



**US Army Corps
of Engineers**

TECHNICAL REPORT CERC-91-8

FIELD WAVE GAGING: FIVE-YEAR DEPLOYMENT PLAN, FY90-94

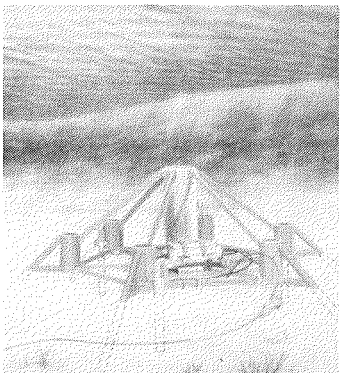
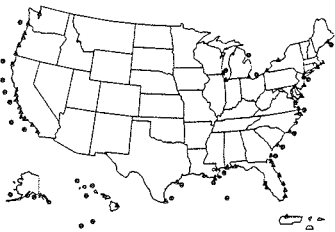
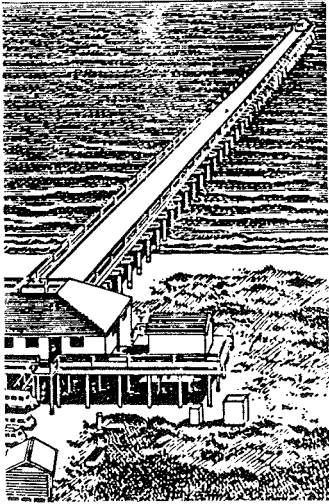
by

David D. McGehee

Coastal Engineering Research Center

DEPARTMENT OF THE ARMY

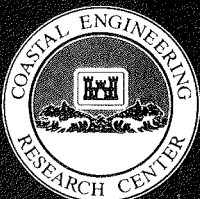
Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199



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13. ABSTRACT (Maximum 200 words) The Field Wave Gaging Program is a multi-year effort to obtain data sets of nearshore wave conditions for the entire US coastline. A five-year plan that provides the locations and schedules of existing and planned gage deployments based on FY90 budget projections is presented. Data requirements and gage deployments are presented in a series of tables and maps for each US Army Corps of Engineers coastal Division. An updated plan will be published annually.				
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Preface

This is the first Five-Year Deployment Plan of the Field Wave Gaging Program (FWGP), sponsored by Headquarters, US Army Corps of Engineers (HQUSACE). Subsequent plans will be published annually. This report is a product of the Coastal Field Data Collection Program (CFDCP), Coastal Engineering Research Center (CERC), US Army Engineer Waterways Experiment Station (WES), under Work Unit 12115. Mr. J. Michael Hemsley was the former CFDCP Program Manager, and Ms. Carolyn M. Holmes is the present CFDCP Program Manager. The HQUSACE Technical Monitors are Messrs. John H. Lockhart, Jr.; John G. Housley; James E. Crews; and Robert H. Campbell.

This report was prepared by Mr. David D. McGehee of the Prototype Measurement and Analysis Branch (PMAB), Engineering Development Division (EDD), CERC. The FWGP is administered at CERC under the supervision of Mr. William L. Preslan, Chief, PMAB, and Mr. Thomas W. Richardson, Chief, EDD. Mr. Charles C. Calhoun, Jr., and Dr. James R. Houston are Assistant Chief and Chief, CERC, respectively.

Commander and Director of WES is COL Larry B. Fulton, EN. Dr. Robert W. Whalin is Technical Director.

Introduction

The Field Wave Gaging Program (FWGP) is provided by Work Unit 12115 of the Coastal Field Data Collection Program, US Army Corps of Engineers. It is managed by the US Army Engineer Waterways Experiment Station (WES), Coastal Engineering Research Center (CERC). The purpose of the FWGP is to collect coastal wave climatology data sets for use in the planning, design, and operation of coastal projects and for coastal research for all sections of the United States coastline (Figure 1). This goal will be accomplished through a combination of long-term measurements to directly establish wave statistics and short-term measurements to calibrate and verify numerical transformation models and hindcasts. This plan is a schedule of the number, location, and type of wave gages deployed in the current fiscal year (FY90) and to be deployed in the next 4 fiscal years (FY91-FY94).

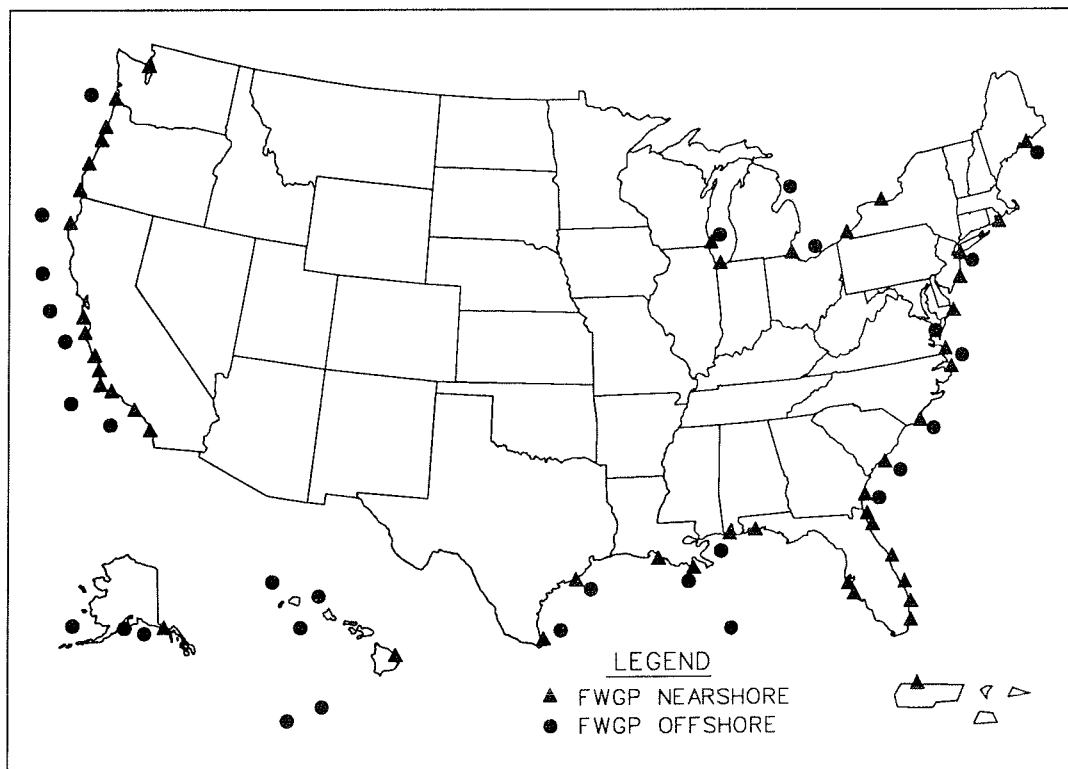


Figure 1. Field Wave Gaging Program Projected Deployments through FY 94

The plan is presented as a series of tables and accompanying charts. The first section consists of the data needs identified by the major subordinate commands (MSC) in a series of meetings held at each Division Headquarters and by CERC researchers for use in model validation. Data requested for improvement of design, operation, or maintenance of existing or future coastal projects, and for calibration and verification of wave propagation/transformation models, included wind and current in addition to directional and non-directional waves. A total of 241 areas were selected, with 176 rated as high priority by the MSC. A table and a chart are presented for each coastal Corps Division with corresponding map index numbers for each area.

These locations represent areas with specific data requirements, and not actual instrument sites. Some areas may require multiple gages, while others may not be suitable for gage deployment. Many have immediate and unique utility for model calibration; others may be redundant for that purpose. Technical, logistic, and economic constraints can vary widely, sometimes for adjacent areas. The interaction of these factors with the MSC needs resulted in the prioritization of the areas in the schedule.

Section II contains the 5-year deployment schedule for each Division that most economically contributes to the needs of the MSC and the goal of the FWGP. The type of gage and deployment date, by quarter, are listed in a table and shown on a Divisional chart. Numerical models that would use an area's data for input or verification are listed. The existing data-base, in gage years, from historical measurements in an area is also included.

The Division deployment maps indicate by symbols existing and scheduled gage locations, as well as discontinued gage sites where sufficient data have been collected to make reliable projections. Other agencies and programs have deployed gages, but only data sets several years in length will be included in the FWGP database. This includes the National Data Buoy Center (NDBC) network of deep ocean, nondirectional gages. These are indicated on the maps with a separate symbol when not supported by FWGP funds. However, the FWGP has funded the installation or the conversion to directional gages by the NDBC. These are included in the table with appropriate comments.

This plan is based on projected funding levels of the FWGP, presented below, according to the FY90 Work Unit 12115 Implementation Plan. It is also based on scheduled developments in gage technology and anticipated gage mortality based on past experience. Cooperative efforts and cost sharing with other Corps and non-Corps elements could enhance the number and schedule of gages in a Division.

FWGP Projected Funding					
Fiscal Year	90	91	92	93	94
Budget - M\$	1.1	1.6	2.1	2.5	2.5

List of Symbols

Data Needs

- α Directional wave spectra
- \odot Nondirectional wave spectra
- ∇ Low-frequency wave, tides, and average water levels
- \llcorner Winds
- \rightarrow Currents

Gage Types

- @ DWG-CM (directional + currents)
- # Puv gage (directional + currents)
- % Anemometer
- * Single pressure gage (nondirectional)
- = Linear array (directional)
- X Sxy or DWG-1 (directional)
- 0 Nondirectional buoy wave gage
- / Directional buoy wave gage

List of Abbreviations

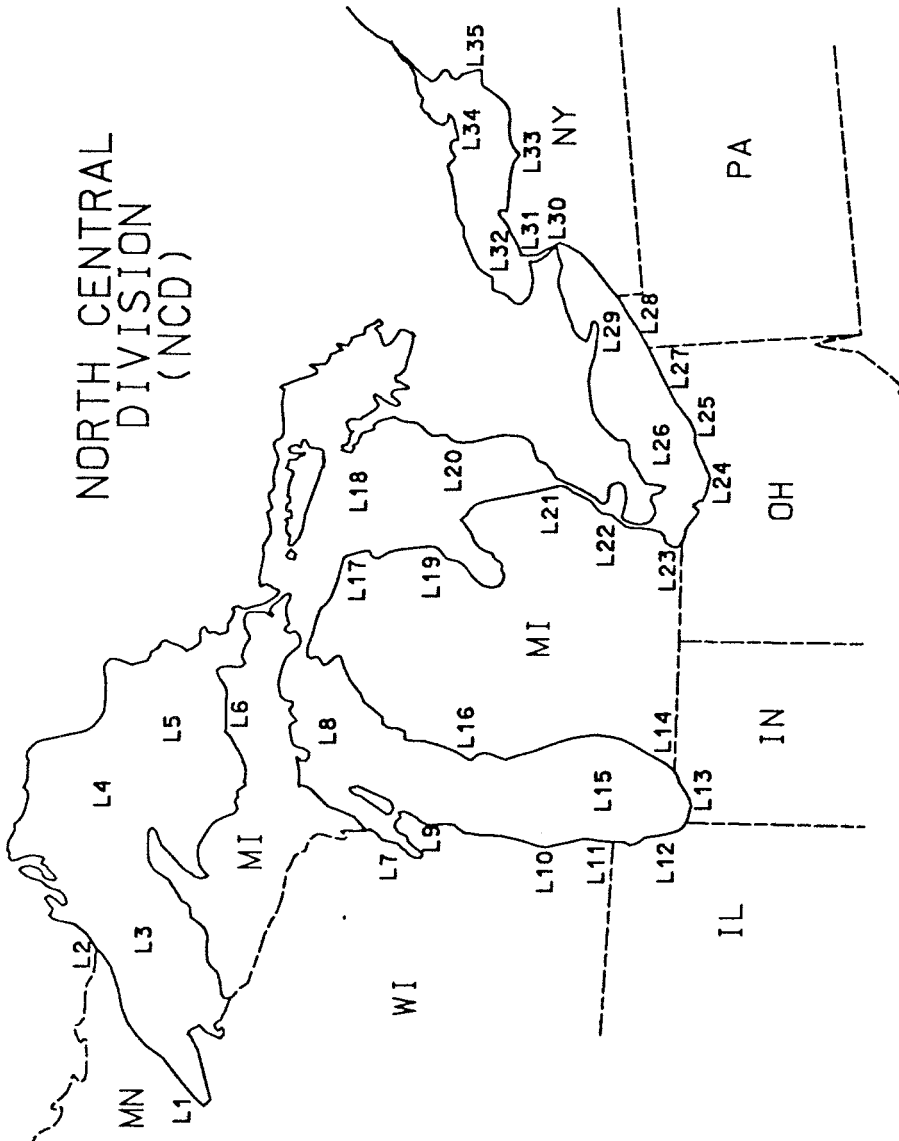
BFY	Budget fiscal year, FY91
CFY	Current fiscal year, FY90
COE	Corps of Engineers
CM	Current meter
C-MAN	Coastal Marine Automated Network (by NDBC)
Dir.	Directional wave gage or measurement
Div.	Division
DWG-1	Directional Wave Gage, version 1 (by COE)
DWG-CM	Directional Wave Gage, with current meter option (by COE)
FY	Fiscal year
HRB	Harbor Oscillation model
IE	Inlets and Entrances Wave/Current Interaction Model
L	Long duration gage (30 to 50 years)
MCCP	Monitoring Completed Coastal Projects Program (by COE)
MMS	Minerals Management Service
NDBC	National Data Buoy Center, National Oceanic and Atmospheric Administration
NOAA	National Oceanic and Atmospheric Administration
Non-dir.	Nondirectional wave gage or measurement
(P)	Partial support

