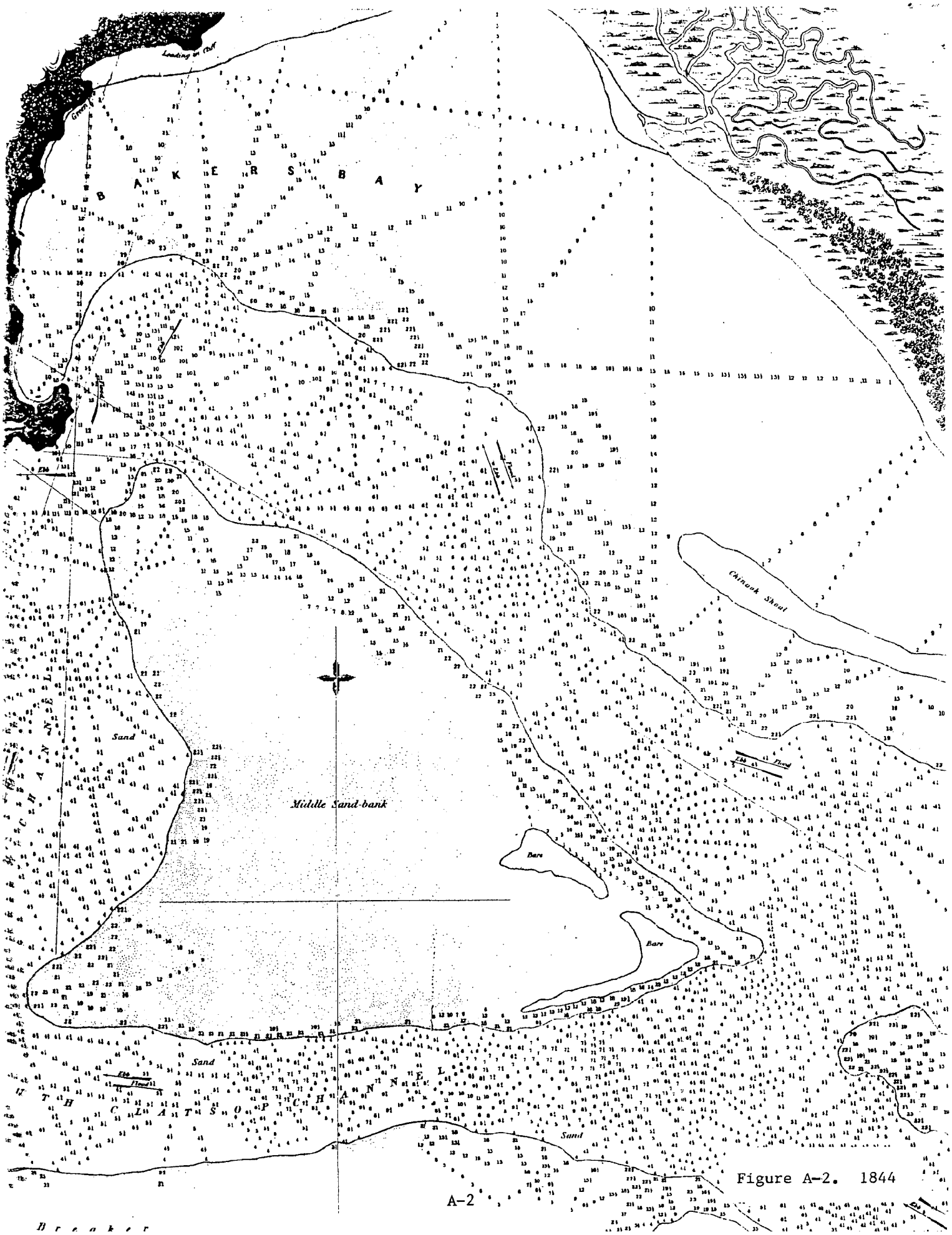

Figure A-2. 1844

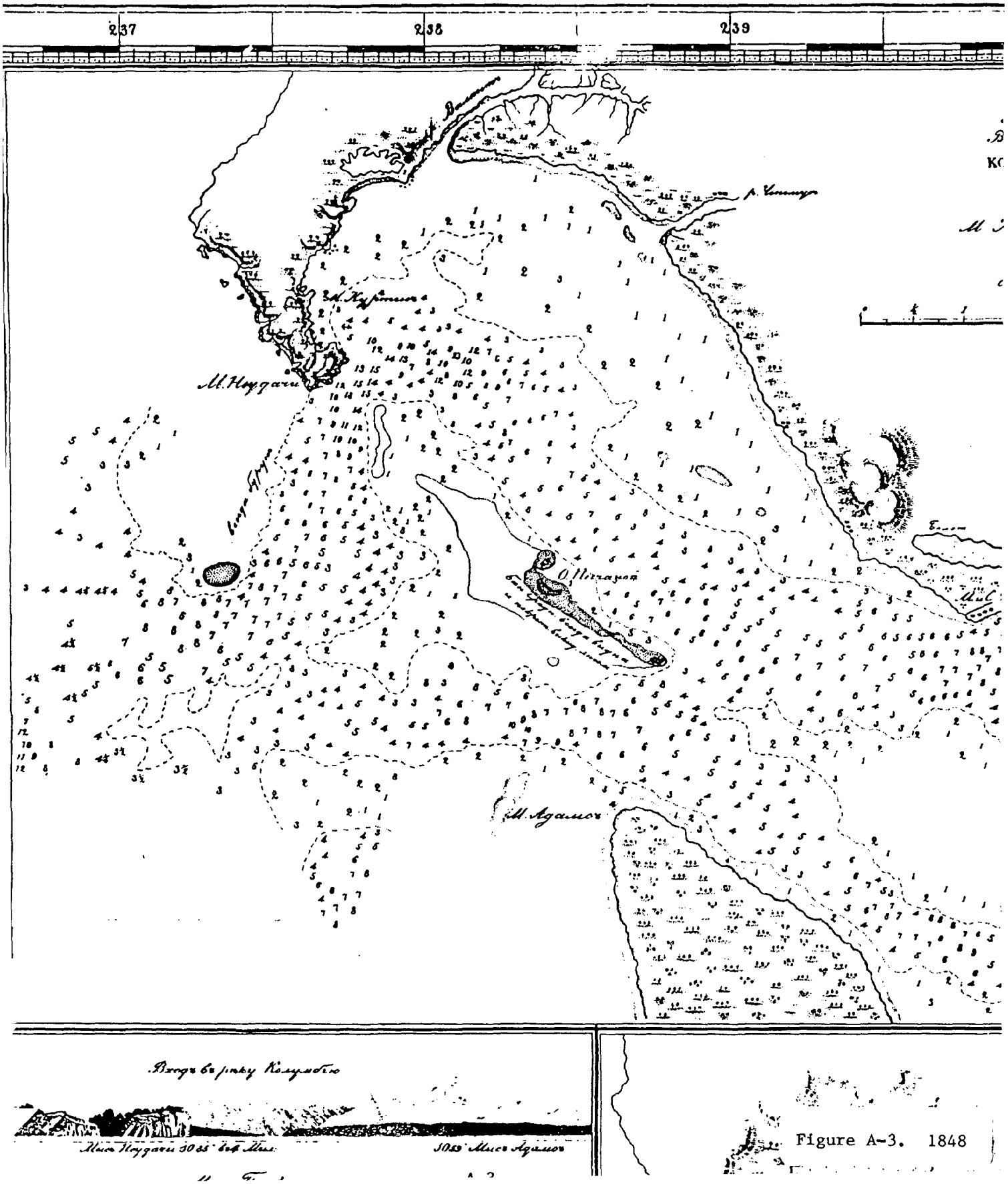

Figure A-3. 1848

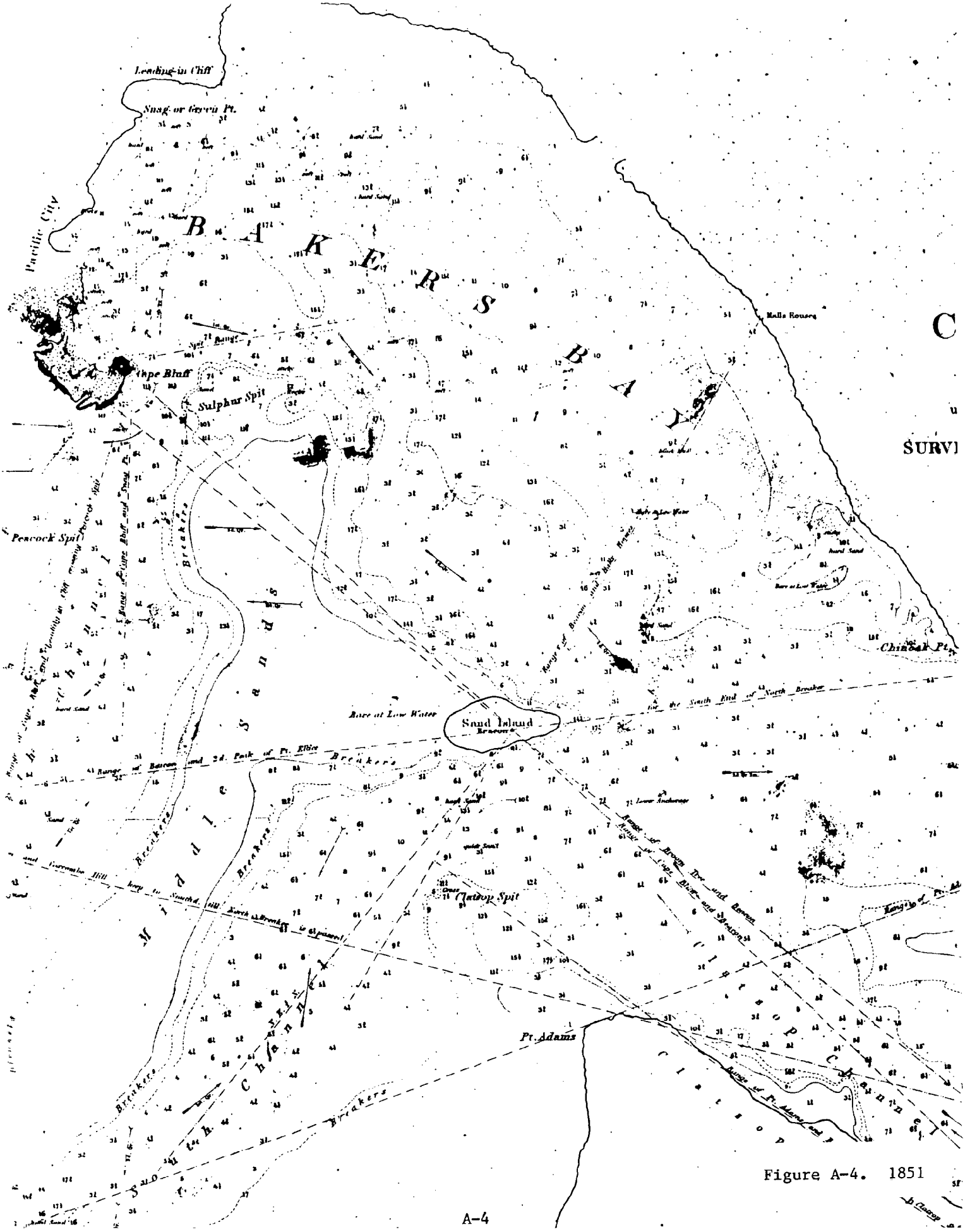

Figure A-4. 1851

Figure A-5. 1870

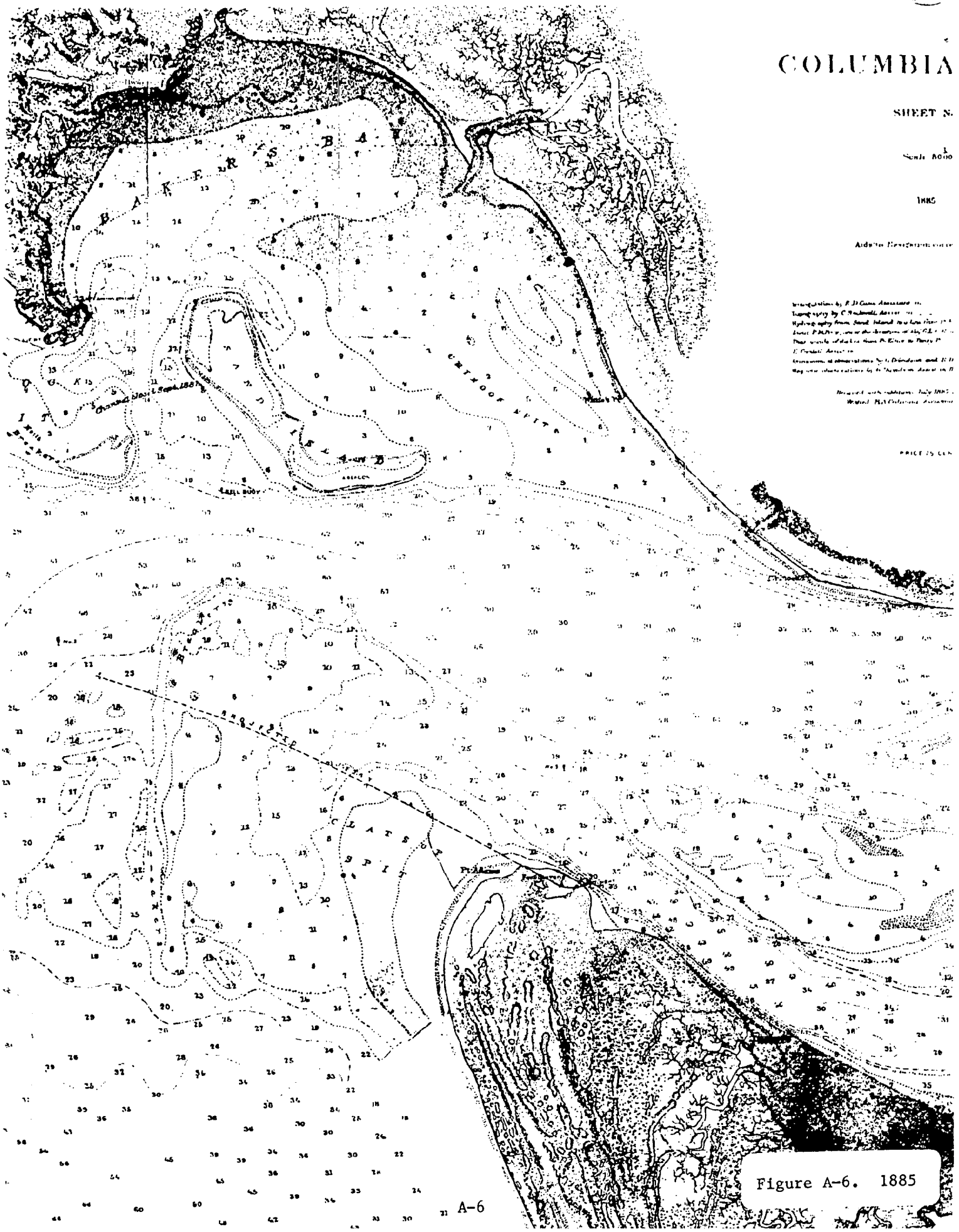

Figure A-6. 1885

Figure A-7. 1890

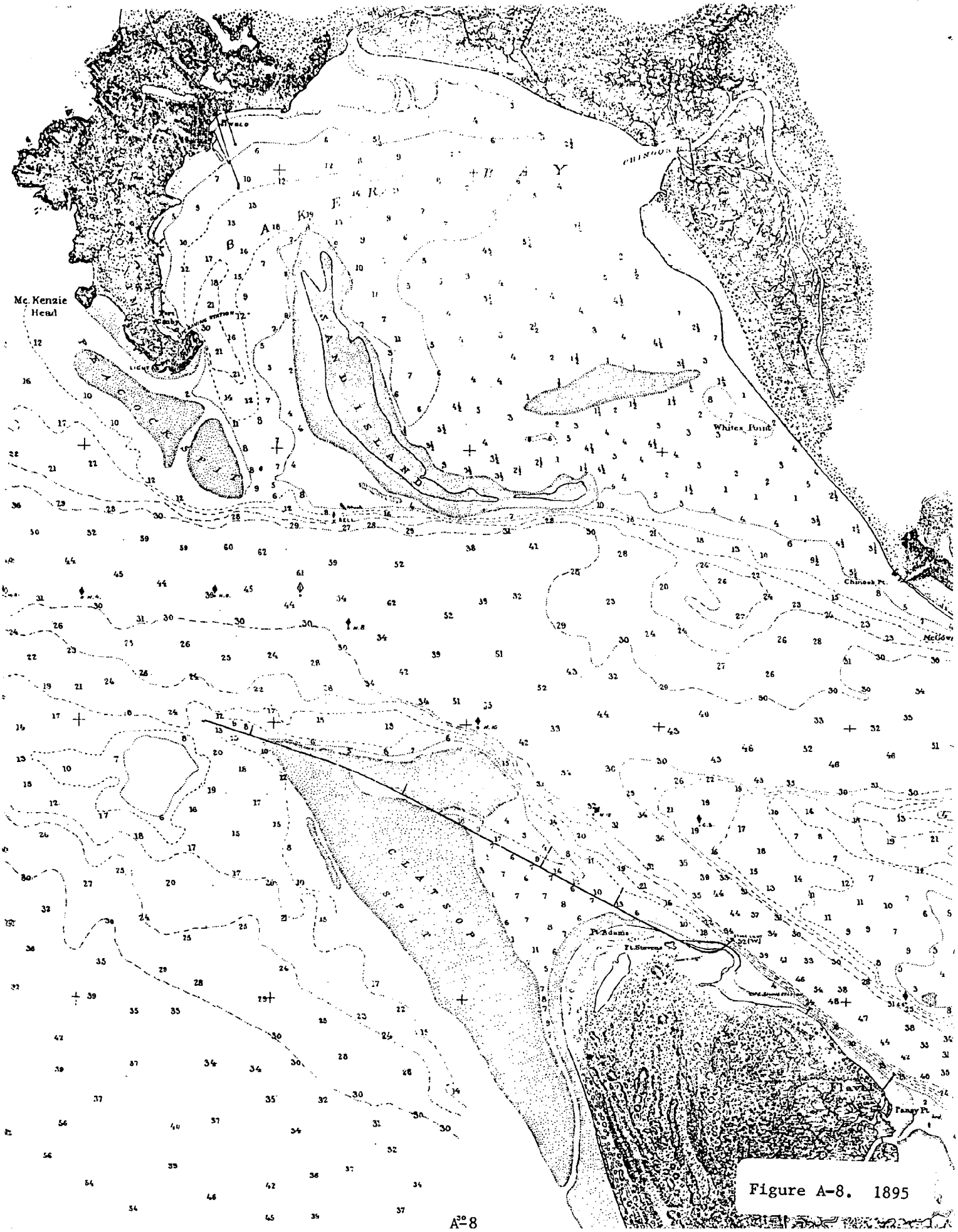

Figure A-8. 1895

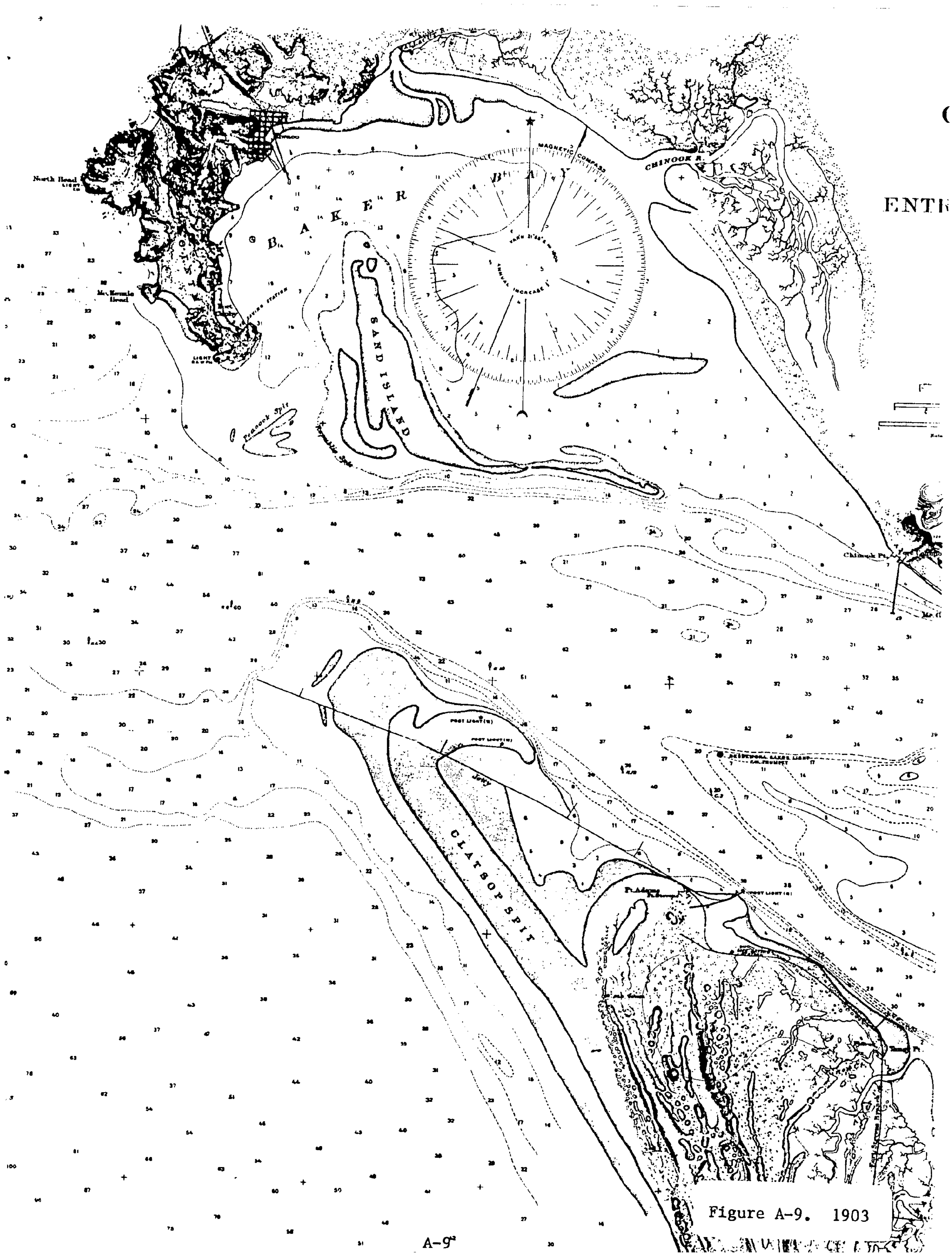

Figure A-9. 1903

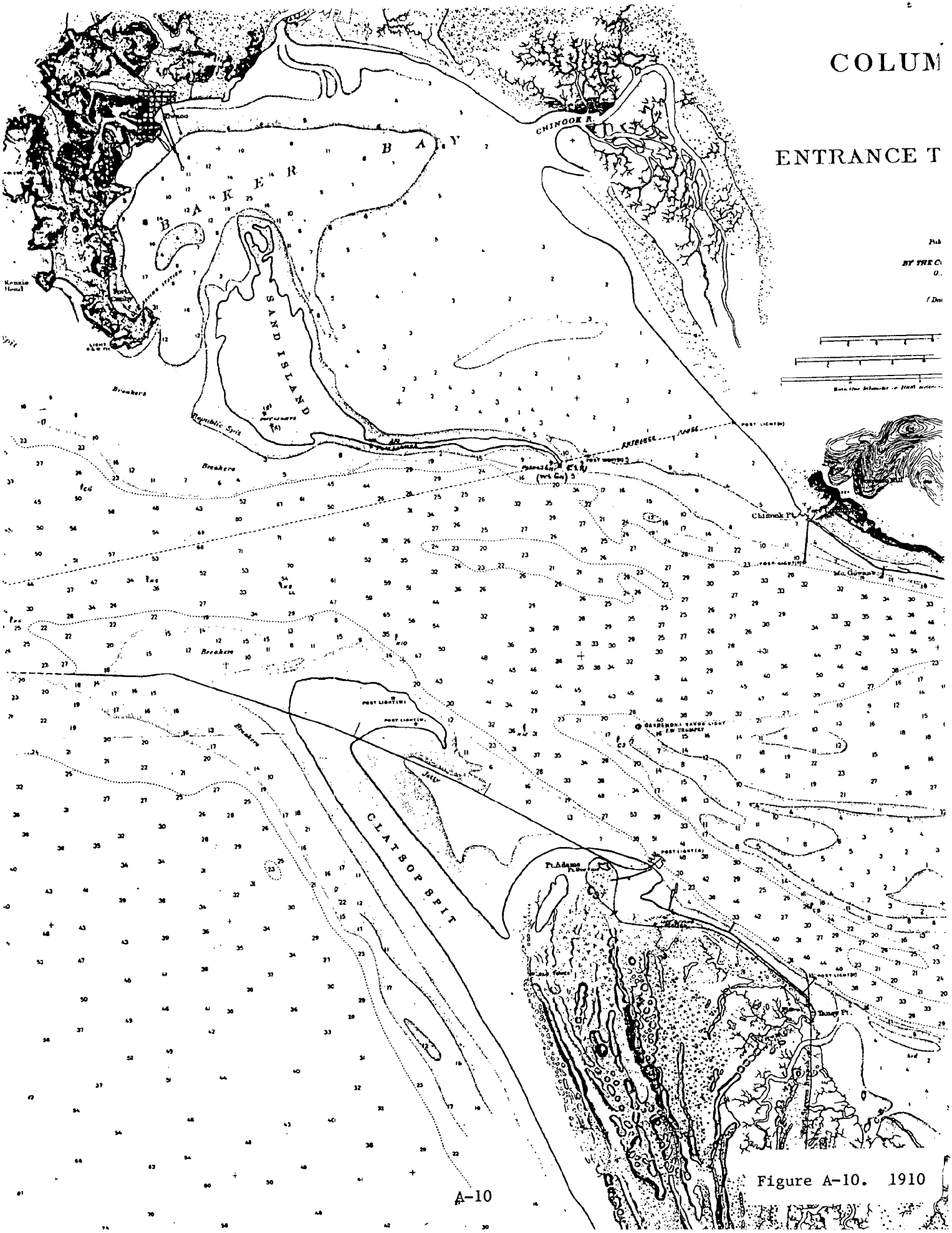

Figure A-10. 1910

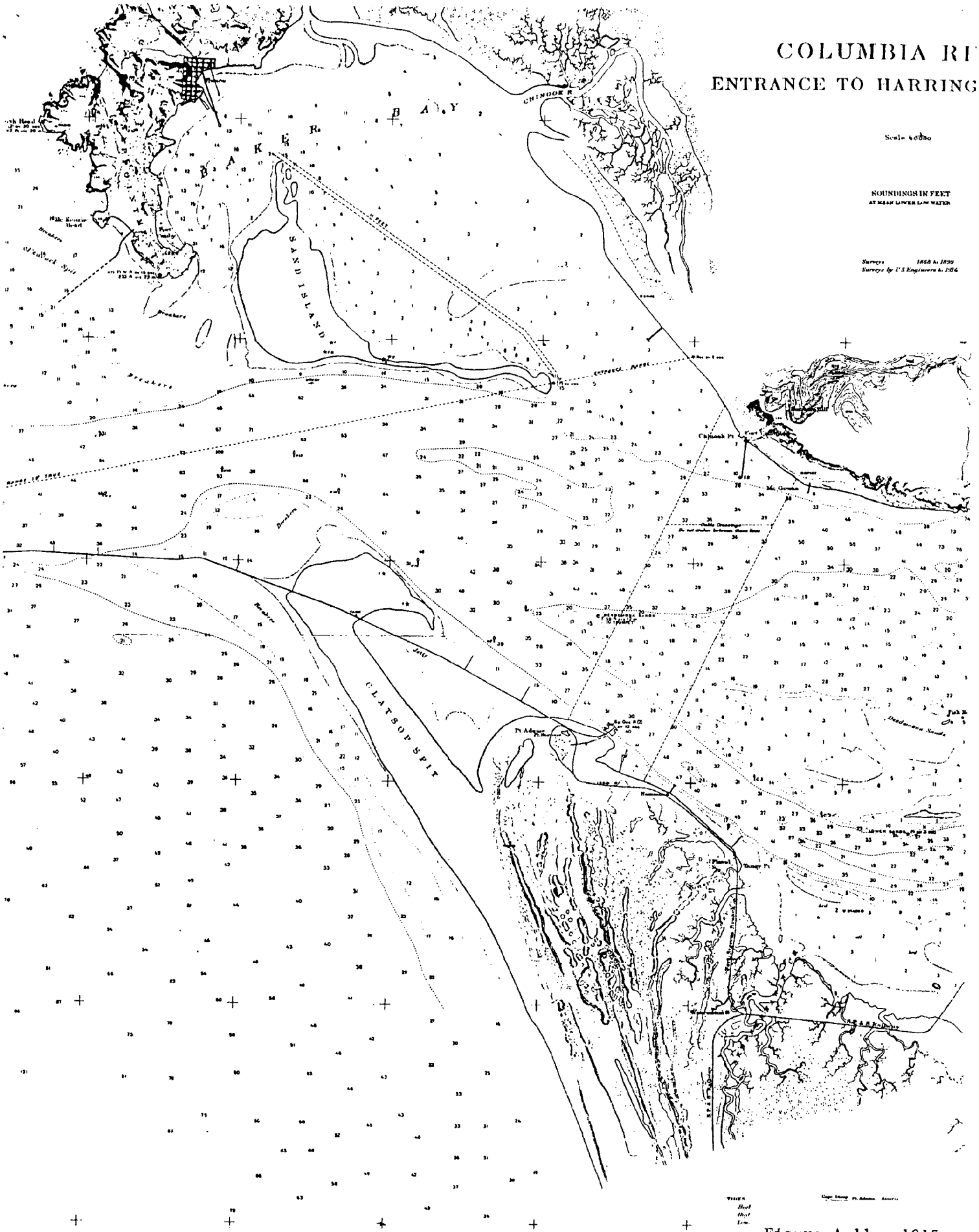

Figure A-11. 1915

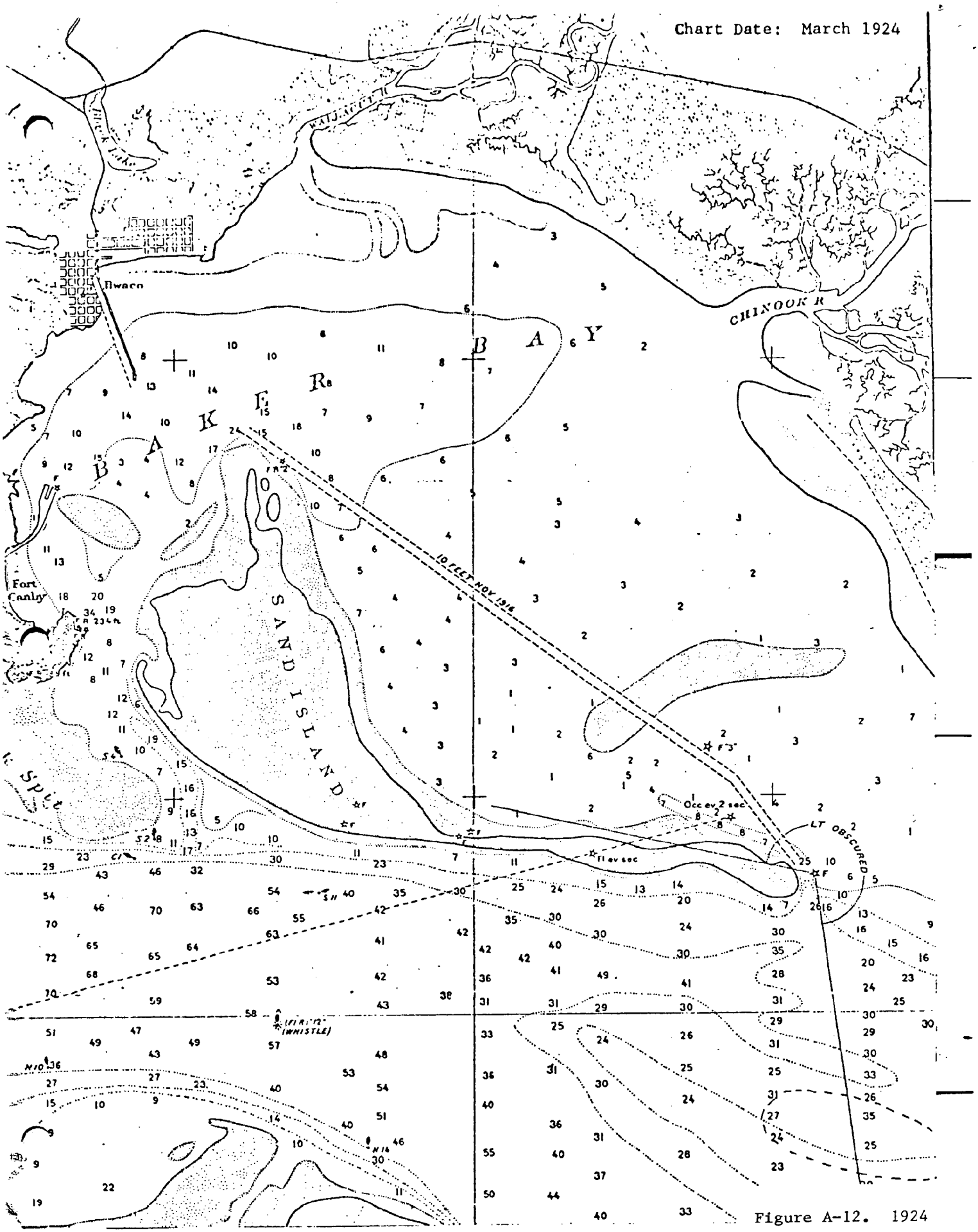

Figure A-12. 1924

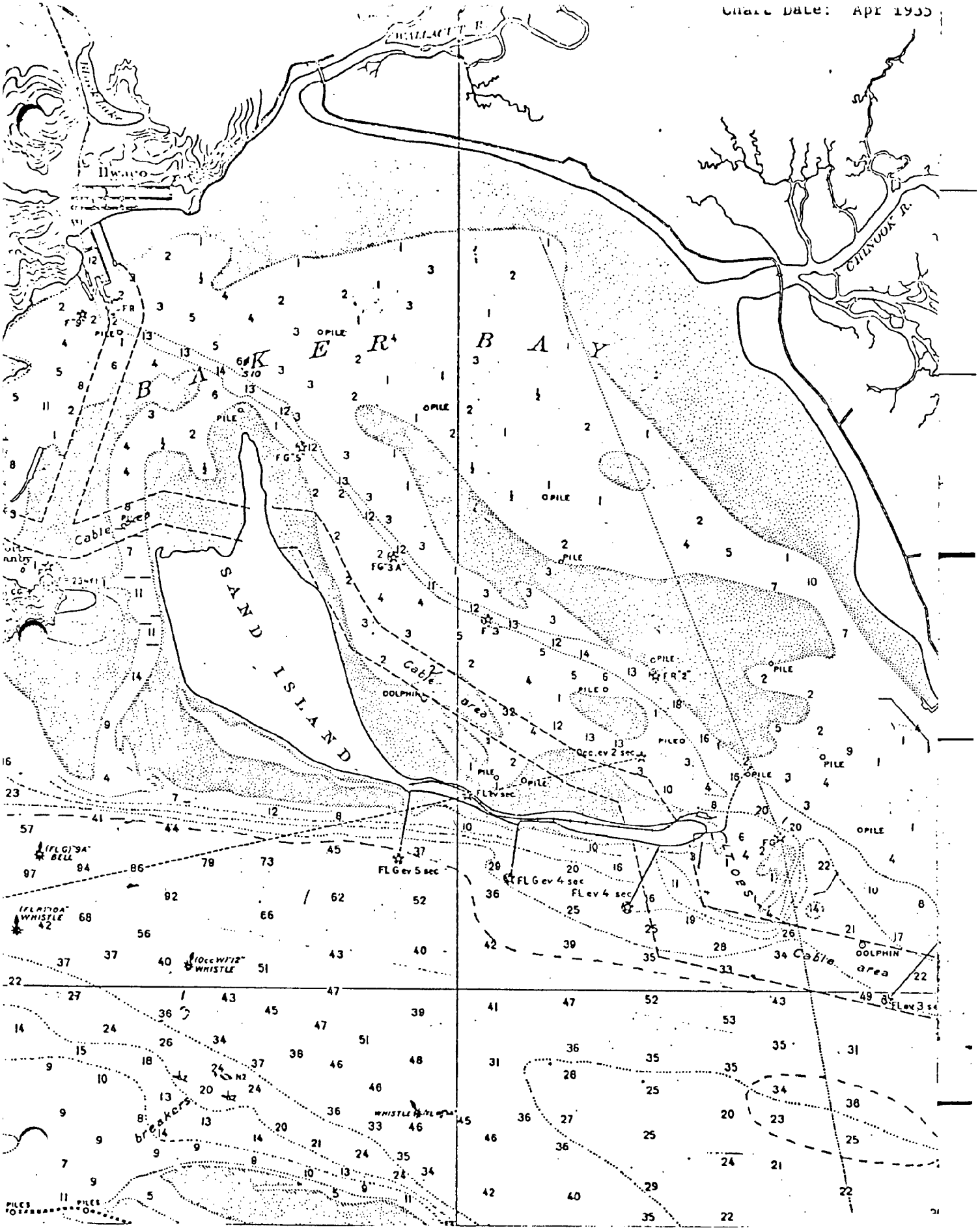

Figure A-13. 1935

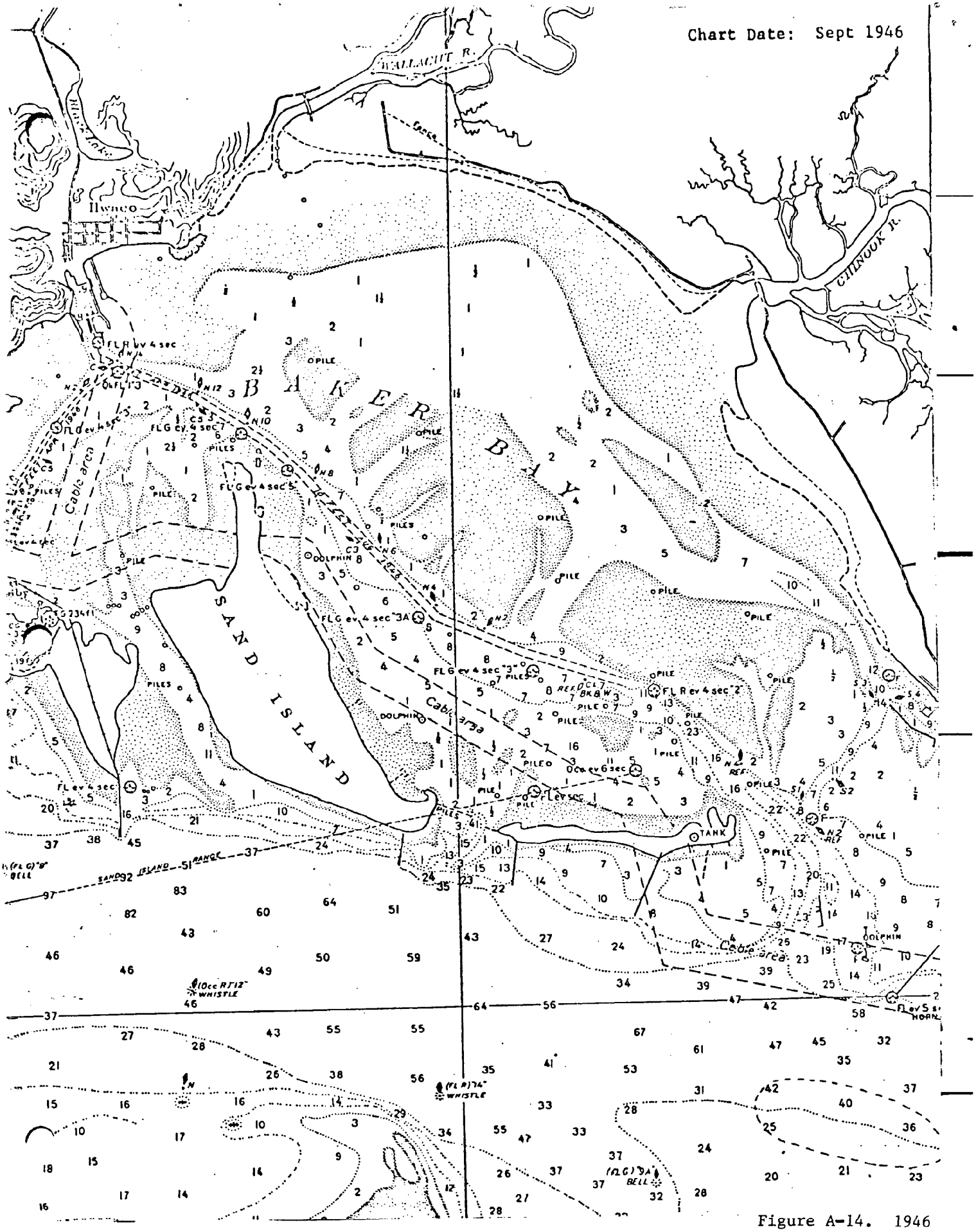

Figure A-14. 1946

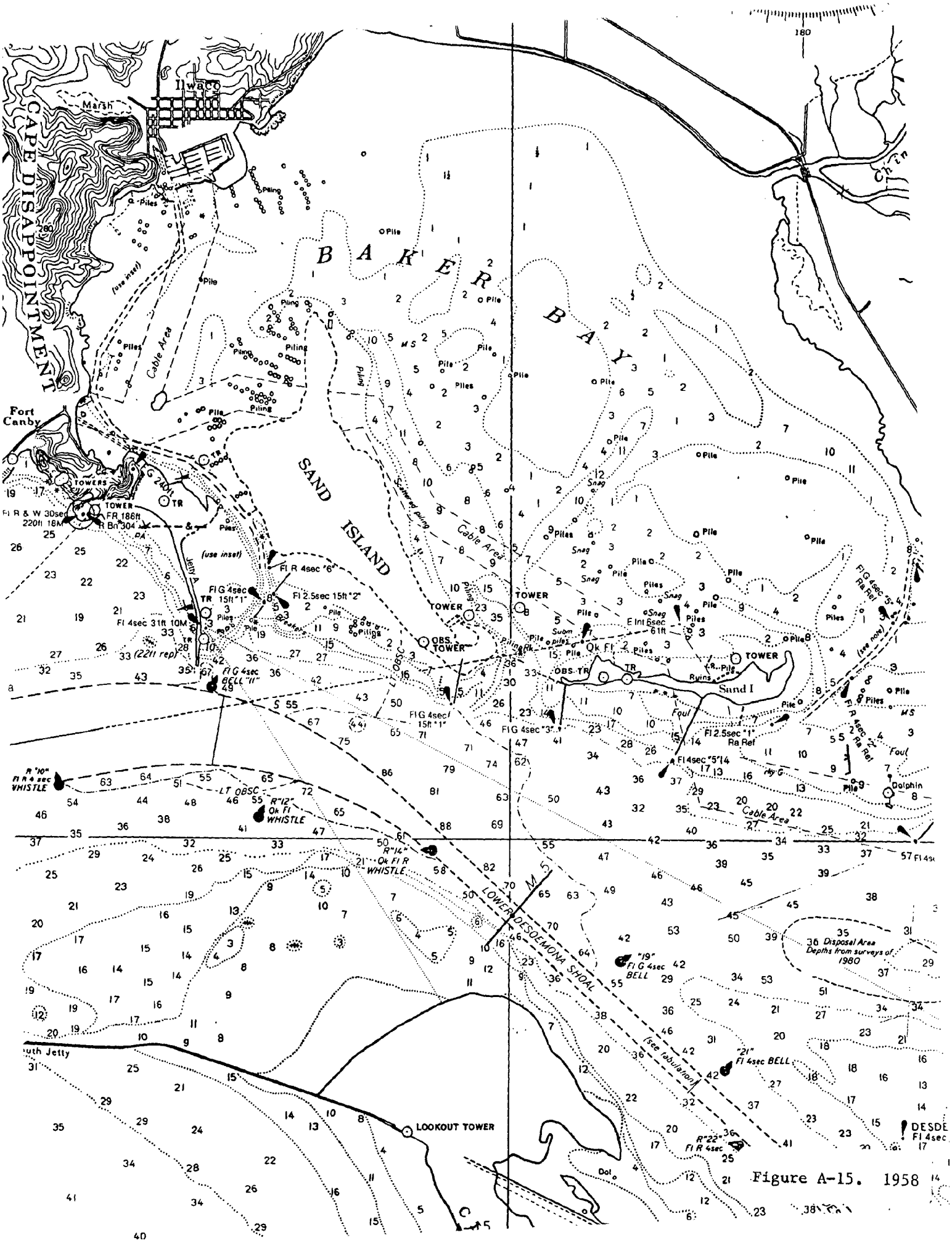

Figure A-15. 1958

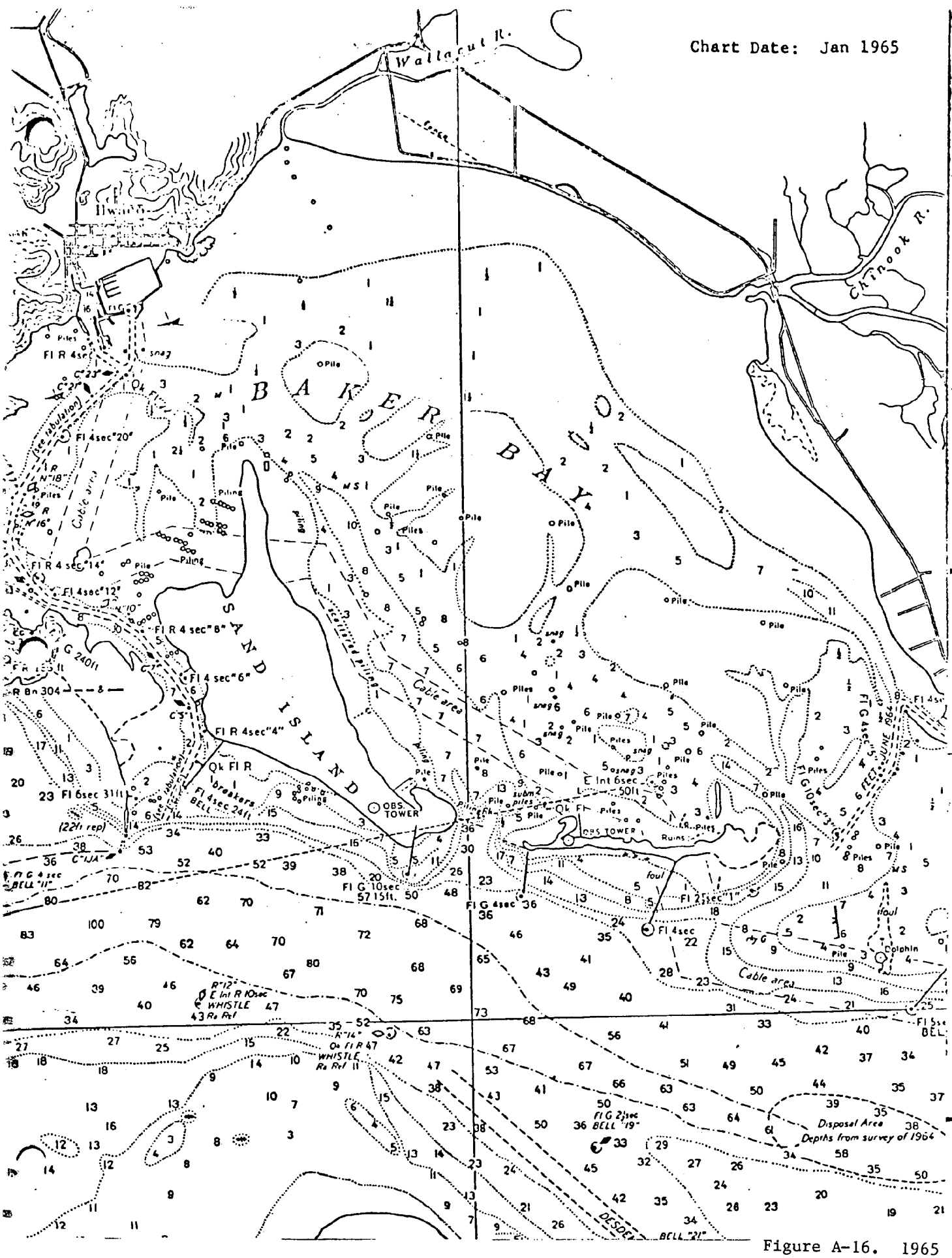

Figure A-16. 1965

Chart Date: March 1977

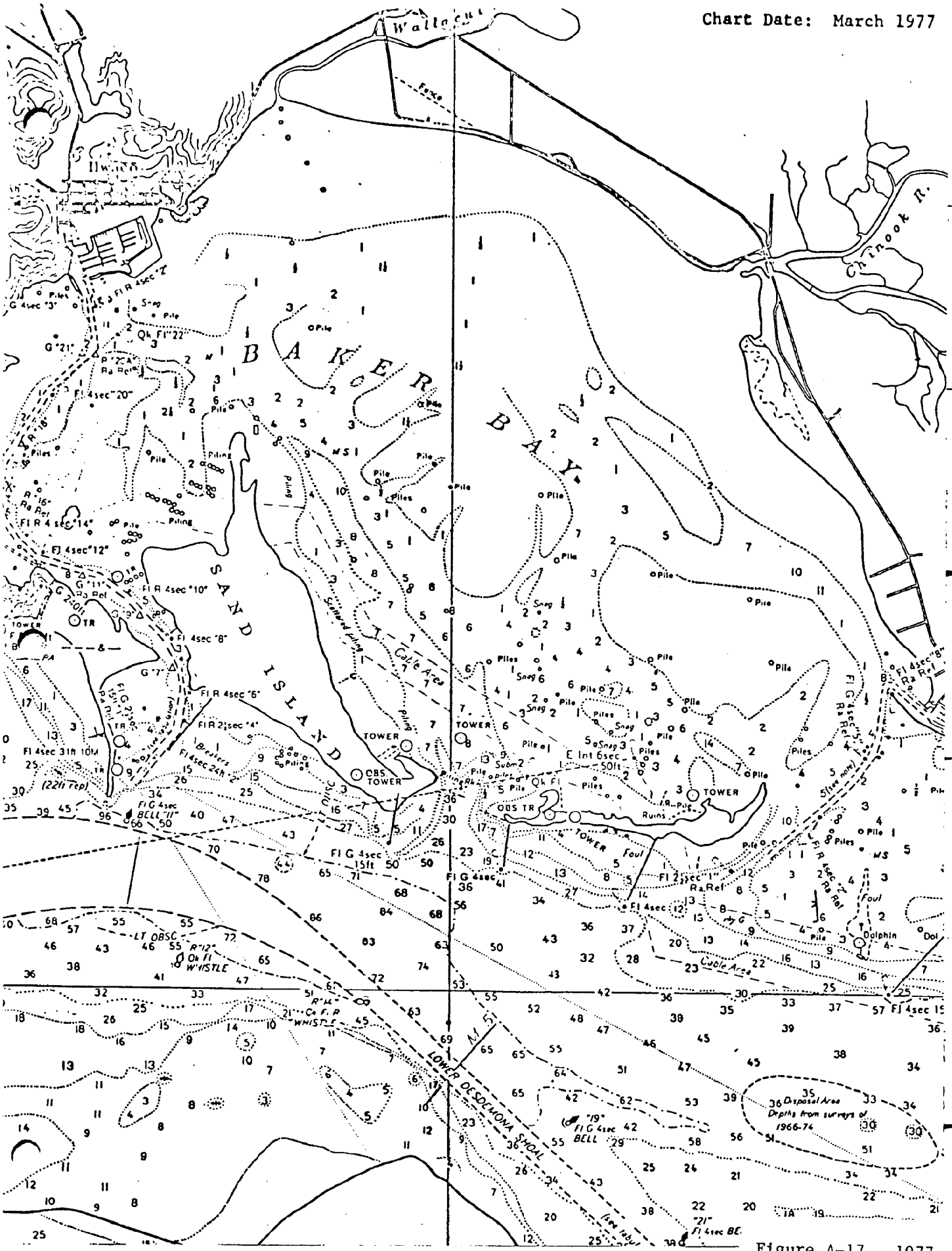

Figure A-17. 1977

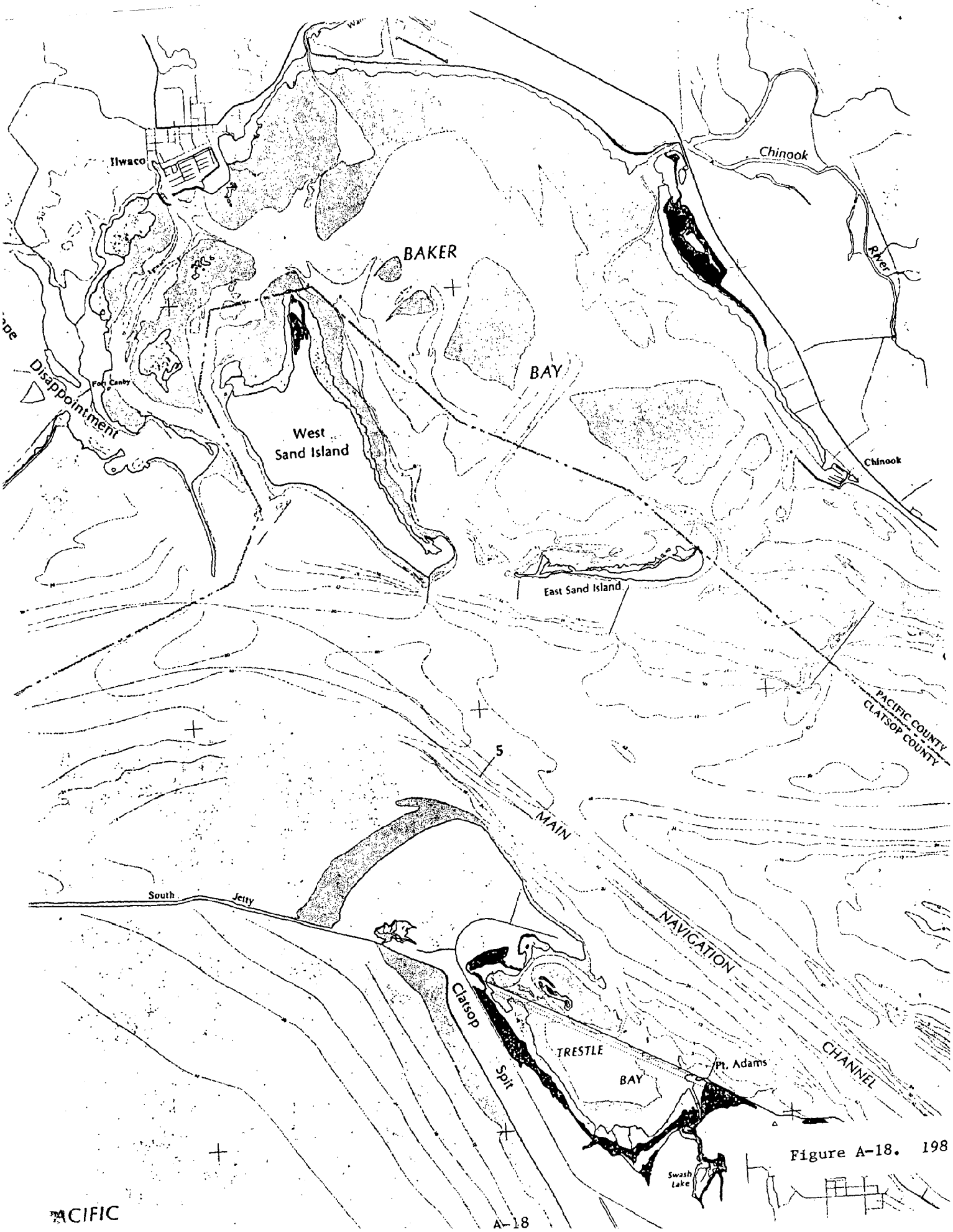
Ilwaco
Chinook
River
BAKER
BAY
Disappointment
Fort Canby
West
Sand Island
Chinook
East Sand Island
PACIFIC COUNTY
CLATSOP COUNTY
5
MAIN
NAVIGATION
CHANNEL
South
Jetty
Clatsop
Spit
TRESTLE
BAY
Pt. Adams
Swash
Lake
PACIFIC

Figure A-18.

APPENDIX B

DISPOSAL VOLUMES AND COST ESTIMATES

Dredging volumes and associated information on percent relief work and sediment phi size (Provided by Nancy Case, U.S. Army Corps of Engineers).

PROJECT/BAR	AVE.C.Y.[1]	% RELIEF	% NOT RELIEF	AVE/C.Y. NOT RELIEF	AVE.% Phi 2.5 AND FINER	AVE/ C.Y. Phi 2.5