Puv	Combination pressure and current meter wave gage (directional)
RCP	Regional Coastal Processes Wave Transformation Model
S	Short duration gage (3 to 5 years)
SED	Sediment Transport Model
SIO	Scripps Institution of Oceanography
Sxy	Radiation Stress, as measured by large slope array wave gage
USN	US Navy
WIS	Wave Information Study (hindcast)

Section I

Data Needs

NORTH CENTRAL
DIVISION
(NCD)

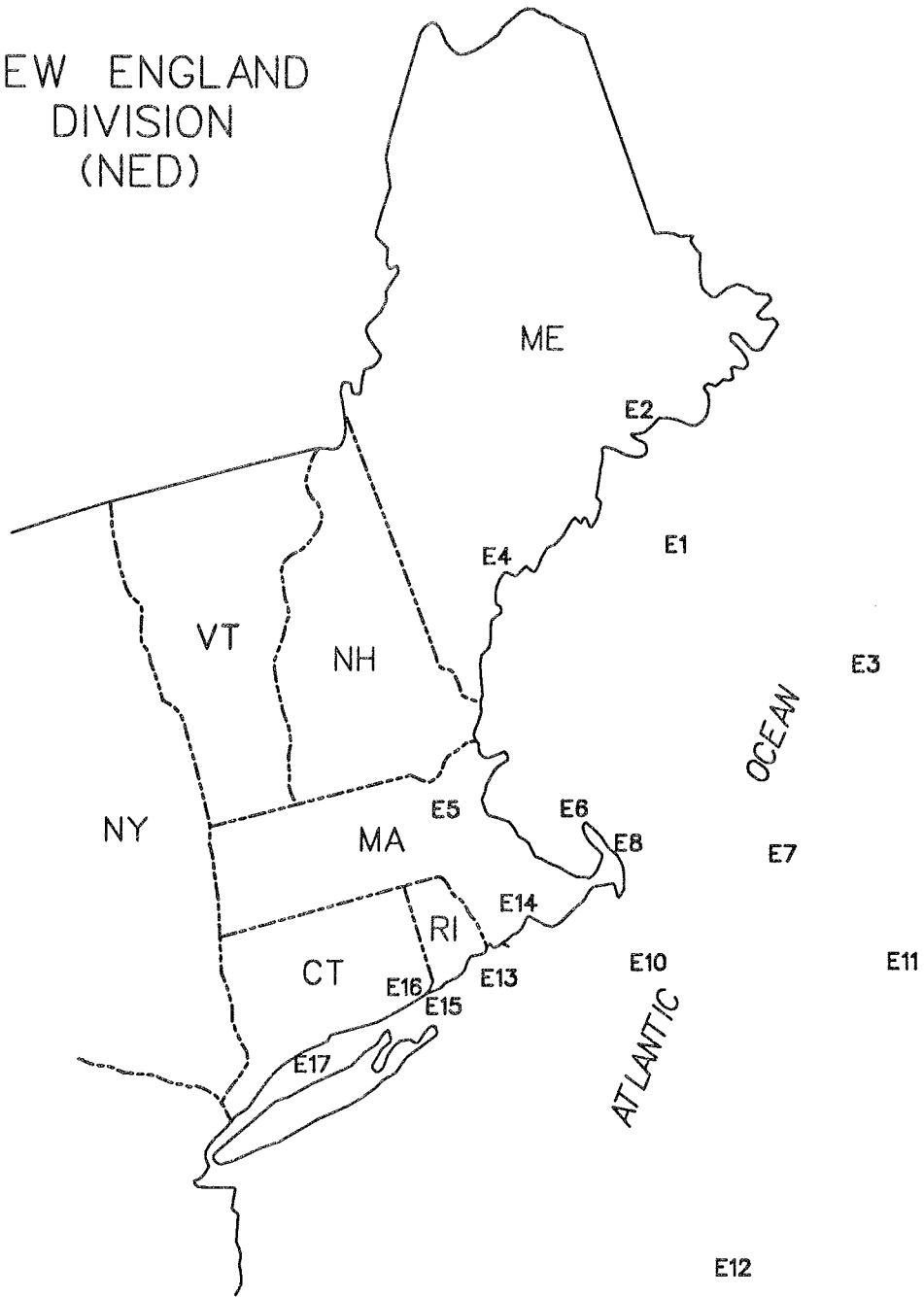


FIELD WAVE GAGING - DATA NEEDS

DIVISION NCD

MAP INDEX NO.	AREA NAME	HIGH PRIORITY	MED. PRIORITY	DURATION	DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER	COMMENTS	EXISTING GAGES	
												COE	OTHER
L1	Duluth			S									
L2	Grand Marais			S									
L3	West Lake Superior			L							NDBC buoy *45006-3D: non-directional	1	
L4	Mid Lake Superior			L							NDBC buoy *45001-3D: non-directional	1	
L5	East Lake Superior			L							NDBC buoy *45004-12D: non-directional	1	
L6	Grand Marais, MI			S									
L7	Green Bay			S									
L8	North Lake Michigan			L							NDBC buoy *45002-12D: non-directional	1	
L9	Kewaunee			S									
L10	Sheboygan			L							Eval. wave variability over lake cycle		
L11	Milwaukee			S							2 gages requested		
L12	Chicago			L							Potential coop w/State: multiple gages		
L13	Indiana Shores			S							Potential coop w/State: multiple gages		
L14	Benton Harbor			S							Co-op w/MCCP work unit		
L15	South Lake Michigan			L							NDBC buoy *45007-3D: directional	(P)	1
L16	Big Sable Point			S							Nearshore processes experiments	1	
L17	Hammond Bay			S									
L18	North Lake Huron			L							NDBC buoy *45003-6N: non-directional	1	
L19	Harrisville			S									
L20	South Lake Huron			L							NDBC buoy *45008-6N: non-directional	1	
L21	Harbor Beach			S									
L22	Detroit			S									
TOTALS													

NEW ENGLAND
DIVISION
(NED)



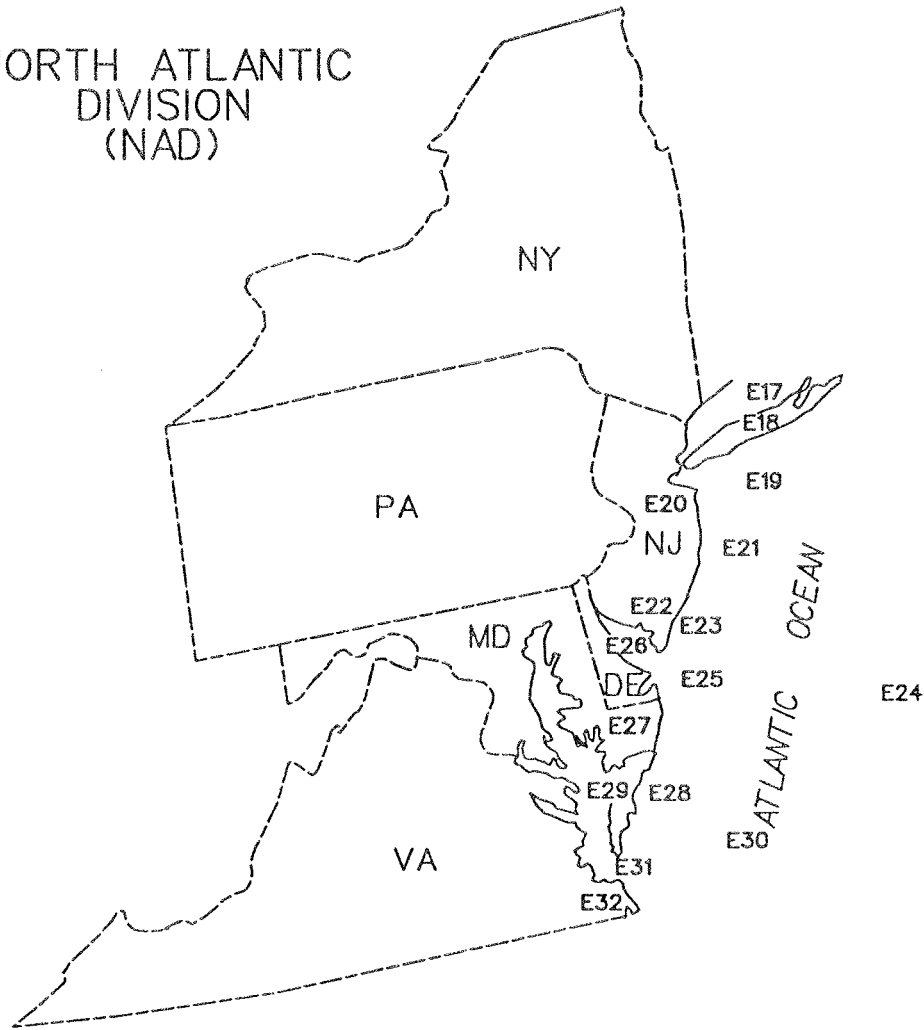
FIELD WAVE GAGING - DATA NEEDS

DIVISION

NED

MAP INDEX NO.	AREA NAME	HIGH PRIORITY	MED. PRIORITY	DURATION	DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER	COMMENTS	EXISTING GAGES	
												COE	OTHER
E1	Grand Manan	●		L	●			●					
E2	Frenchman Bay	●		S	●		●	●					
E3	Gulf of Maine	●		L							NDBC buoy #44005-6N; non-directional		I
E4	Saco Bay		●	S	●		●						
E5	Boston	●		S	●		●	●			NDBC buoy #44013-LNB; non-directional		I
E6	Provincetown	●		S	●								
E7	Cape Cod	●		L	●		●						
E8	Chatham	●		S	●								
E9	S. Cape Cod Shore	●		S	●		●	●			Short term intensive gaging at multiple sites		
E10	Sankaty Head		●	S	●		●						
E11	Georges Bank		●	L	●		●				NDBC buoy #44011-6N; non-directional		I
E12	Nantucket	●		L							NDBC buoy #44008-LNB; non-directional		I
E13	Marthas Vineyard		●	S	●		●	●					
E14	Narraganset Bay	●		S	●		●	●			Directional buoy + array needed		
E15	Block Island Sound		●	S	●		●						
E16	New London	●		S	●		●						
TOTALS			5	-									4

NORTH ATLANTIC
DIVISION
(NAD)