Flavel	500,000	85	15	75,000	22	16,500
Other C&LW	30,000	85	15	4,500	15	675
MCR	50,000	100	0			0
Skipanon, Chinook and Baker Bay	65,000	61	39	25,350	75	19,013
TOTAL	645,000	84[2]	16[2]	104,850		36,188

[1] Current O&M Program in the estuary.

[2] Weighted Average.

Estimate of increased dredging costs assuming disposal at Area D is discontinued (provided by Nancy Case, U.S. Army Corps of Engineers)

1. Flavel-approximately 500,000 cy/year

-normally done as relief for MCR
-Essayons usually requires 11 days @ 47,000cy/day @ $.86/cy
-The haul to ocean disposal site B increases cycle time 185% and reduces Essayons production to 39,500cy/day @ $1.03/cy requiring 13 days

-contract equivalent cycle time increases 177% production is 13,900 cy/day @ $2.67/cy requiring 36 days

-Since Flavel & MCR share plant
-Essayons on MCR @ $.94 & contractor $1.50 contractor 160% increase in cost
-Essayons on Flavel using B @ $1.03 & contractor @ $2.67 contractor 259% increase in cost
-Both Essayons & contractor work MCR for less than Flavel

Let Essayons do Flavel	500,000cy	($1.03) =	515,000
	500,000cy	($ .86)	430,000
			85,000

Impact

1) Essayons will spend 13 days on Flavel & not on MCR
2) Increase cost for project $85,000

2. MCR

-MCR utilizes Flavel for relief approximately 15% time contract plant average 24,900 cy/day @ 1.50
Essayons 43,000 .94

-150 Dredging days - 13 days for Flavel = 137 days
-6.5 M cy required which is approximately Essayons capacity for $6.11 M