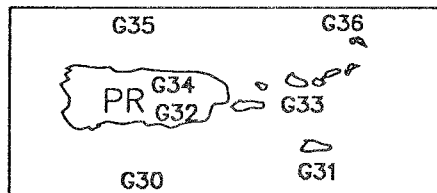
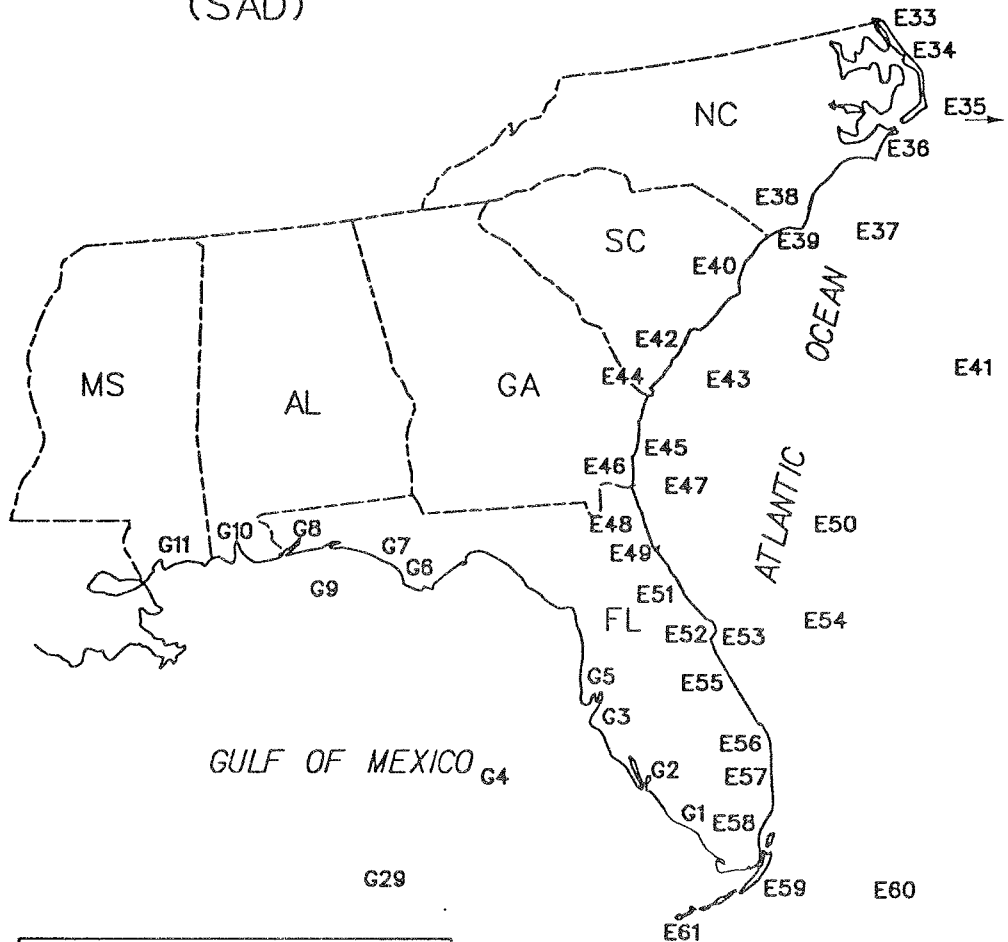


FIELD WAVE GAGING - DATA NEEDS

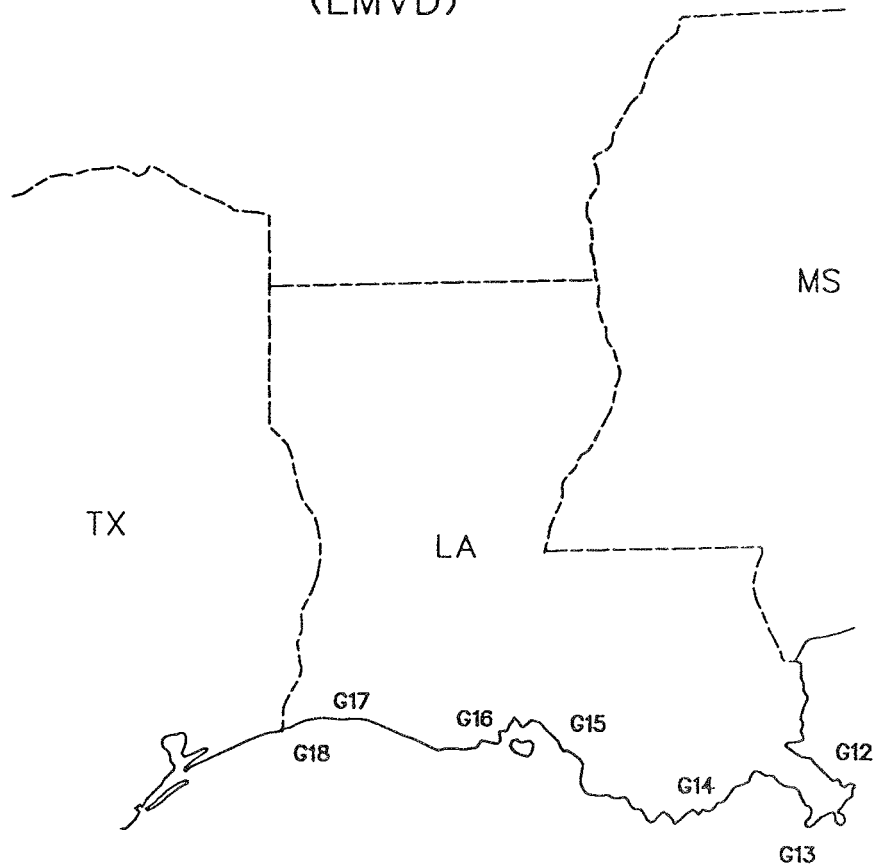
DIVISION NAD

MAP INDEX NO.	AREA NAME	HIGH PRIORITY	MED. PRIORITY	DURATION	DIR. WAVES	NONDR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER	COMMENTS	EXISTING GAGES	
												COE	OTHER
E17	Long Island Sound	•		S	•			•	•		2 locations for a dir. buoy		
E18	Long Island Shoreline	•		S	•		•		•		5 sites identified		
E19	Ambrose	•		L	•		•						
E20	N. Jersey Shore	•		S	•		•						
E21	Barnegat Inlet		•	S	•		•		•				
E22	Atlantic City	•		L	•		•		•				
E23	Cape May	•	•	S	•		•		•				
E24	Hotel	•		L	•		•				NDBC buoy #44004-6N; non-directional		I
E25	Delaware Bay Entrance	•		L	•		•				NDBC buoy #44009-LNB; non-directional		I
E26	Delaware Shore	•		S	•		•		•		Gage mount & cable in place		
E27	Ocean City	•		S	•		•				Co-operation w/Episodic Events	2	
E28	Chincoteague Inlet	•		S	•		•						
E29	Chesapeake Bay (A-K below)												
E29-A	Baltimore		•	S	•		•		•				
E29-B	Chester River	•		S	•		•						
E29-C	Kent Island		•	S	•		•						
E29-D	Tilghman Island	•		S	•		•						
E29-E	Choptank River	•		S	•		•						
E29-F	Cambridge & VIC		•	S	•		•				Multiple sites		
E29-G	Calvert Cliffs	•		S	•		•						
E-29-H	Potomac River	•		S	•		•						
E29-I	S. Potomac Shores		•	S	•		•				Multiple sites		
TOTALS													

SOUTH ATLANTIC
DIVISION
(SAD)

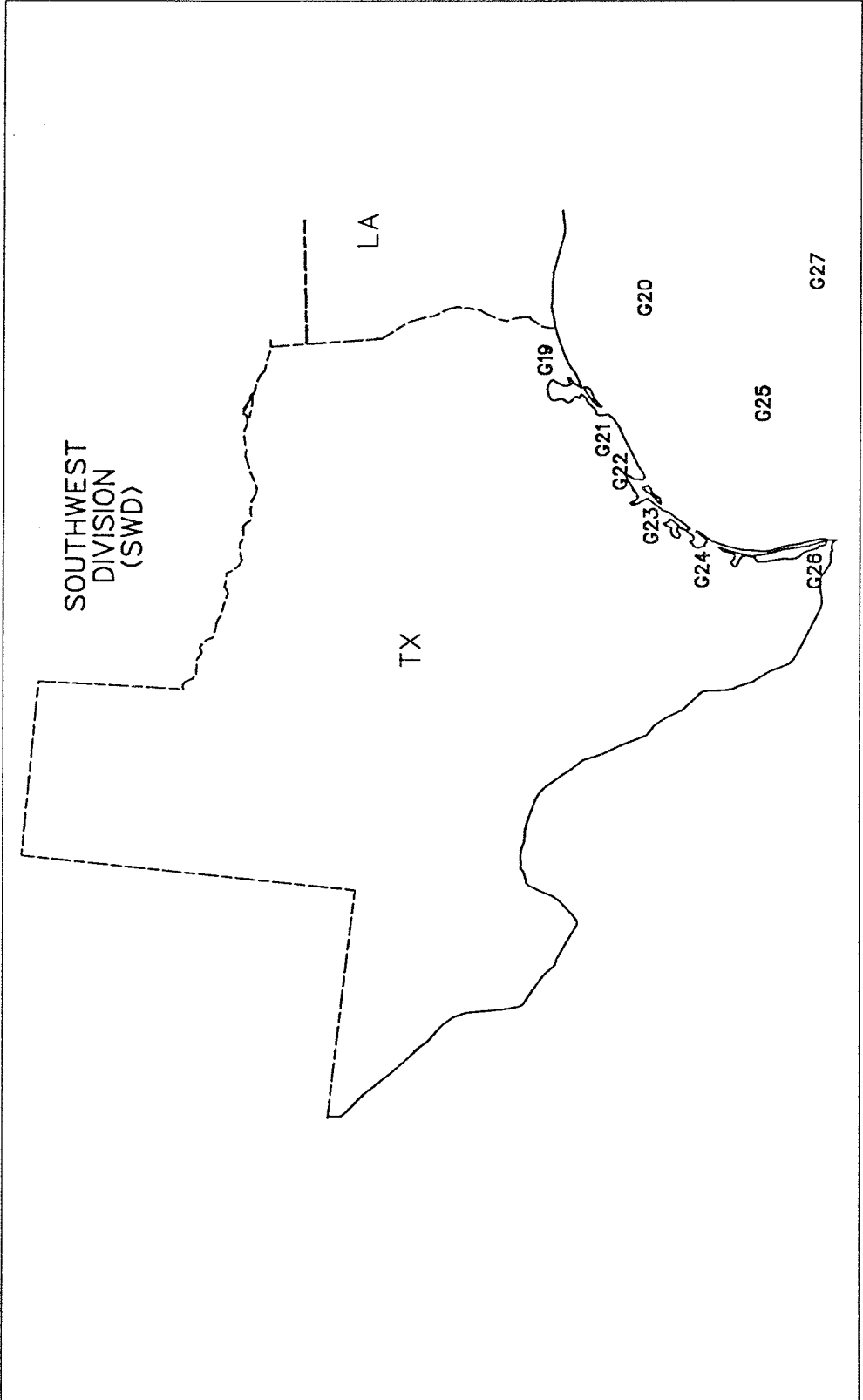


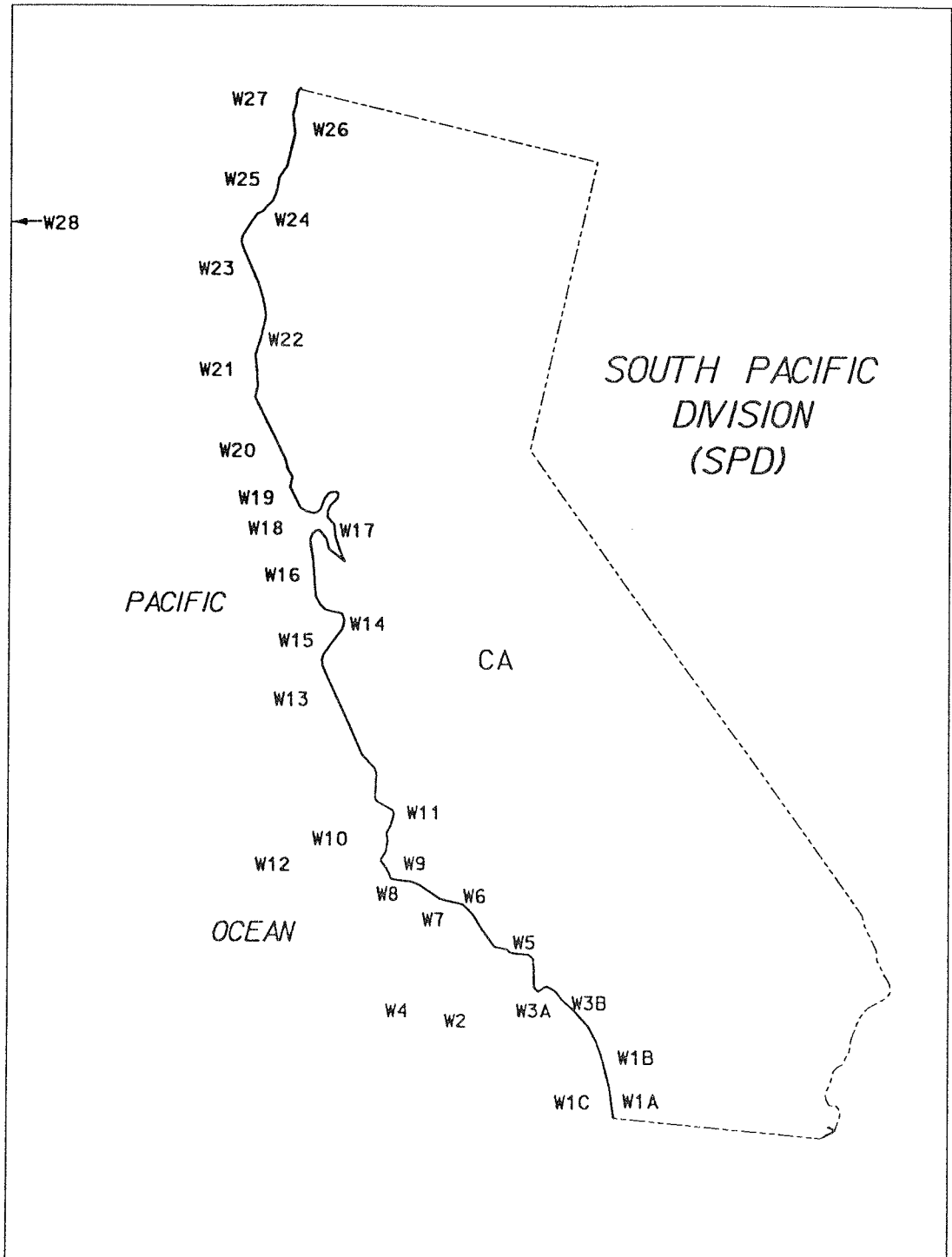
LOWER MISSISSIPPI
VALLEY DIVISION
(LMVD)



GULF OF MEXICO

G28

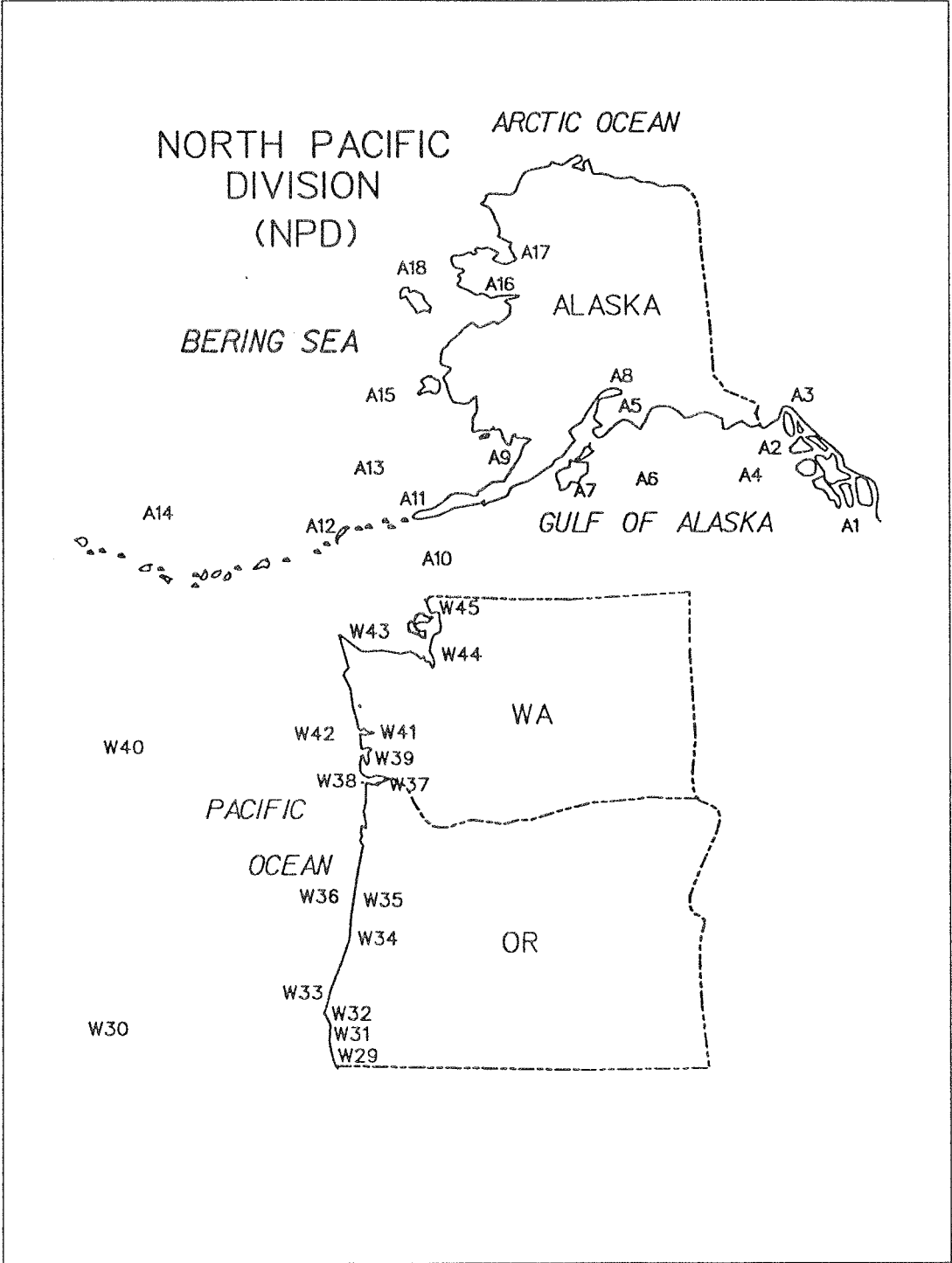




FIELD WAVE GAGING - DATA NEEDS

DIVISION SPD

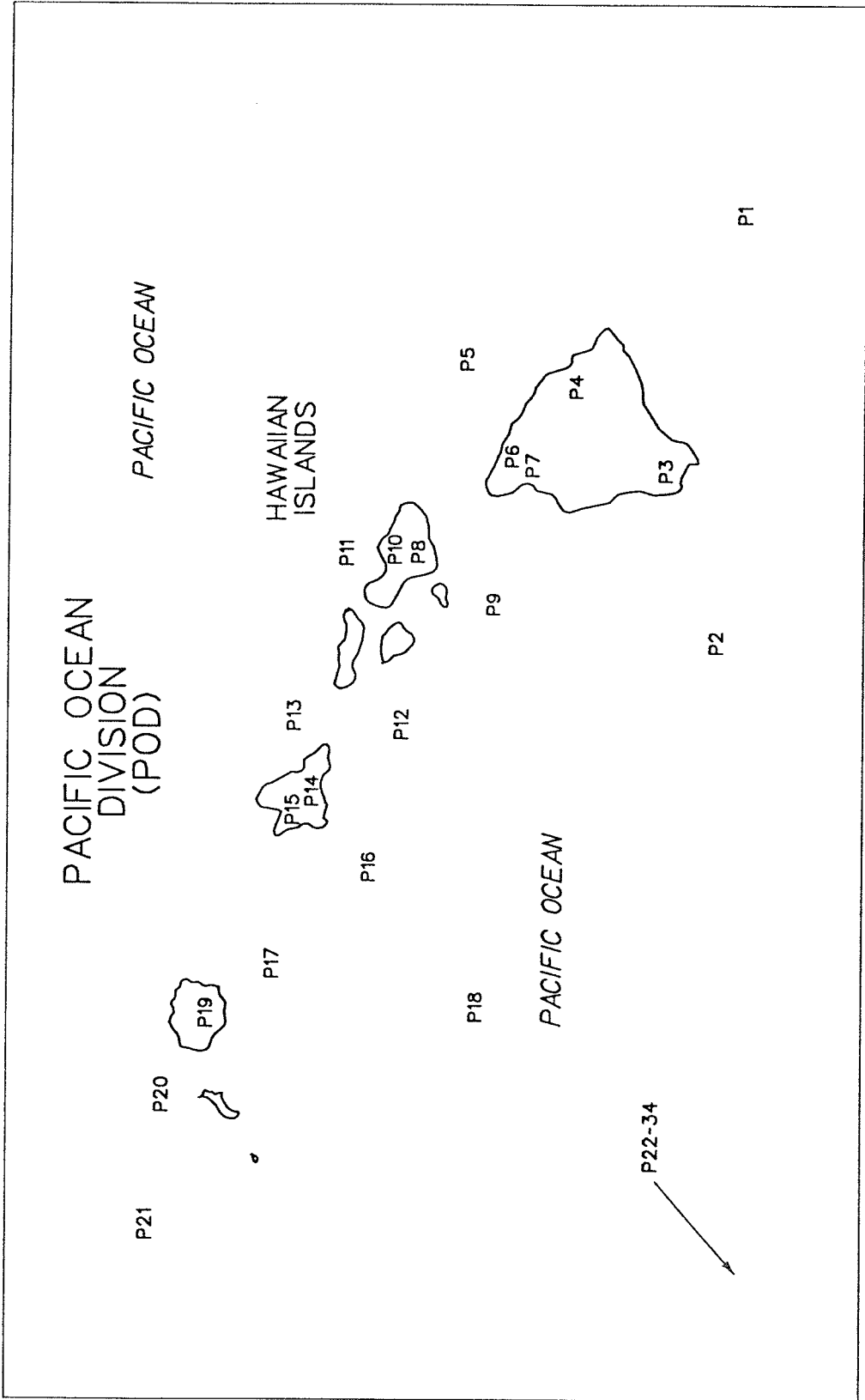
MAP INDEX NO.	AREA NAME	HIGH PRIORITY	MED. PRIORITY	DURATION	DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER	COMMENTS	EXISTING GAGES	
												COE	OTHER
W1-A	San Diego	●		S	●		●	●	●		Potential co-op w/o O&M, SPD; Significant data base exists from 3 sites	2	
W1-B	Oceanside	●		S							Significant database exists from 3 sites	2	
W1-C	San Pedro Channel	●		L	●		●				Provide Southern Swell effect on South. California		
W2	Catalina Ridge	●		L	●		●				NDBC buoy *46025-3D; directional	(P)	1
W3-A	San Pedro Bay	●		S	●		●				Co-op w/MCCP Redondo Beach work unit		
W3-B	Redondo Beach	●		S	●		●				Potential co-op w/SPD and Ports of LA/LB	1	
W4	South. California Bight	●		L	●		●				Co-op w/MCCP Redondo Beach work unit		
W5	Santa Monica	●		S	●		●				Co-op w/USN	(P)	1
W6	Santa Barbara	●		S	●		●						
W7	Santa Cruz Canyon	●		S	●						Navy owned, COE operated		1
W8	Point Conception	●		L	●		●				NDBC buoy *46023-10D; non-directional		1
W9	Point Arguello	●		S	●		●				Non-directional gage on Harvest Platform	1	
W10	Santa Maria	●		S	●		●				NDBC buoy *46011-6N non-directional		
W11	Marro Bay	●		S	●		●				S10 buoy at Diablo Canyon; non-directional	1	
W12	Pt. Buchon	●		S	●		●				2 gages required		
W13	Cape San Martin	●		S	●		●				NDBC buoy *46028-6N; non-directional		1
W14	Monterey Bay	●		S	●		●						2
W15	Monterey Offshore	●		L	●		●				NDBC buoy *46042-3D; directional		1
TOTALS													