-w/o Flavel Area D relief Essayons production decreases 15% to 36,550 cy/day
Season Capacity 137(36,550) = 5,007,350 cy
-Shortfall to contractor 6,500,000
-5,007,350
1,492,650 cy @ 1.50

Contract cost	$ 1,138,975
-Essayons 137 days @ 40,600	5,562,200
	7,801,175
-Essayons Cost	6,110,000
	1,691,175

Impact

1) Essayons would not be able to maintain bar w/o contractor assistance.
2) Increase cost of MCR O & M $1.7 M

3. Skipanon

-Cost would increase from $1.90/cy to $3.25/cy for hopper work
-Estimated annual 39,700 cy (3.25-1.90) =

Impact
-Increase cost $53,595

4. Baker Bay

-Cost would increase from $2.30 to $2.70
-Estimated annual 5,200cy. Note: new channel deepening will affect this total
-Estimated new requirement @ 10,400/cy/year (conservative) 10,400(.40) = $4,160.00

Impact
-Increase cost $4,200

5. Chinook

-Cost would increase from $1.65 to $3.22
-Estimated annual equivalent 20,100 (3.22-1.65) = $31,600

Impact
-Increase cost $31,600

6. Desdemona/Upper Sands/Tongue Pt., Astoria
-Assume increase same as Flavel 160%
-29,000cy(1.03-.86) $4,930

Total Impact on Estuary Program

	Current $	Increase
MCR	6,110,000	1,700,000
Flavel	430,000	85,000
Skipanon	75,000	54,000
Baker Bay	24,000	4,000
Chinook	33,000	32,000
Lower C &LW	25,000	5,000
	6,697,000	1,880,000/year

28% increase in cost

Estimate of increased dredging costs assuming an average of 16% of the material now disposed of at Area D is taken to Ocean Disposal sites.