FIELD WAVE GAGING - DATA NEEDS

DIVISION NPD

MAP INDEX NO.	AREA NAME	HIGH PRIORITY	MED. PRIORITY	DURATION	DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER	COMMENTS	EXISTING GAGES	
												COE	OTHER
W29	Cape Sebastian			S									
W30	Oregon			L							NDBC buoy *46002-6N: non-directional		1
W31	Coquille			S								2	
W32	Coos Bay			S									
W33	Cape Arago			L							S10 buoy at Coquille: non-directional	1	
W34	Siuslaw			S							Coop w/MCCP Program planned	1	
W35	Yaquina			S							Coop w/MCCP Program planned: multiple gages		
W36	Cape Foulweather			L							NDBC buoy *46040-30: non-directional		1
W37	Columbia River entrance			L							Need gages on both sides of entrance	1	
W38	Columbia River Offshore			L							NDBC buoy *46010-LNB: non-directional		1
W39	Willapa Bay			S									
W40	Washington			L							NDBC buoy *46005-6N: non-directional		1
W41	Grays Harbor			S									
W42	Grays Harbor Offshore			L							Replace waverider w/upgraded NDBC	1	1
W43	Strait of Juan de Fuca			L									1
W44	Seattle			S									
W45	San Juan Islands			S									
A1	Ketchikan			S									
A2	Sitka			S							Multiple gages required		
A3	Lynn Canal			S									
A4	Southeast Alaska			L									
TOTALS													



FIELD WAVE GAGING - DATA NEEDS

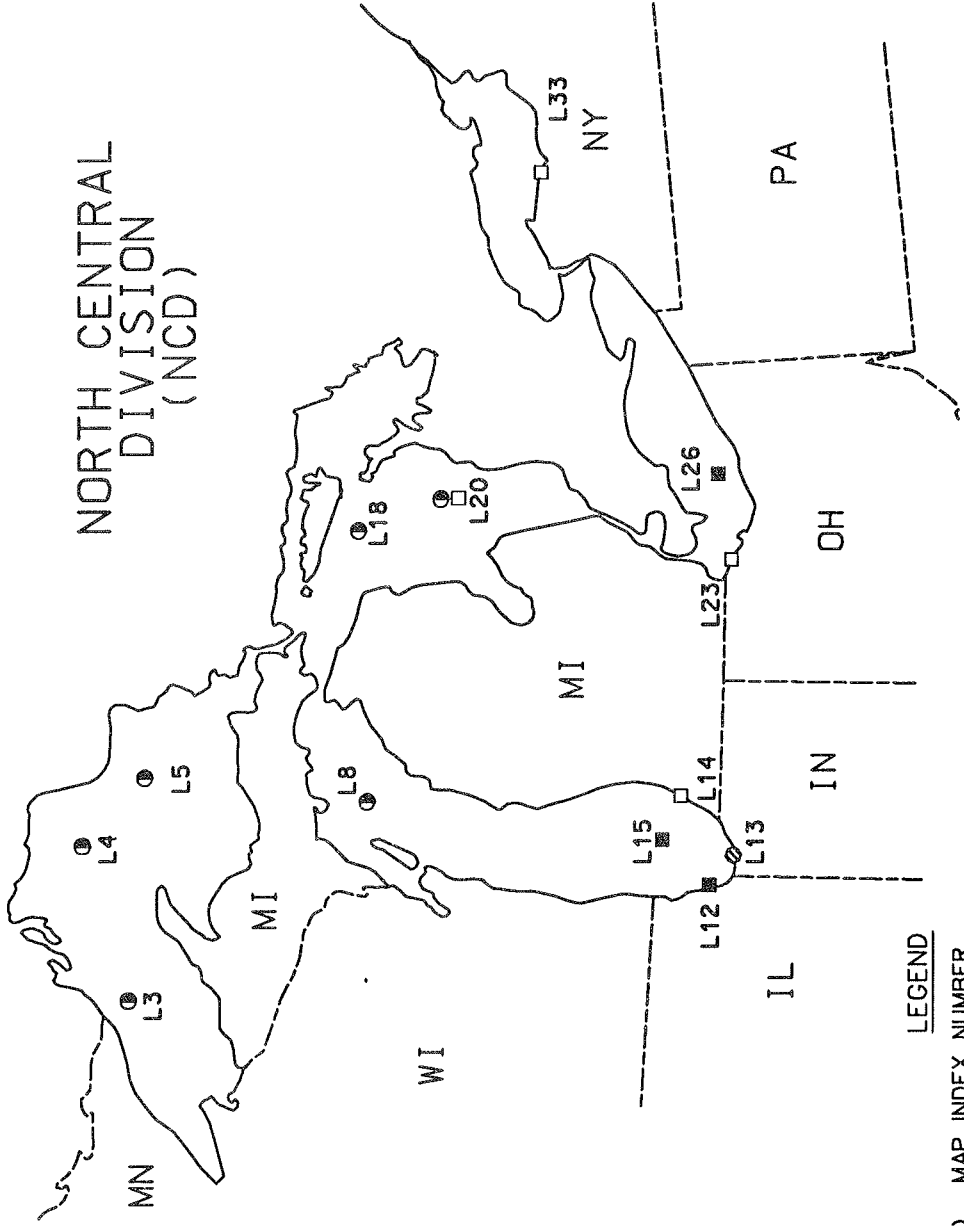
DIVISION _____ POD _____

MAP INDEX NO.	AREA NAME	HIGH PRIORITY	MED. PRIORITY	DURATION	DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER	COMMENTS	EXISTING GAGES	
												COE	OTHER
P1	South East Hawaii			L							NDBC buoy #51004-6N; non-directional		1
P2	South West Hawaii			L							NDBC buoy #51002-6N; non-directional		1
P3	Ka Lae			S									
P4	Hilo			S									
P5	Hawaii Offshore, Northeast			L									
P6	Hawaii, North			S									
P7	Kauai			S									
P8	Hawaii West			L									
P9	Maui Southwest			S									
P10	Kahului Harbor			S									
P11	Maui Offshore, North			L									
P12	Molokai Offshore, South			L									
P13	Oahu Northeast			L							Waverider at Makapu; non-directional	1	
P14	Honolulu			S									
P15	Barbers Point			S							Gages in place under MSCP program	2	
P16	Oahu South			L									
P17	Kauai Channel			L							NDBC buoy #51003-6N; non-directional		1
P18	West Hawaii			L									
P19	Lihue			S									
P20	Barking Sands			L							Continue coop w/USN		1
P21	North West Hawaii			L							NDBC buoy #51001-6N; non-directional		1
TOTALS													

Section II

Deployment Plan

NORTH CENTRAL DIVISION (NCD)



LEGEND

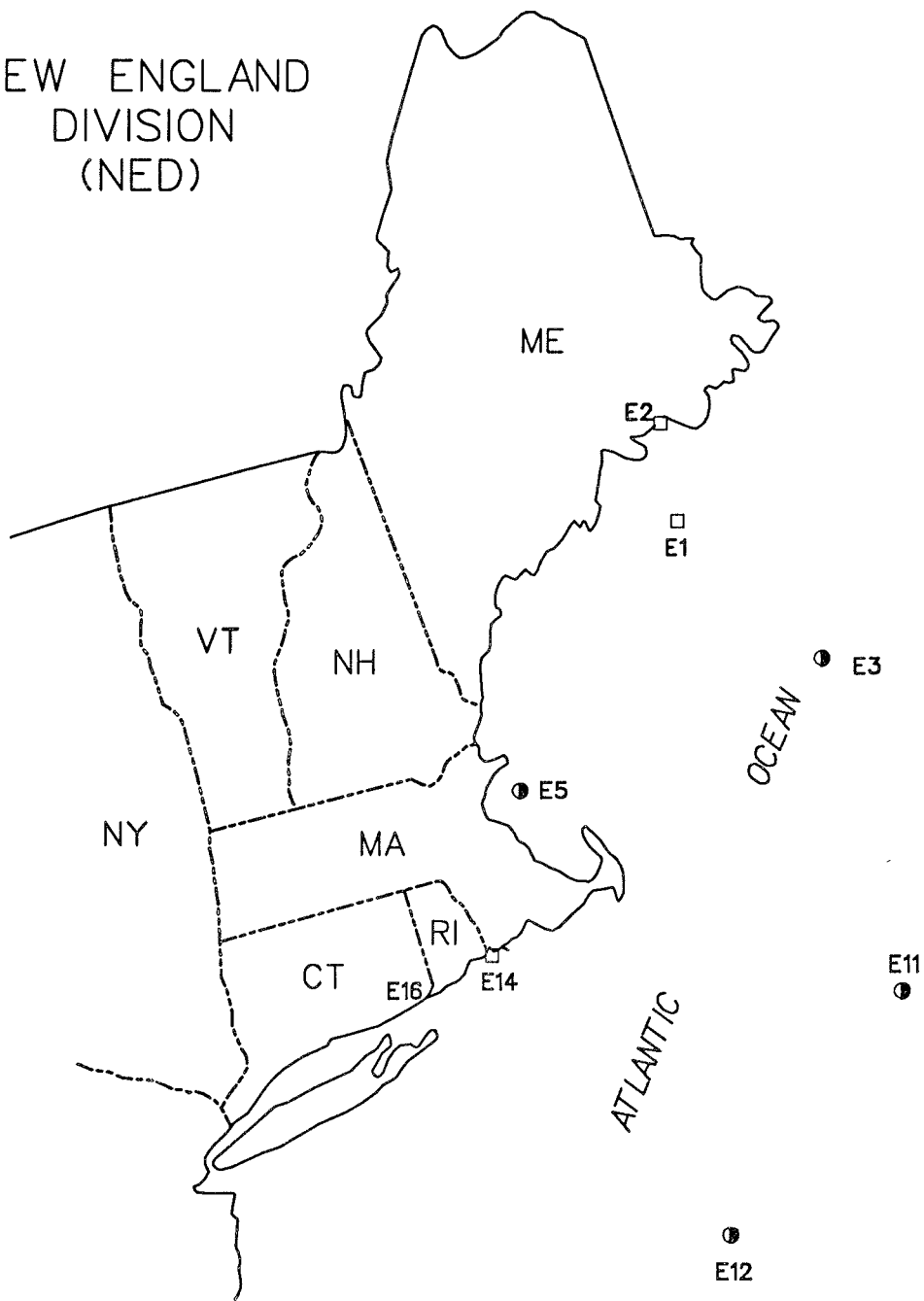
- L33 (TYP) MAP INDEX NUMBER
- DIRECTIONAL GAGE - SCHEDULED
- DIRECTIONAL GAGE - EXISTING
- ⊘ NON-DIRECTIONAL GAGE - DISCONTINUED
- NON-DIRECTIONAL GAGE - NOT FWGP FUNDED

FIELD WAVE GAGING PROGRAM - GAGE DEPLOYMENT PLAN

DIVISION NCD

MAP INDEX NO.	AREA NAME	DATA NEEDS						MODEL VERIFICATION	GAGE STATUS						GAGE DEPLOYMENT						COMMENTS
		DR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER		GAGE YEARS	GAGE YEARS	CFY	BFY	91	92	93	94	95	96			
L26	Western Lake Erie	●	●		●			WIS	8	1	/	/	/	/	/	/	Upgrade of existing NDBC #45005				
L15	South Lake Michigan	●			●			WIS	6	0	/	/	/	/	/	/	Upgrade of existing NDBC #45007				
L12	Chicago	●		●			WIS RCP	0	0	X	XXXX	XXXX	XXXX	XXXX			NCD support provided				
L14	St. Joseph/Benton Harbor	●		●			WIS RCP	0	0		XXX	XXXX	XXXX	XXXX			Beach fill installed and MCCP monitoring at EOFY 91				
L20	South Lake Huron	●			●		WIS	6	0	0	00	0	00	0	///	///	Upgrade existing NDBC buoy #45008				
L23	Toledo	●		●			WIS RCP	0	0						XXXX						
L33	Rochester	●		●			WIS RCP	0	0						XX						
TOTALS									20	1	4	4	5	5	6						

NEW ENGLAND
DIVISION
(NED)










LEGEND

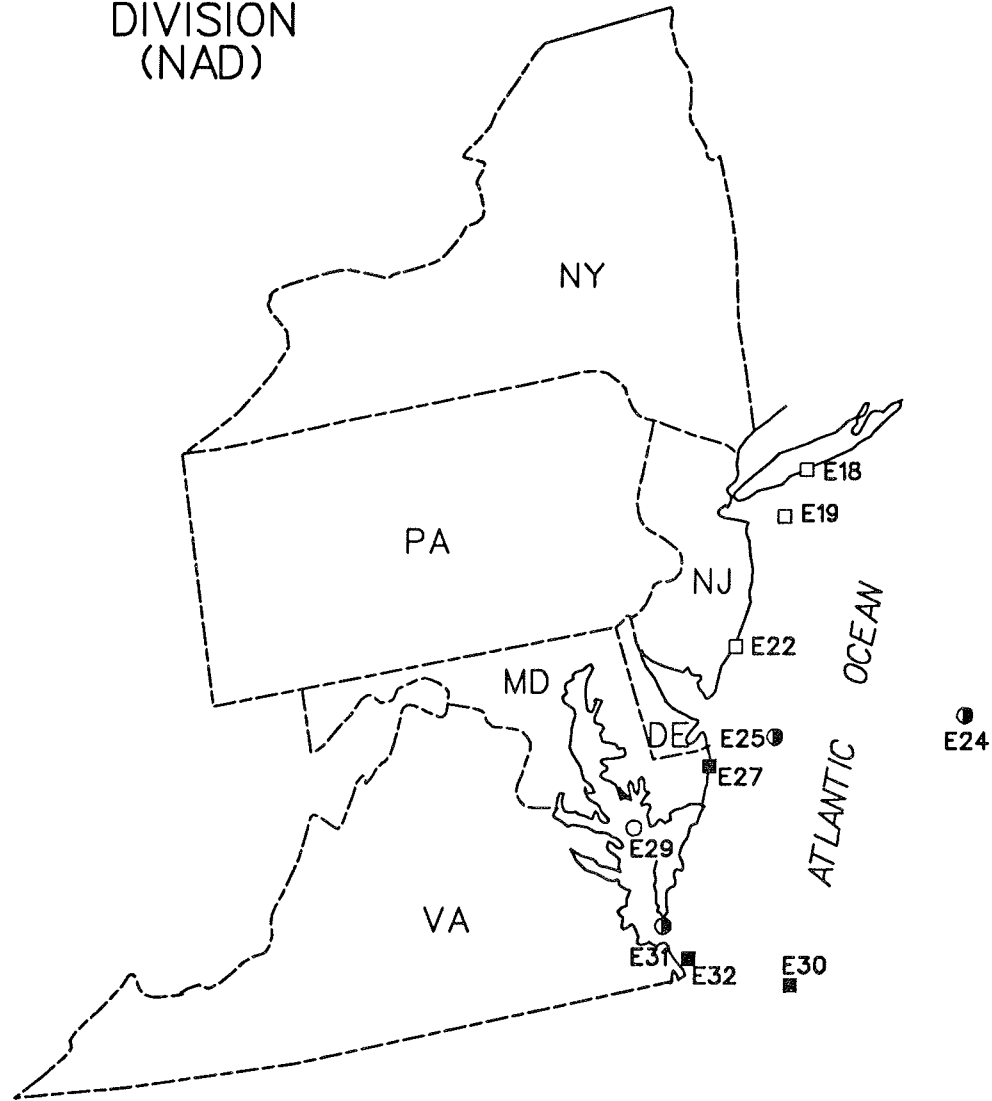
- | | |
|-----------|--|
| E16 (TYP) | MAP INDEX NUMBER |
| □ | DIRECTIONAL GAGE - SCHEDULED |
| ● | NON-DIRECTIONAL GAGE - NOT FWGP FUNDED |

FIELD WAVE GAGING PROGRAM - GAGE DEPLOYMENT PLAN

DIVISION NED

MAP INDEX NO.	AREA NAME	DATA NEEDS					MODEL VERIFICATION	GAGE STATUS					GAGE DEPLOYMENT	COMMENTS	
		DIR. WAVES 	NONDIR. WAVES 	TIDES/WL 	WINDS 	CURRENTS 		OTHER	GAGE YEARS 	GAGE YEARS 	CFY	BFY			FY
E1	Grand Manan	•			•		WIS	0	0		///	////	////	////	
E2	Frenchmans Bay	•			•		WIS RCP	0	0			XX XXXX	XXXX	XXXX	
E4	Narragansett Bay	•			•		WIS RCP	0	0				XX XXXX	XXXX	
TOTALS								0	0	0	1	2	3	3	

NORTH ATLANTIC
DIVISION
(NAD)



LEGEND

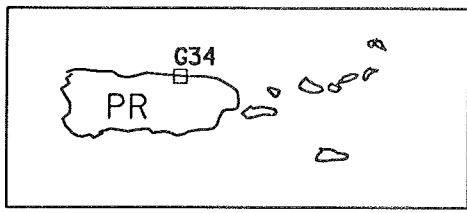
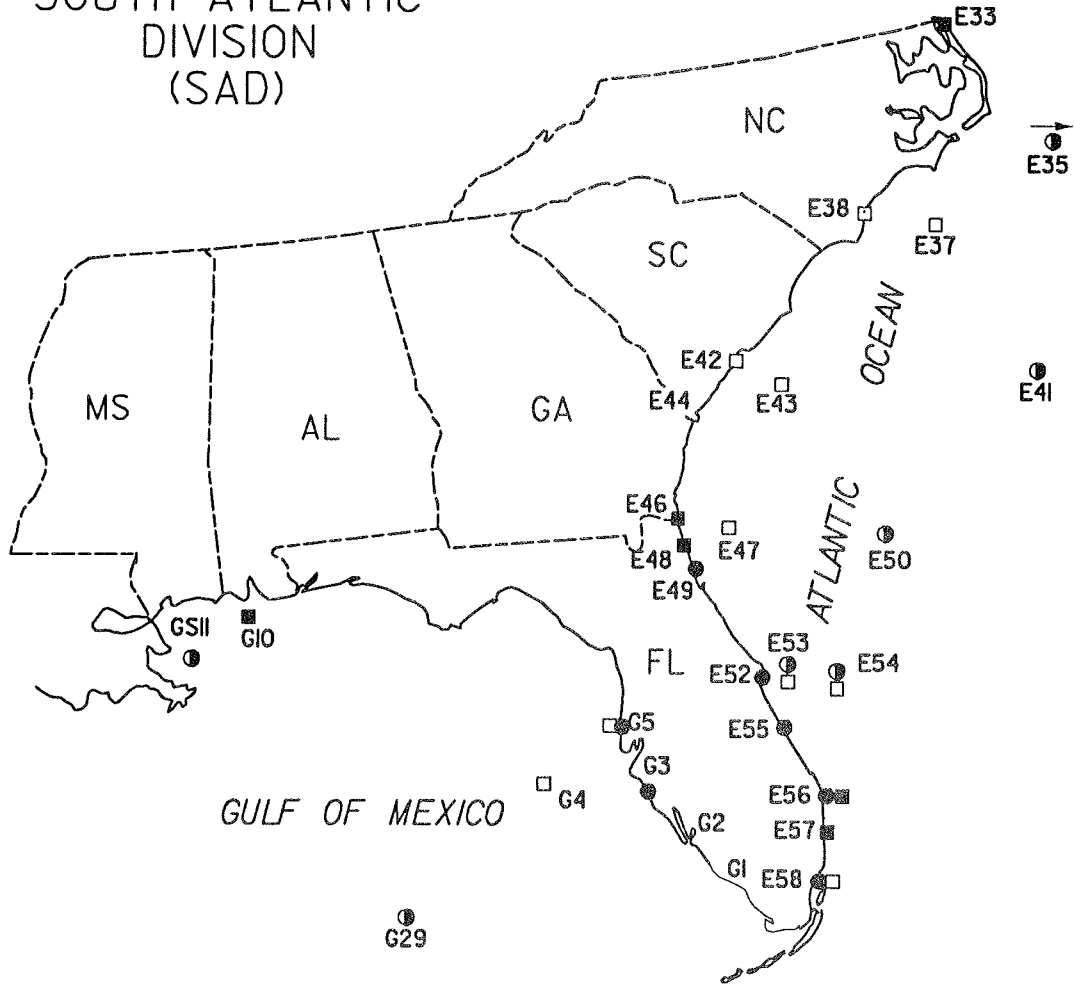
- | | |
|-----------|--|
| E32 (TYP) | MAP INDEX NUMBER |
| □ | DIRECTIONAL GAGE - SCHEDULED |
| ■ | DIRECTIONAL GAGE - EXISTING |
| ○ | NON-DIRECTIONAL GAGE - SCHEDULED |
| ● | NON-DIRECTIONAL GAGE - NOT FWGP FUNDED |

FIELD WAVE GAGING PROGRAM - GAGE DEPLOYMENT PLAN

DIVISION NAD

MAP INDEX NO.	AREA NAME	DATA NEEDS					MODEL VERIFICATION	GAGE STATUS					GAGE DEPLOYMENT					COMMENTS
		DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS		OTHER	GAGE YEARS	GAGE YEARS	CFY	BFY	FY	FY	FY	FY		
E27	Ocean City	●	○	●	●	●	WIS RCP	3	0	**	***	****	****	****	94		Installed and operated by MCCP	
E30	Norfolk Canyon	●			●		WIS	0	0	/	////	////	////	////			NDBC 3M buoy	
E32	Virginia Beach	●		●		●	WIS RCP	0	0	*	****	****	***				Cost sharing with State of Virginia	
E22	Atlantic City	●		●		●	WIS	0	0			●	●●●●	●●●●				
E19	Ambrose	●			●		WIS	0	0				///	////				
E29-H	Potomac River		●					0	0					0	0000			
E-18	Long Island Shoreline	●		●			WIS	0	0						●●			
TOTALS								3	0	4	4	5	6	5				

SOUTH ATLANTIC
DIVISION
(SAD)