Flavel Bar

-Present cost: $430,000 for 500,000 cu. yd.
-Present relief work: 15%
-Dredging costs: $0.86 per cu. yd. when using Area D
$1.03 per cu. yd. when using ocean sites
-Cost assuming 15% taken to ocean sites:

500,000 (.15) ($1.03)	=	$ 77,250
500,000 (.85) ($.86)	=	365,500
		$442,750

-Cost Increase:

	$442,750
	-430,000
	$ 12,750

MCR

-Present cost: $6,110,000 for 6,500,000 cu. yd.
-Dredging costs: Corps Hopper Dredge: $0.94 per cu. yd.
Contractor dredge: $1.50 per cu. yd.
-Cost assumes that the Corps hopper dredge looses 2 days (13 days x 16%) out of 150 in hauling 16% of the Flavel material to ocean sites. This lost time would be made up by a contractor dredge.

Contractor dredge needed for:
1,492,650 cu. yd. x 16% = 238,824 cu. yd.

Contractor cost	238,824 x $1.50 =	$ 358,236
Corps Hopper cost 148 days @ $40,600 per day =		$6,008,800
		$6,367,036

-Cost Increase:

	$6,367,036
	-6,110,000
	$ 257,036

Skipanon

-Present cost: $75,430 for 39,700 cu. yd.
-Present relief work: 39%
-Dredging cost: $1.90 per cu. yd. when using Area D
3.25 per cu. yd. when using ocean sites.
-Cost assuming 39% taken to ocean sites.

39,700 (.39)($3.25)	=	$50,320
39,700 (.61)($1.90)	=+	46,012
		$96,332

-Cost increase: $ 96,332
- 75,430
$ 20,902

Baker Bay West Channel

-Present cost: $24,000 for 10,400 cu. yd.
-Anticipated cost: $33,600 for 14,560
-Present relief work: 39%
-Dredging cost: $2.30 per cu. yd. when using Area D
2.70 per cu. yd. when using ocean sites.
-Cost assuming 39% taken to ocean sites.
14,560 (.39)($2.70) = $15,332
14,560 (.61)($2.30) = +20,428
$35,760

-Cost increase: $ 35,760
- 33,600
$ 2,160

Chinook Channel

-Present cost: $33,000 for 20,100 cu. yd.
-Present relief work: 39%
-Dredging cost: $1.65 per cu. yd. when using Area D
3.22 per cu. yd. when using ocean sites.
-Cost assuming 39% taken to ocean sites.
20,100 (.39)($3.22) = $25,242
20,100 (.61)($1.65) = +20,231
$45,473

-Cost increase: $ 45,473
- 33,000
$ 12,473

Other Projects

-Present cost: $25,000 for 29,000 cu. yd.
-Present relief work: 15%
-Dredging cost: $0.86 per cu. yd. when using Area D
1.03 per cu. yd. when using ocean sites.
-Cost assuming 15% taken to ocean sites.
29,000 (.15)($1.03) = $ 4,481
29,000 (.85)($ .86) = +21,199
$25,680

-Cost increase: $ 25,680
- 25,000
$ 680

Summary of Cost Increases

	Current Cost	Increase Assuming an average of 16% of material is taken to ocean sites
Flavel Bar	$ 430,000	$ 12,750
MCR	6,110,000	257,036
Skipanon	75,000	20,902
Baker Bay	33,600*	2,160
Chinook	33,000	12,473
Other Projects	25,000	680
TOTAL	$6,706,600 per year	$306,001 per year

$306,001 increase = 4.6%

* includes 40% projected maintenance increase

APPENDIX C

REVISED AREA D POLICY
(language incorporated into Clatsop County's Comprehensive Plan)

Description of Area D inserted into Clatsop County's Dredged Material Disposal Plan

Site Identification
D-Estuary (in-water site located at 46° 14' 19" N, 123° 57' 26" W, Columbia River Mile 7)

Zoning
Aquatic Development

Priority
I

Project Related Use
Area D provides for portions of Corps of Engineers disposal needs for maintenance of Desdemona Shoal, Flavel Shoal, Upper Sands Shoal, Tongue Point Crossing Shoal, Chinook Channel, Baker Bay West Channel, Skipanon Channel and the Columbia River Bar. Area D may also be used for non-federal dredging projects in the lower Columbia River.

Dredging Requirements
Disposal at Area D amounts to approximately 650,000 cubic yards per year for Corps of Engineers projects. An additional 100,000 cubic yards per year are allowable for other projects.

Acreage/Capacity
The site capacity has been set at approximately 650,000 cubic yards per year for Corps of Engineers projects and 100,000 cubic yards per year for other projects.

Special Conditions on Use
Conditions on the use of site D shall include, but shall not be limited to, the following:

1) Dredged material disposal at Area D shall be allowed for the following Corps dredging projects and sites: Flavel Shoal, Desdemona Shoal, Upper Sands Shoal, Tongue Point Crossing Shoal, Chinook Channel, Baker Bay West Channel, Skipanon Channel, and the Columbia River Bar. Non-federal projects proposed in estuarine locations between the mouth of the Columbia River and Tongue Point may also be eligible for disposal in Area D, provided they meet the policies and standards for estuarine in-water disposal.

2) Total disposal for Corps of Engineers projects at Area D shall not exceed 3,250,000 cubic yards over a 5 year period.

3) The Corps of Engineers has provided the following estimates of their Area D disposal needs for the projects and shoals listed in Condition #1.

Flavel Shoal	500,000 cubic yards per year

Desdemona, Upper Sands, and Tongue Point Crossing Shoals	30,000 cubic yards per year
Columbia River Bar	50,000 cubic yards per year
Skipanon, Chinook, and Baker Bay West Channels	65,000 cubic yards per year
Total Disposal	Approximately 650,000 cubic yards per year

All dredged material disposal at Area D shall be reported to the Clatsop County Department of Planning and Development. If annual disposal amounts significantly exceed those given above, the Corps of Engineers shall limit subsequent disposal operations at Area D to ensure that the 5-year disposal limit (3,250,000 cubic yards) is not exceeded.

4) Total annual disposal for non-federal projects shall not exceed 100,000 cubic yards.

Additional Comments

In designating Area D as a dredged material disposal site its zoning was changed from Aquatic Conservation Two to Aquatic Development. The following discussion provides justification for this zone change.

Within the Columbia River Estuary there are natural, conservation and development management units. Goal 16 specifies that within development management units areas shall be designated for navigation needs. The Goal further specifies that such areas shall include subtidal areas for in-water disposal of dredged material. Area D is a subtidal in-water dredged material disposal site needed for maintenance of federally authorized navigation channels and has been utilized by the Corps of Engineers on a continuous basis since approximately 1946. It is appropriate, therefore, that the site be designated development to reflect past and expected future usage.

Under the County Dredged Material Disposal Plan, conditions placed on use of the site will not allow disposal to increase significantly above current disposal rates (see Condition 3 above). Since the site has been chronically disturbed since 1946 and because future disposal will be controlled, the integrity of the estuarine ecosystem will not be affected by the change in zone designation.

Changes to the Subarea Policies of Clatsop County's Plan pertaining to Area D

Subarea Policies

(Note: New language is underlined, deleted language is bracketed [ ])

Amendments to Section 31, Lower River and Islands Plan

Subsection: Area Policies

4. Dredged Material Disposal at Area D and Tansy Point
[The Area D and Tansy Point in-water dredged material disposal sites should be used only when weather and sea conditions render the use of disposal sites outside the Columbia River mouth hazardous.]
The use of Area D and Tansy Point in-water dredged material disposal sites shall be kept to an absolute minimum. In all cases, ocean disposal shall be substituted for the use of these sites whenever feasible. The use of Area D shall be carefully regulated by implementing cubic yardage limitations for dredged material disposal. These limitations shall be stipulated in the County's Dredged Material Disposal Plan.

The shoaling problems which result from dredged material disposal at Area D present an ongoing concern in the estuary. A large portion of the material deposited at the site moves upriver and is eventually redeposited in the navigation channel. A smaller portion of the Area D material moves into Baker Bay and is deposited. The Corps of Engineers should continue to examine alternative disposal sites and methods that would result in fewer adverse shoaling impacts. The use of Area D should be discontinued when feasible alternatives are found.

Amendments to Section P31.2, Baker Bay

Subsection: Issues and Findings

Use conflicts in this subarea include the impacts on aquatic and terrestrial habitat of dredging, dredged material disposal, and proposed black sands mining. The eastern portion of the small Sand Island has been inventoried as a nesting area for Caspian terns. This area has also been used as a disposal site for maintenance dredging of the Chinook Channel [;it is now filled to capacity.]...