LEGEND

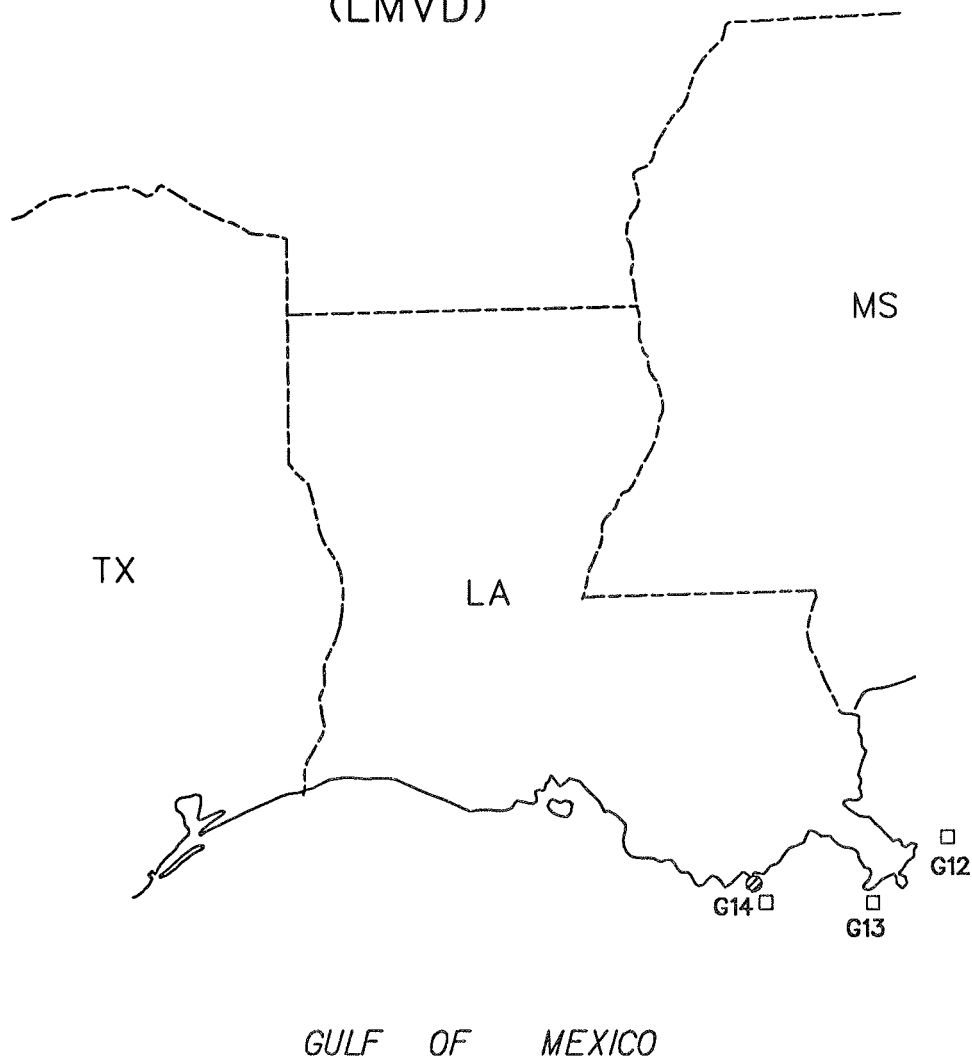
- | | |
|-----------|--|
| E58 (TYP) | MAP INDEX NUMBER |
| □ | DIRECTIONAL GAGE - SCHEDULED |
| ■ | DIRECTIONAL GAGE - EXISTING |
| ● | NON-DIRECTIONAL GAGE - EXISTING |
| ⊙ | NON-DIRECTIONAL GAGE - NOT FWGP FUNDED |

FIELD WAVE GAGING PROGRAM - GAGE DEPLOYMENT PLAN

DIVISION SAD

MAP INDEX NO.	AREA NAME	DATA NEEDS						MODEL VERIFICATION	GAGE STATUS					GAGE DEPLOYMENT				COMMENTS								
		DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER		GAGE YEARS	GAGE YEARS	CFY	BFY	FY	FY	FY	FY										
E53	Canaveral	•		•	•	←			0000	0000	0000	0000	0000	0000	0000	////	////									
E54	E. Canaveral	•		•	•				0000	0000	0000	0000	0000	0000	0000	////	////									
E47	St. Marys Entrance	•		•	•			WIS RCP	13	////	////	////	////	////	////	////	////			Reposition offshore when USN support ends						
E43	South Carolina Bight	•		•	•			WIS			////	////	////	////	////	////	////									
E37	North Carolina Bight	•		•	•			WIS			////	////	////	////	////	////	////									
G4	Tampa Offshore	•		•	•			WIS							////	////	////									
E42	Folley Island	•		•	•			WIS									X	XXXX								
E38	Wilmington	•		•	•			WIS											XXXX							
G34	San Juan	•		•	•			WIS												XX						
TOTALS																	65	16	14	9	8	10	12			

LOWER MISSISSIPPI VALLEY DIVISION (LMVD)

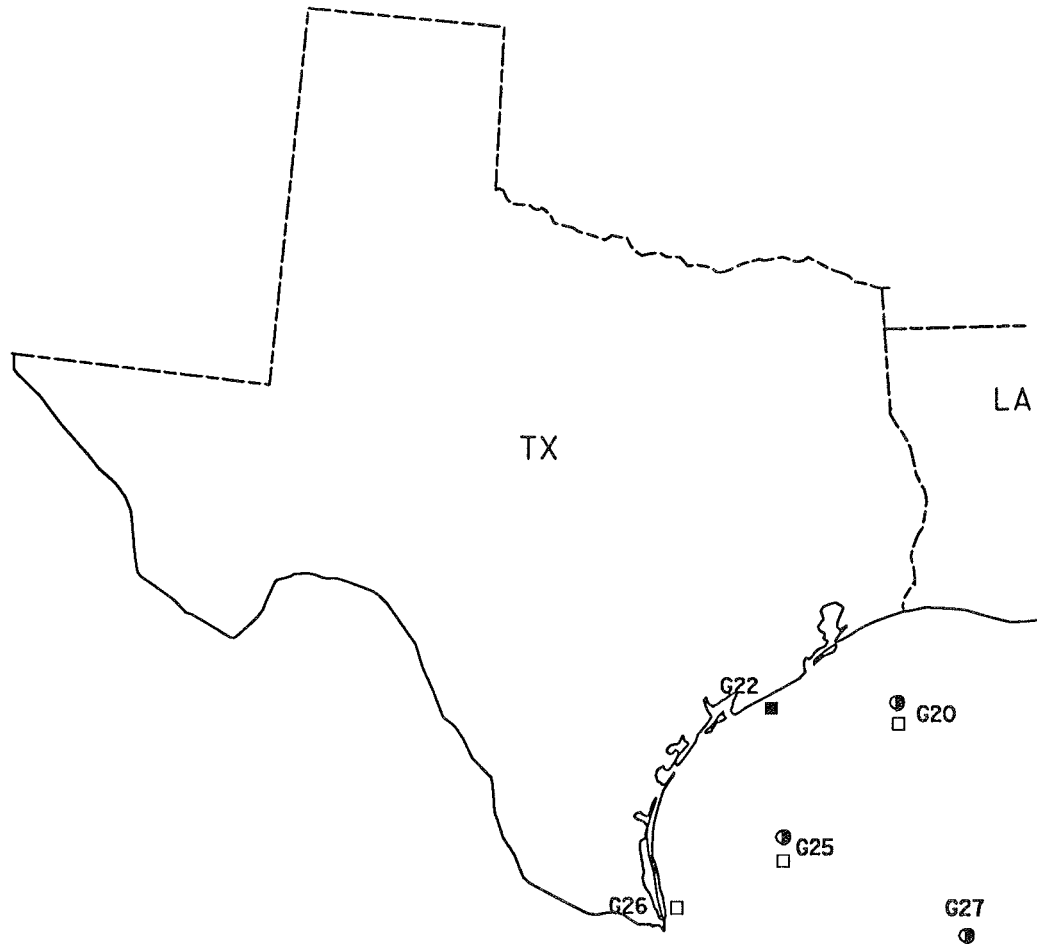


LEGEND

- | | |
|-----------|--|
| G28 (TYP) | MAP INDEX NUMBER |
| □ | DIRECTIONAL GAGE - SCHEDULED |
| ⊘ | NON-DIRECTIONAL GAGE - DISCONTINUED |
| ● | NON-DIRECTIONAL GAGE - NOT FWGP FUNDED |

□⊘
G28

SOUTHWEST
DIVISION
(SWD)



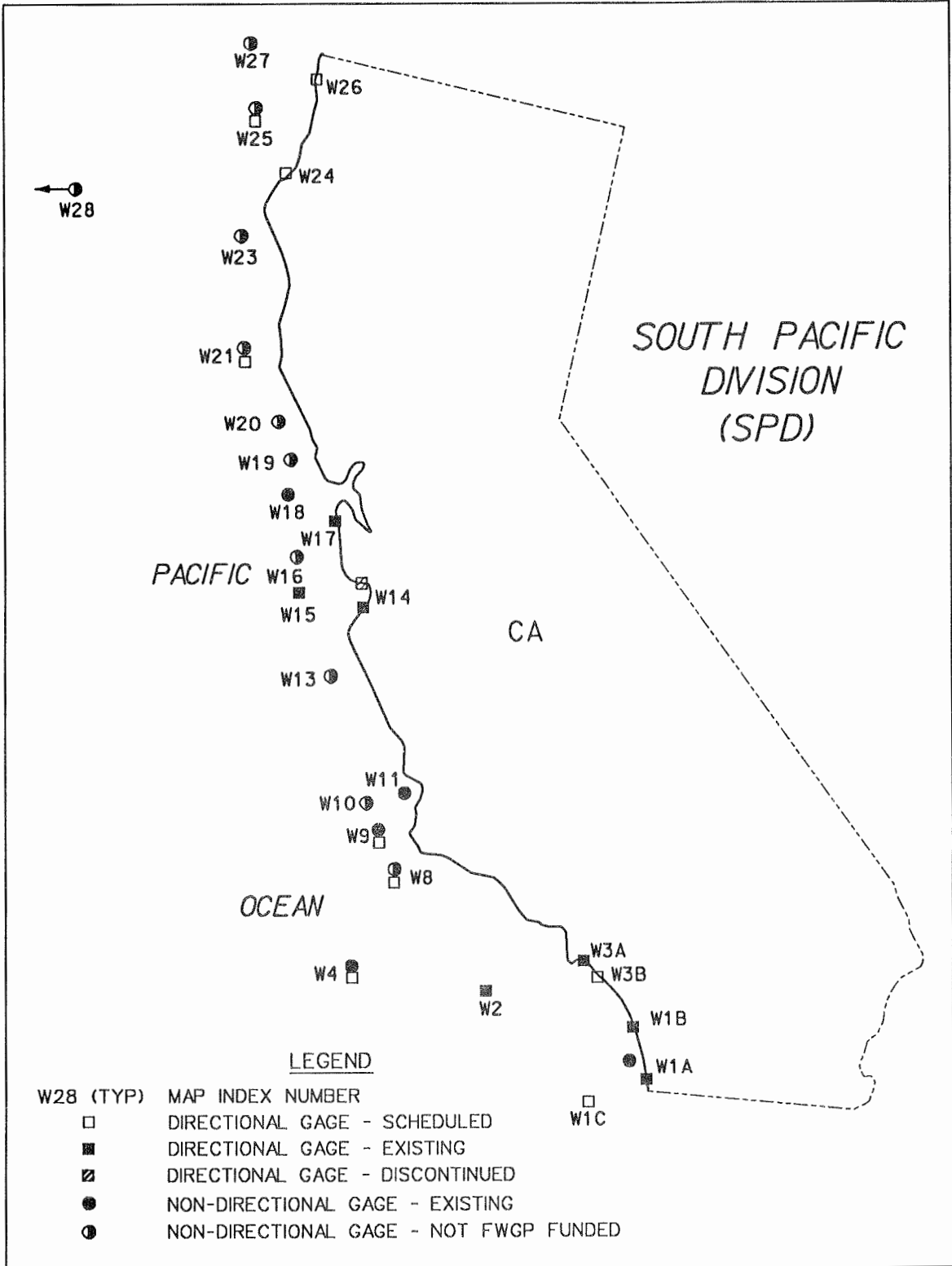
LEGEND

- | | |
|-----------|--|
| G27 (TYP) | MAP INDEX NUMBER |
| □ | DIRECTIONAL GAGE - SCHEDULED |
| ■ | DIRECTIONAL GAGE - EXISTING |
| ● | NON-DIRECTIONAL GAGE - NOT FWGP FUNDED |

FIELD WAVE GAGING PROGRAM - GAGE DEPLOYMENT PLAN

DIVISION SWD

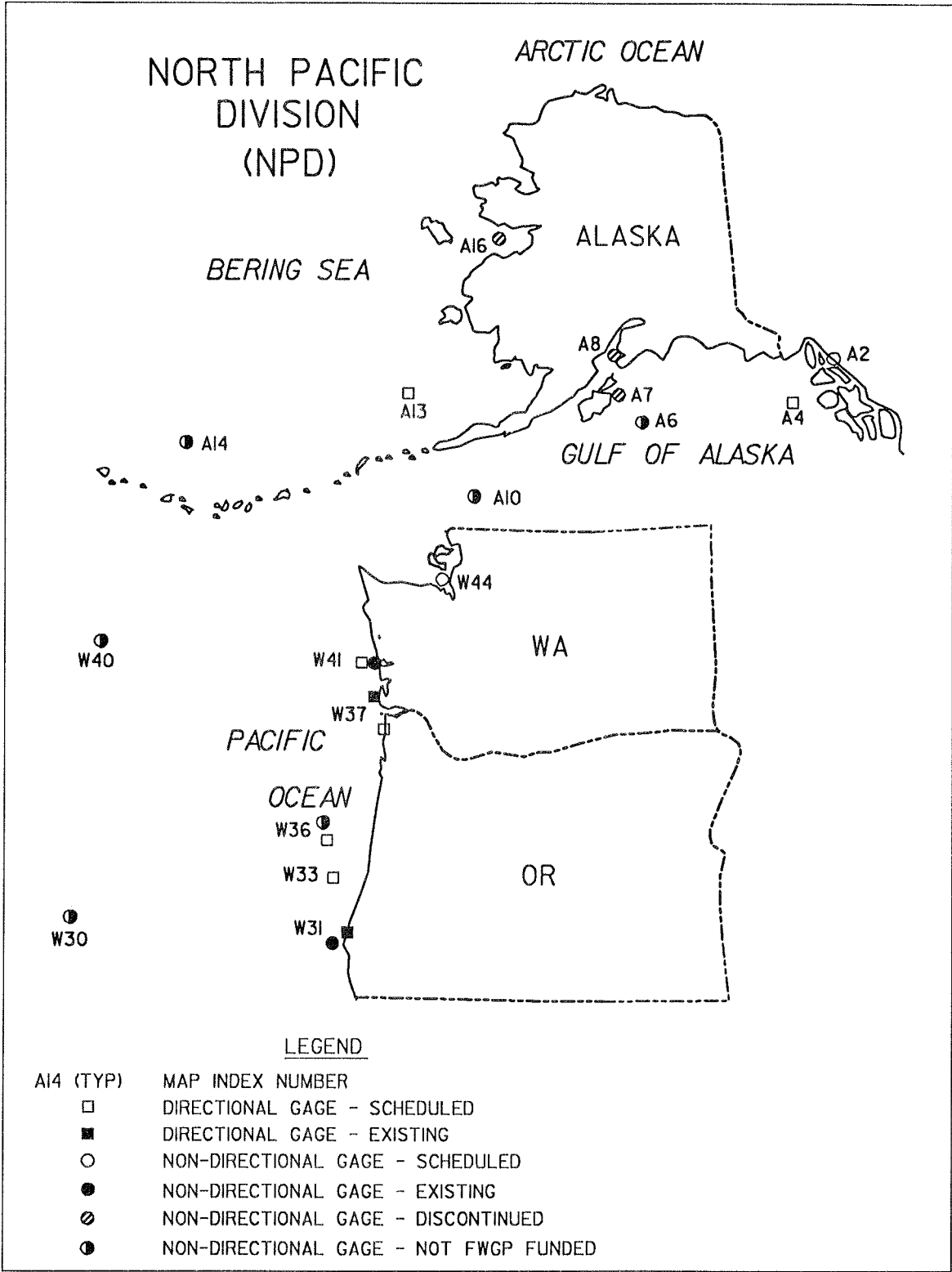
MAP INDEX NO.	AREA NAME	DATA NEEDS						GAGE STATUS		GAGE DEPLOYMENT				COMMENTS		
		DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER	MODEL VERIFICATION	GAGE YEARS	CFY YEARS	BFY	FY	FY		FY	
G22	Matagorda	●		●				WIS SED	0	0	**	****	****	**XX	XXXX	installation by MCCP
G20	North Texas Coast	●			●			WIS	0	0	0	00//	////	////	////	Upgrade NDBC 3M buoys; cost-sharing w/MMS
G25	South Texas Coast	●			●			WIS	0	0	00	000//	////	////	////	Upgrade NDBC 3M buoys; cost-sharing w/MMS
G26	Brownsville	●		●				WIS RCP	0	0				XX	XXXX	
TOTALS									0	0	3	3	3	4	4	



FIELD WAVE GAGING PROGRAM - GAGE DEPLOYMENT PLAN

DIVISION SPD

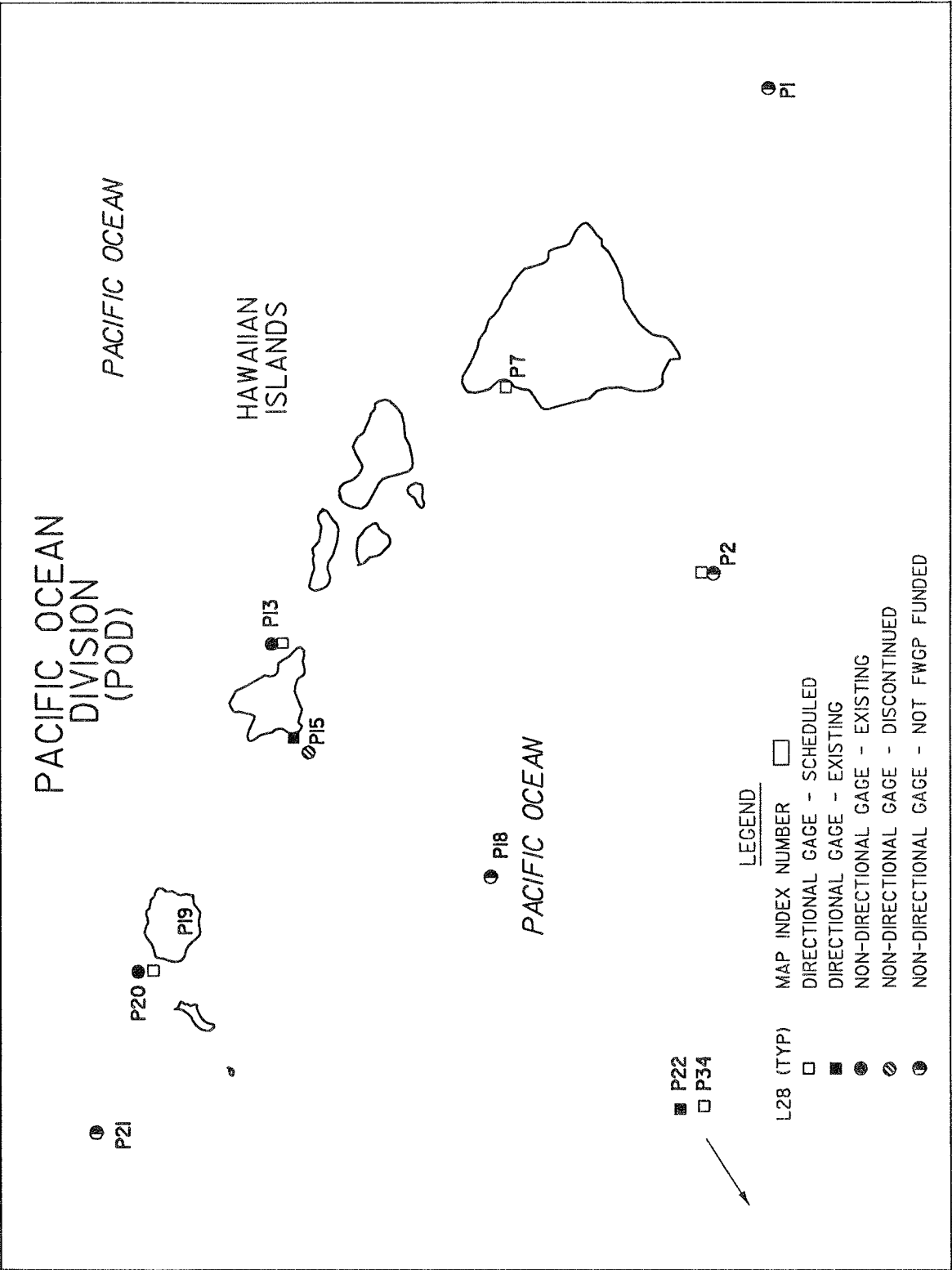
MAP INDEX NO.	AREA NAME	DATA NEEDS						GAGE STATUS			GAGE DEPLOYMENT				COMMENTS		
		DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS	OTHER	MODEL VERIFICATION	GAGE YEARS	GAGE YEARS	CFY	BFY	FY	FY		FY	
W17	San Francisco	●	●	●	●	●	●	WIS	8	3	XXXX	XXXX					Tsunami station Slope array at Pt. Montara
W18	Farallon Islands	●	●					WIS	7	0	0000	0000	0000	0000	0000		Waverider supported by City of San Francisco
W21	Point Arena	●			●			WIS	9	0	0000	000/	////	////	////		Upgrade ND9C 10M buoy #46014
W3B	Redondo Beach	●	●	●			WIS RCP	0	0	//// XXXX (+)	//// XXXX (+)	//// XXXX (+)	//// XXXX (+)	//// XXXX (+)	//// XXXX (+)		Four DWG's and one ND9C 3M directional buoy installed by MSCP
W24	Humboldt	●		●			WIS	0	0			XX	XXXX	XXXX	XXXX		
W25	Eel River	●		●			WIS	8	0	0000	000	X	XXXX	XXXX	XXXX		Replace ND9C Nomad buoy w/3M directional buoy at #46022
W26	Crescent City	●		●			WIS	2					X	XXXX			
W1-C	San Pedro Channel	●		●			WIS	0	0						XX		Index gage for Southern California
TOTALS								75	29	15	16	16	16	16	16		



FIELD WAVE GAGING PROGRAM - GAGE DEPLOYMENT PLAN

DIVISION _____ NPD _____

MAP INDEX NO.	AREA NAME	DATA NEEDS					MODEL VERIFICATION	GAGE STATUS			GAGE DEPLOYMENT				COMMENTS		
		DIR. WAVES	NONDIR. WAVES	TIDES/WL	WINDS	CURRENTS		OTHER	GAGE YEARS	GAGE YEARS	CFY	BFY	FY	FY		FY	
W41	Grays Harbor	●		●				WIS	6	0	0000	0000	XXXX	XXXX	XXXX	XXXX	Replace wave rider with slope array in FY 92
W31	Coquille	●		●				WIS	6	2	0000 XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	Replace waver rider in FY 91
W37	Columbia River Ent.	●		●				WIS	4	3	XXXX	XXXX XX	XXXX	XXXX	XXXX	XXXX	Add slope array on south side in FY 92
W36	Cape Foulweather	●			●			WIS	2	0	0000	00//	////	////	////	////	Upgrade NDBC 3M buoy #46040
A4	South East Alaska	●			●			WIS				/	////	////	////		
W33	Cape Arago	●			●			WIS				/	////	////	////		
A2	Sitka	●	●		●			WIS						0000 XXXX	0000 XXXX		
W44	Seattle	●	●		●									00 XX	0000 XXXX		
A13	Pribilof Islands							WIS								/	
TOTALS									18	5	5	5	7	9	10		



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P20

P19

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P13

P15

PACIFIC OCEAN

P7

P2

P1

P22

P34

LEGEND

- MAP INDEX NUMBER
- DIRECTIONAL GAGE - SCHEDULED
- DIRECTIONAL GAGE - EXISTING
- NON-DIRECTIONAL GAGE - EXISTING
- NON-DIRECTIONAL GAGE - DISCONTINUED
- NON-DIRECTIONAL GAGE - NOT FWGP FUNDED

L28 (TYP)

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- ◊
- ⊙