Subsection: Subarea Policies

1. Channel realignments must be justified in terms of hydraulics, sand transport and impacts on maintenance dredging.
[2. No more dredged material disposal should occur on the uplands of Little Sand Island. Beach nourishment is also discouraged, because the material may contribute to shoaling in Baker Bay.]
3. ...

Amendments to Section 31.3, Estuary Channels

Subsection: Issues and Findings

In-water disposal of dredged material is a major issue. Approximately 1.2 million cubic yards of dredged material are removed from this reach each year. Approximately 630,000 cubic yards of material (most originating from the river channels upstream from the estuary) are placed in the Harrington Point Sump by hopper dredge each year, and eventually placed by pipeline dredged on Rice Island (in the Estuary Sands subarea). [Between 700,000 and 1,000,000] Approximately 650,000 cubic yards of material is deposited in Area D annually [this total has been declining and may be much smaller in the future.] Use of the Tansy Point site is minor and irregular.

The overall filling trend in the estuary was discussed under Aquatic Features. The fate of the dredged material deposited in estuary disposal sites is a major concern. Much of the material may stay in the estuary reentering channels or building up shoals in bays and flats marginal to the channels. [Material placed in Area D, for example, may end up in Baker Bay, increasing the already severe shoaling and access channel maintenance problems there.]

Subsection: Subarea Policy

[The continued use of the Tansy Point site and Area D should occur (as per interagency agreement) only when weather and sea conditions render the use of disposal areas outside the mouth hazardous.] The use of Area D and Tansy Point in-water dredged material disposal sites shall be kept to an absolute minimum. In all cases, ocean disposal shall be substituted for the use of these sites whenever feasible. The use of Area D shall be carefully regulated by implementing cubic yardage limitations for dredged material disposal. These limitations shall be stipulated in the County's Dredged Material Disposal Plan. [New in-water sites in the estuary may be designated in the future and that the use of Area D and Tansy Point may be discontinued within the next few years.]

The shoaling problems which result from dredged material disposal at Area D present an ongoing concern in the estuary. A large portion of the material deposited at the site moves upriver and is eventually redeposited in the navigation channel. A smaller portion of the Area D material moves into Baker Bay and is deposited. The Corps of Engineers should continue to examine alternative disposal sites and methods that would result in fewer adverse shoaling impacts. The use of Area D should be discontinued when feasible alternatives are found.

Changes to the Standards of the Clatsop County Land and Water Development and Use Ordinance and to the Regional Policies of the County's Plan

Amendment to S4.233, Dredged Material Disposal Standard

[A. Aquatic and shoreland disposal of dredged material shall be allowed only at approved sites identified in the Comprehensive Plan except if the disposal operation is part of an approved fill project or an approved flow-lane operation in development designated navigation channel areas.]

F. Except for flow-lane disposal and beach nourishment, disposal of dredged materials inside the estuary shall be substituted for ocean disposal only when [sea or weather conditions area a hazard to safe navigation for the dredging vessel.] the use of ocean disposal sites is not feasible.

Amendment to Policy P20.6, Dredging and Dredged Material Disposal

1. Loss or disruption of significant estuarine fish and wildlife habitat and damage to essential properties of the estuarine resource shall be minimized by careful location, design and construction of: (1) facilities requiring dredging, (2) sites designated to receive the dredged material, and (3) dredging operation staging areas and equipment marshalling yards. Disposal of dredged material shall be at [an approved] sites where the biological productivity and physical characteristics are appropriate to receive the material. Dredged materials shall not be placed in productive habitat unless as an activity associated with an approved development project. Shoreland disposal should enhance or be compatible with the final use of the site area. Except for flowlane disposal and beach nourishment, in-water disposal within the estuary may be substituted for ocean disposal only when [sea or weather conditions prohibit dredging vessels from using ocean disposal sites.] the use of ocean disposal sites in not feasible.

ATTACHMENT - C

CREST

Post Office Building, Room 214 P.O. Box 175, Astoria, Oregon 97103 (503) 325-0435

April 21, 1986

TO: Dredged Material Disposal Advisory Committee

FROM: David Fox, CREST DF

SUBJ: Advisory Committee Meeting #1

Enclosed are the agenda and related materials for the first dredged material disposal advisory committee meeting. The meeting will be held at the Port of Astoria offices on April 25, 1986, from 10:00 a.m. to 3:00 p.m. (see attached map for directions).

The purpose of the meeting will be to:

1) provide background information on the CREST dredged material plan update project,
2) establish priorities for dredged material disposal options,
3) develop a list of general conditions for types of disposal projects,
4) review and critique local plan policies on dredged material disposal, and
5) develop a dredged material disposal site evaluation matrix.

We have enclosed background material and worksheets for the meeting. Please fill out the worksheets and bring them to the meeting for further refinement. We will use them to guide discussion and to tally the results of the meeting. If you cannot attend, please fill out the worksheets and send them to us along with any other comments you might have. If you have any questions, please call me.

Enclosure 1:

AGENDA

Columbia River Estuary Dredged Material Disposal
Advisory Committee Meeting #1
April 15, 1986
10:00 a.m. - 3:00 p.m.
Port of Astoria Offices
#1 Portway
Astoria, Oregon

1)	10:00 a.m.	Introductory Remarks
2)	10:30 a.m.	Dredged Material Disposal Options and Priorities; Conditions on the use of sites (refer to enclosure 2)
	12:00 noon	Lunch
3)	1:00 p.m.	Dredged Material Disposal Policies (refer to enclosure 3)
4)	2:00 p.m.	Dredged Material Disposal Site Selection Criteria (refer to enclosure 4)

CREST

Post Office Building, Room 214 P.O. Box 175, Astoria, Oregon 97103 (503) 325-0435

May 13, 1986

TO: Dredged Material Disposal Advisory Committee
FROM: David Fox DF
SUBJ: Advisory Committee Meeting #2

The second dredged material disposal advisory committee meeting will be held in the Astoria Post Office Building on May 27, 1986, from 10:00 a.m. to 3:00 p.m. (see enclosed agenda and map).

The purpose of the meeting will be to review existing and proposed dredged material disposal sites located between the mouth of the river and the Tongue Point area. We intend to focus discussion on those sites that present major environmental, engineering, or land use conflicts. The product of the meeting should be a refined list of dredged material disposal sites and agreed-upon methods for resolving conflicts presented at various sites.

The enclosed draft dredged material disposal site inventory and maps provide background material for the meeting. Please review sites Pa-S-3.2 through CC-S-18.8 using the site evaluation matrix developed at the first meeting (also enclosed). If you cannot attend the meeting, please send your review comments to me prior to May 27. If you have any questions please call me.

AGENDA

Columbia River Estuary Dredged Material Disposal
Advisory Committee Meeting #2

May 27, 1986

10:00 a.m - 3:00 p.m.

Post Office Bldg. Room 209
8th and Commercial Streets

Astoria, Oregon

10:00 a.m.	Introductory Remarks
10:30 a.m.	Review of Sites Pa-S-3.2 through CC-E-8.5
12:00 noon	Lunch
1:00 p.m.	Review of sites Ha-S-7.6 through CC-S-18.8
3:00 p.m.	Adjourn

CREST

Post Office Building, Room 214 P.O. Box 175, Astoria, Oregon 97103 (503) 325-0435

May 29, 1986

TO: Dredged Material Disposal Advisory Committee
FROM: David Fox DF
SUBJ: Advisory Committee Meeting #3

The third dredged material disposal advisory committee meeting will be held in the Astoria Post Office Building on June 12, 1986, from 10:00 a.m. to 3:00 p.m. (see enclosed agenda).

The purpose of the meeting will be to review existing and proposed dredged material disposal sites located between Tongue Point and the upriver limit of our planning area. We intend to focus discussion on those sites that present major environmental, engineering, or land use conflicts. The product of the meeting should be a refined list of dredged material disposal sites and agreed-upon methods for resolving conflicts presented at various sites.

The draft dredged material disposal site inventory and maps sent to you on May 13 provide background material for the meeting. Please review sites CC-E-21.0 through Wk-B-51.8 using the site evaluation matrix developed at the first meeting (also included in the May 13 mailing). If you cannot attend the meeting, please send your review comments to me prior to June 12. If you have any questions please call me.

AGENDA

Columbia River Estuary Dredged Material Disposal
Advisory Committee Meeting #3

June 12, 1986

10:00 a.m - 3:00 p.m.

Post Office Bldg. Room 202
8th and Commercial Streets

Astoria, Oregon

10:00 a.m.	Introductory Remarks
10:30 a.m.	Review of Sites CC-E-21.0 through CC-S-35.0
12:00 noon	Lunch
1:00 p.m.	Review of Sites Wk-B-34.4 through Wk-B-51.8
3:00 p.m.	Adjourn

DREDGED MATERIAL DISPOSAL ADVISORY COMMITTEE

Agency	Division	Name
Corps of Engineers	(Navigation)	Nancy Case
	(Natural Resources)	Dave Kurkoski
	(Astoria)	Gerry Black
	(Regulatory Branch)	Richard Berg
U.S. Fish and Wildlife Service		Nancy Ellifrit
U.S. Environmental Protection Agency		Gary Voerman
National Marine Fisheries Service		Rob Jones
Soil Conservation Service		Don Leach
Washington Department of Fisheries		Mary Lou Mills
Washington Department of Natural Resources		Dan Barth
Oregon Department of Fish and Wildlife		Brent Forsberg
Oregon Division of State Lands		Ken Bierly
Dept. of Land Conservation & Development		Patty Snow
Pacific County		Bill Crossman Ken Kimura
Wahkiakum County		Robert Torppa
Clatsop County		Curt Schneider
Town of Hammond		Leslie Shepard
City of Warrenton		Jim Rankin
City of Astoria		Jean Hallaux
Port of Astoria		Steve Felkins
Port of Ilwaco		Bob Petersen
Wahkiakum Port District #2		Everett Groves
Fisheries Extension		Jim Bergeron
Local Citizens		Irene Martin Chuck Haglund

NOAA COASTAL SERVICES CTR LIBRARY
3 6668 14112765 6